The Trinity Amps

TRIP TOP

Amp Builder's Guide

July 2020, Version 21.3

www.trinityamps.com

Thank You

Thank you for purchasing your TRIP TOP kit from Trinity Amps. We truly hope that you enjoy building it and that it will be enjoyed for many years. If you have any questions, please do not hesitate to contact us and.

Please be sure to check the package contents in case there are any missing items.

We are always looking for feedback form our Customers on our products. We have checked the build instructions over thoroughly and are confident in our product. However, mistakes do happen so our advice is that as you connect each wire and part according to the layout, cross-check against the schematic. If you find any inconsistencies, or have any concerns, please let us know. Do not hesitate to contact us! We want this build to be successful for you and for Trinity Amps!

We're confident that you will like our product and our support and when you're completed, we'd appreciate your comments posted on any of the internet forums such as thegearpage.net, 18watt.com, AX84.com or trinityamps.com. You will find some extra business cards in the package. Please keep one and pass the rest around.

We know you have a choice in suppliers and do appreciate your business. If there is any other product, we can provide to you or your associates, please get in touch and we will be happy to discuss requirements.

Sincerely,

Stephen Cohrs,
Trinity Amps

Web site: **www.trinityamps.com**
email: **stephen@trinityamps.com**

Table of Contents

Introduction

This guide has been prepared for builders of Trinity Amps Kits. It is always being improved and we would appreciate your feedback and comments to: **sales@trinityamps.com**

Accordingly, content and specifications are subject to change without notice.

We do try to make it as accurate as possible, but it is sometimes hard to keep up with the changes. Therefore, if you do find an error, please let us know about it and we will correct it. Suggestions are welcome so if you have one, please get in touch with us.

Sources of help.

Forums: Please use the various forums to get help. They are an excellent resource and can be found at trinityamps.com, AX84.com, the Gear Page etc..

Color assembly pictures and the latest drawings, tips, techniques are all in the Trinity Amps Forum, in the Resources Forum. To view the Resources, you need to sign up so go to **www.trinityamps.com** and click on the Forum button.

Email: We can't help with every problem but if you can not get your problem resolved, email us and we'll do our best to help.

Phone Call: If your problem can't be solved, email for a phone appointment.

Acknowledgements

Much of the content in this document is original. Rather than reinvent content, some parts are based on content from other excellent sources and are hereby acknowledged.

Concept used with permission from from CtG electronics www.ctgelectronics.weebly.com/

R.G. Keen's site **www.geofex.com** - Tube Amp FAQ, Tube Amp Debugging
AX84.com site **www.AX84.com** - Gary Anwyl's P1 construction guide version 1.0
www.18watt.com - website for various content and diagrams – Richie TMB
Aron from diystompboxes.com

WARNING

Please Read this Information Carefully

The projects described in these pages utilize **POTENTIALLY FATAL HIGH VOLTAGES.** If you are in any way unfamiliar with high voltage circuits or are uncomfortable working around high voltages, **PLEASE DO NOT RISK YOUR LIFE BY BUILDING THEM.** Seek help from a competent technician before building any unfamiliar electronics circuit. While efforts are made to ensure accuracy of these circuits, no guarantee is provided, of any kind!

USE AT YOUR OWN RISK: **TRINITY AMPS EXPRESSLY DISCLAIM ALL LIABILITY FOR INJURY OR PROPERTY DAMAGE RESULTING FROM THIS INFORMATION! ALL INFORMATION IS PROVIDED 'AS-IS' AND WITHOUT WARRANTY OF ANY KIND.**

REMEMBER: NEVER OPERATE YOUR AMP WITHOUT A LOAD. YOU WILL RUIN YOUR OUTPUT TRANSFORMER!

Version Control

Version	Date	Change
1.0	19Mar2015	First draft
1.1	23Mar2015	Updated based on comments from Chris Moir
1.2	27Mar2015	Tone board tip added; installation of control bus bar updated
1.3	19Apr	Updates based on feedback
1.4	24Apr	Updates based on Chris Moir's first build
1.5	20May	Removed terminal strip on V6, p. 27 (R. Coppola)
1.6	28Jun	Updates to power supply and heater wire sections (J. Waterkotte & R. Coppola)
1.7	18Jul	Many Updates including: Sec. 2 , 6SL7 pin numbers ; Sec. 4, PT colours added; Test PT V4-V5 pins; PSU filter cap updated to 47uF from 100uF; bias R updated to 22K from 47K; Sec. 5 enhanced section picture of turret board; added alternate installation; corrected pin numbers in pictures of terminal strip installation at V1,V2 & grid resistor on V4, V5 Sec. 7 Made a note to lengthen the centre tap wire of the OT; clarified the wiring of PSU ground and Bias supply; updated bias resistor to 47K from 22K in PSU HiV Sec. 8 added note to set meter to 600V Sec. 10 Revamped the Start-Up procedure; added cathode bias section
1.9	15Aug	Enhanced Distortion troubleshooting with more tips; Noted wiring of OT to Impedance switch.
1.91	23Nov15	Corrected connection to Bias supply from Rectifier from pin 8 to pin 6.
1.92	27Dec16	Updated BOM for 20Ga BUS BAR; updated instructions on BUS BAR installation
1.93	31Mar17	Corrected primary impedance from 5500 to 6800 ohms
1.94	9May17	C19, 22,23,24 changed to 47uf/63V
1.95	22Aug17	Updated Connecting the Tone Boards instructions
1.96	4Sep17	Updated for Bias Selector slide Switch. Was toggle switch; Updated BOM
1.97	18Jan18	Corrected turret board layout in manual; Updated bias cap info to 47uF/63V) (M.O'Toole); updated V4,V5 grid resistor layout (M.Vockner)
1.98	6Aug18	Updated Bias Selector Switch
1.99	13Feb19	Updated BOM; added #10 Tx mounting screws
2.00	29Jun19	Updated for new PT
2.00	13Apr20	Output Power Measurements added (R. Brotherstone)
2.01	7Jul20	Updated BOM
2.02	14Jul20	Tone board layout updated / corrected. Bias switch layout, wiring and testing clarified.
2.03	17Jul20	Corrected to "Connect the 500R / 50uf Positive end / 500R"
2.04	25Jul20	Corrected Tone Board installation to match Layout drawing
2.05	31Jul20	Note for 15K bias range resistor added.
2.06	20Aug20	Changed to 15K bias range resistor.
21.2	28Jul21	Updated BOM to correct missing 2-22K Tone Board resistors 21.3
21.3	16Aug21	Updated heater -Hum pot wiring.


DON'T YOU BOYS EVER GET TIRED OF BUILDING THOSE STUPID AMPLIFIERS?

Builders Guide General Theory

For a discussion on Guitar Amp Basics and Tube Amp Theory, please refer to our support page document **Builders Guide General Theory**

Trip Top Description

Based on several years of vintage Ampeg B15 designs, the Trip Top combines the original circuits of both the Ampeg B-15NC (1964) as well as the later B-15NF (1965-67). The B-15-NF channel has the volume control section before the tone stack and in the B-15-NC channel it is after. Maintaining these circuits keeps the same gain structure and biasing found in the original B-15N amp designs, helping to preserve their true heritage. It also has two power supply settings - Cathode and Fixed bias to provide further tone structure.

The Trip Top is designed to output approximately 30 watts in cathode bias mode and 40 watts in fixed bias mode using 6L6GC tubes.

It was possible to get it to sound very, very close to Sly-Fi Chapel's 70s B15N using an Ampeg Portaflex 15" Bass cab, so it's tone has been proven authentic. But it has some extra hot sauce the original doesn't and it absolutely kills for bass. Sly-Fi Chapel recently re-amped all the bass on a current project as a result and found the extra headroom and tone stack arrangements made it better than their studio B15 in a lot of ways.

But calling it a bass amp is missing half the point. It's an AMAZING guitar amp. It has a different sonority than other Trinity offerings which have a focus on a very smooth but sparkly top end (the Triwatt being the one that slightly deviated). The Trip Top is the opposite - there's still a nice smooth top end - band plenty of it - but this amp is all about low end girth and grind. It's got a nice big tight booty (even with the bass tone knob on full!) that inspires rocking out down low on the neck with open chords!! Fixed bias has a more forward, clear, present sound... Cathode bias gives it a saggier feel but adds this gorgeous rich high harmonic overtone to everything - really nice for those ringy single coil U2-esque type sounds

The Trip Top combines the original circuits of both the Ampeg B-15NC (1964) as well as the later B-15NF (1965-67). Maintaining these circuits keeps the same gain structure and biasing found in the original B-15N amp designs, helping to preserve their true heritage.

It has two channels each have volume with a 'Pull Bright' switch, treble and bass controls. The first channel, NORMAL, from the B-15-NF, has the volume control section before the tone stack. The second channel, CASCADE, comes from the B-15-NC which has the volume control section after the tone controls.

The power amp section has two switch selectable bias modes - fixed (B-15NF) and cathode (B-15NC). While 1N4007 solid state rectifier diodes were used for the "NB" configuration, this was not incorporated into the design but can be a user implemented option.

The Trip Top is designed to output approximately 30 watts in cathode bias mode and 40 watts in fixed bias mode.

The tube set used in both the B-15NC and B-15NF is incorporated in the design: Three 6SL7-GT dual triodes for preamp and phase inverter circuits, two 6L6GC power tubes, and a 5AR4 rectifier. A small change in the phase inverter to power amp coupling capacitors in original B-15Ns from .022uF to .047uF opens things up a bit.

The Output Transformer has multiple impedance secondarys which allow a choice of 4, 8 or 16 ohm speaker loads. The primary impedance is 5500 ohms.

The Trip Top is built using point-to-point wiring using turret board construction for optimal service and reliability. High-quality tubes, coupling capacitors and resistors are selected for maximum tone, performance and reliability. The Trinity Amps power transformer and output transformer are all custom built and selected for maximum tone, performance and reliability.

Biasing Tube Amps

The 'Biasing' of tube amps commonly refers to "setting the idling current in the Power Tubes in Push-Pull output stages" - the No-Signal or Static (=DC) Current Levels are the target spec and the surrounding voltage conditions are adjusted accordingly when possible. The voltage-to-current bias relationship that exists for a power tube under a given bias set will respond differently from tube to tube (between brands especially) AND, more-so, over time of use. Some amplifiers have mechanisms for automatically setting the bias, Cathode Bias for example, and others don't and are called Fixed Bias. Some Fixed Bias amps have a control to change the bias setting. These are sometimes called Variable Bias.

In Fixed Bias/ Variable Bias push-pull amplifiers a separate power supply circuits is employed to generate a negative voltage with respect to chassis ground - this voltage is fed to the grid terminal of the power tubes through bias feed resistors (typically 47k to 220k ohms) ... this is the negative Bias voltage that is typical written in amplifier schematics, in variable bias amplifiers this voltage can be "swept" through a potentiometer.

In Principle As the bias voltage in the grid is brought more negative with respect to the chassis ground (say, from -42volts to -52volts) then you'll typically find that the gain of the output stage will drop along with the drop in idling currents ... if the bias voltage is made less negative (opposite) then you'll find the gain of the output stage going the other way along with the increase in idling currents ... Note: some players mistakingly see the bias control as merely another volume control - the Red-Knob Fender Twins are notorious for this because of their availability of external control ... guitarists should tell each other to be cautious playing with that control alone unless they plan on making a proper science of it (!)

The Bias Limits
There are two primary biasing LIMITS on the network variable sets that need to be observed when biasing power tubes in a clas-AB push-pull stage.

The **Lower Biasing Limit**, when the amp is underbiased, produces a cross-over notch when observing AC waveforms on an oscilloscope . When a push-pull output stage is underbiased (bias voltage is too negative) it often sounds fuzzy and weak.

The **Upper Biasing Limit** leads to a situation where the dissipation rating of the power tubes is exceeded during normal operation. When the power tubes are running too hot the amplifier will sound very grainy and you might even hear some background crackling when not playing. This is a sign the power tubes are over biased (too much current at idle). Another tell-tale sign that your power tubes are biased way too hot is if the outer plate inside the tube turns red when you play.

Aside from frying the tube this situation can potentially damage the output transformer, so if you ever see this happening while playing it's best to shut the amp down right away and have it serviced. This is an extreme situation that shouldn't happen under proper operating conditions.

Building an Amp

Warning: Do not attempt to build a guitar amp unless you know how to work safely with the dangerous voltages present in a tube amp. These can exceed 700 volts.

Introduction

If you have purchased your Trinity Amp as a kit, this guide will help you build a tube guitar amplifier. It is oriented towards someone who knows a little about electronics but is new to do-it-yourself amps. It outlines a simple path to getting a quality amp build.

Switches and wire

Use standard UL approved switches with a 125V/3A rating for the Power and Standby switches. Use 22 or 20 Gauge insulated solid wire with a 600V rating. It is good to get a variety of colors so you can color code your wiring.

Use 18 Gauge stranded for mains wiring.

Physical layout

Make sure the jacks, sockets and pots mounted along the edge won't interfere with parts mounted on the underside of the chassis. Imagine how chassis will be mounted in the cabinet and make sure there is enough clearance for the speaker and mounting brackets. Trinity amp chassis are laid out with serviceability and neatness in mind.

Grounding

It is recommended that you follow the layout provided with your Trinity Amp. It has been tested and has proven reliable. If you choose to deviate, consider the following information.

Amps traditionally use the chassis for signal ground. This is not the best choice since it can create ground loops and bad ground connections may develop over time. It is better to use star grounding in which all of the local grounds are collected at a single 'star ground' point. With star grounding there is only one connection between the chassis and signal ground.

Here are some rules for laying out a star ground. More information on grounding can be found in the Tube Amp FAQ and the Tech Info page of Aiken Amplification.

(1) Connect the power transformer center tap directly to the negative terminal of the first power supply filter capacitor (cap) then run a separate wire from the negative terminal to the star ground point.
(2) Collect the ground points of each tube and its associated resistors and capacitors to a local ground point that is not connected to the chassis. Run one wire to the star ground point from each collection.
(3) Run exactly one wire from the star ground point to chassis.
(4) Insulate the input and output jacks from the chassis.

The safety ground wire from the mains is separate from the signal ground. Run a wire from the AC ground to the chassis near where the AC power enters the chassis.

Insulated jacks

To insulate the input and output jacks either use plastic insulated jacks or metal jacks with insulating washers. Some people prefer the increased durability of metal jacks. Insulating a metal jack requires a shoulder washer with a 3/8' internal hole that fits a ½' panel hole.

Minimizing transformer interference

To minimize coupling between the power transformer and output transformer orient them so their plates are at right angles. If possible, place them at opposite ends of the chassis.
Keep the input stage wiring short and away from the output stages. This minimizes the possibility of oscillations caused by coupling of the output signal into the input.
Mount the grid resistors as physically close to the grid pins as possible.
Use a twisted pair of wires for the tube filament wiring. Route it away from AC lines and close to the chassis.

Wiring

The traditional method of constructing amps involved mounting the components on tag board or fiberboard. This is the technique that is used for Trinity Amplifiers and is the recommended approach for service and reliability.

Assembling the amp

Before You Begin

When you first receive your kit, remove all of the parts from the shipping box and place them on a well-lit, clean surface. Check all of the parts against the parts list and verify that you have everything before you begin. Contact us at once if you are missing anything, or if something appears to be damaged**.**

Tools

To assemble the amp you need:

1. 25 watt pencil tip soldering iron
2. 60/40 Rosin Core solder (ROHS use Lead-free solder 97/3 tin/copper Rosin Core)
3. wire stripper
4. wire cutter
5. needle nose pliers
6. screwdrivers (Philips, standard)
7. multi-meter with minimum 500V range

Use a stand for the soldering iron, a sponge to keep the tip clean, de-soldering wick material and clip leads. You should also have a multi-meter with at least 500V range, preferably 1000V and an audible continuity

checker. Try to get a multi-meter that measures capacitance. This lets you verify the value of your components before you install them.

Soldering

Soldering is accomplished by heating the components to be soldered and allowing the molten solder to flow onto them. Do not try to melt solder on the tip of the iron and transfer it to the solder joint. It doesn't work. Follow these steps when soldering to boards. **Note ROHS instructions**:

1. Use 60/40 rosin-core solder. (use **lead free** when soldering ROHS boards.)
2. Keep the tip of the soldering iron clean. If it's dirty, wipe it on a damp sponge to clean it.
3. Set the temperature of your soldering iron to about 700F.

ROHS: 725-750F when soldering ROHS turret boards, the dwell time (time to heat and complete the connection) is a little longer and temperature is set a little hotter. The solder used was Lead-free solder 97/3 formula tin/copper with a Rosin Core.

4. Melt some solder on the tip of the iron. The molten solder helps to efficiently transfer heat from the soldering iron to the component leads.
5. Make a good mechanical connection first, and then make a good solder joint.
6. Heat the leads to be soldered by touching it with the tip of the iron.
7. Touch the solder to the leads. The solder should flow onto the leads. Avoid breathing the fumes.
8. Remove the soldering iron and allow the solder joint to cool.

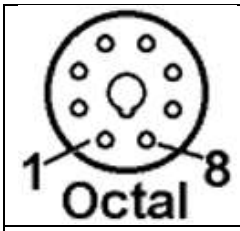
Note: Do not apply the tip of the soldering iron to the turret board any longer than it takes for the solder to flow.

Some people do have success using leaded solder on ROHS boards. Your experience may vary.

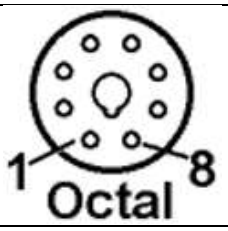
The solder joint should be clean and shiny. (ROHS joints are not as shiny as non-ROHS). If it is dull looking it may be a 'cold solder joint' which is not a good electrical connection. If a solder joint is suspect, heat it with the iron to reflow the solder.

Tube Pin Numbering

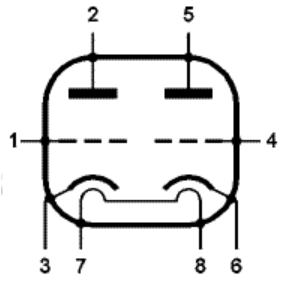
The pins on an 8-pin tube socket are numbered 1 to 8 in a clockwise direction when viewed from the bottom. Note that there is a key to ensure the tube is inserted correctly into the socket.



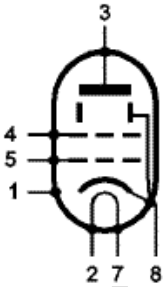
6SL7



6L6 /KT88



6SL7



6L6 /KT88

The pins on the potentiometers are numbered 1 to 3 from left to right when the shaft is facing towards you and the pins are at the top.

Assembly Steps Summary

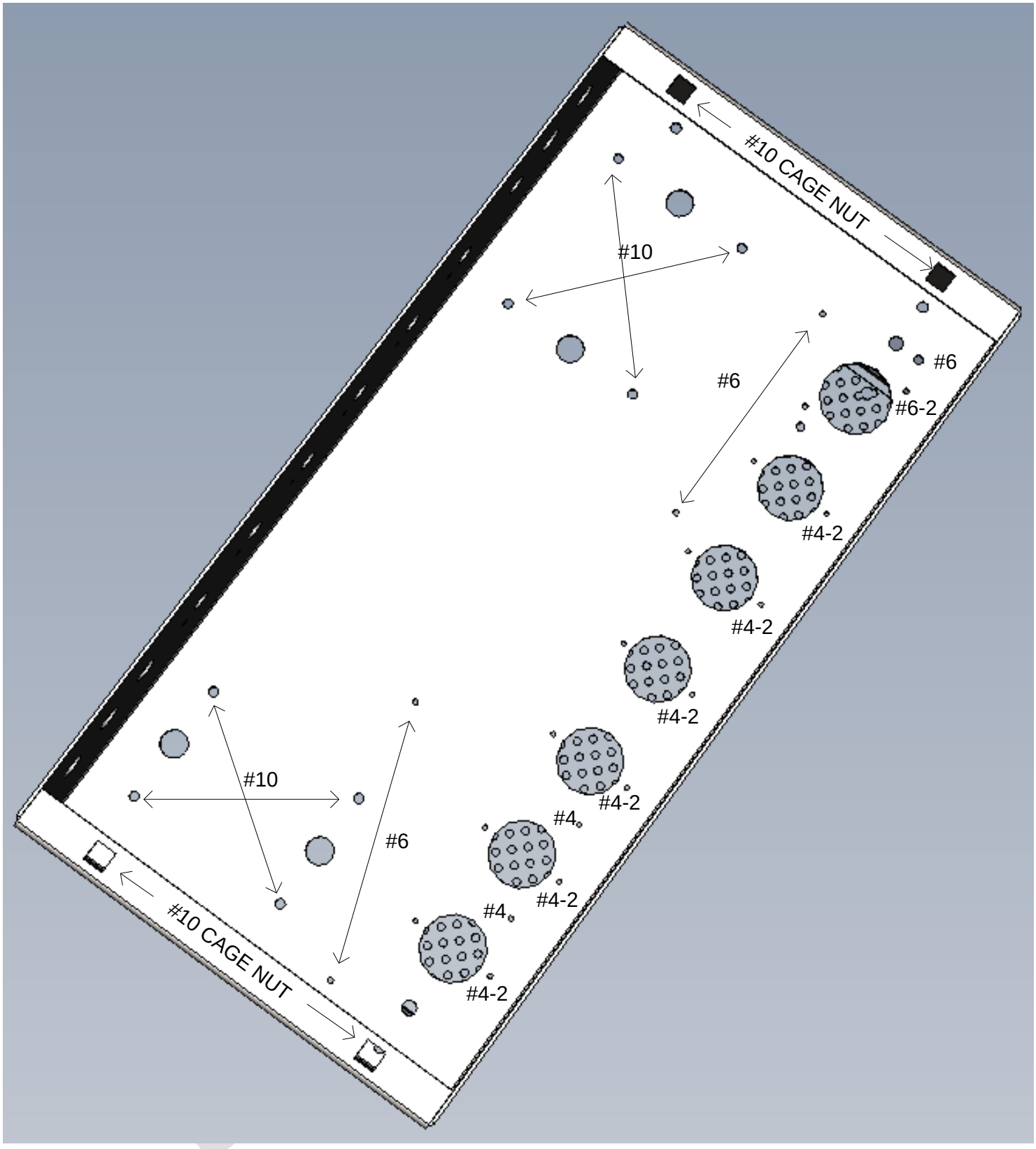
1. Install Hardware on the Chassis.
2. Wire up the heater wires to the sockets.
3. Install Transformers on the chassis.
4. Wire up the power supply - Mains, Transformers, power switch and pilot light.
5. Assemble the turret board and Install on chassis.
6. Connect turret board leads to tubes installing off-board parts as you proceed.
7. Connect turret board leads to controls installing off-board parts as you proceed.
8. Remove input jacks. Wire with 3.3M film resistors and shielded cable. Re-install.
9. Check Wiring.
10. Follow Start-Up procedure.

TIP: On a copy of the layout, highlight the connections as you complete them to make sure they are done correctly.

1. Install the Hardware

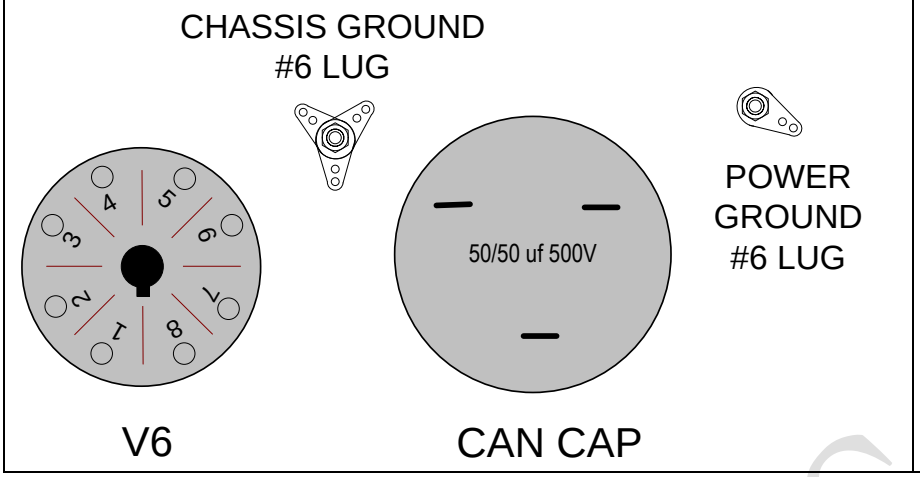
There are many nuts bolts etc. required. Here are some guidelines.

Part	**Where to use**
4-40 X 5/16 (no nuts reqd.)	Mount tube sockets, [optional lock washer under head on threaded chassis];
4-40 nuts	Mounting terminal strips, ground point, IEC socket
4-40 X 7/16	*If supplied – to mount tube sockets with terminal strip, use nut to hold terminal strip with nut/lock washer or lock nut. Use with nuts/lock washer to mount IEC connector, 5 lug terminal strip and 1-#4 pre-amp chassis lug.* *Mount tube sockets on **non-threaded chassis** with lock nut*
6-32 X 3/8	Mount 3 star ground # 6 chassis lugs with lock nut. Mount Capacitor clamp; mount power ground lug in some amps
6-32 X 1	Mount turret board to chassis using stand-off. Use with lock nut.
8-32 X 3/8	Mount Mains ground **ONLY**. Use KEPS nut with lock washer and #8 chassis lug. power ground bolt.
10-32 X 3/8	Mount Output and Power trans. With KEPS lock nuts & washers
10-32 X 2	Mount chassis to cabinet. Use cage nuts in square holes pressed into chassis.


#10 CAGE NUT
#10
#6
#6
#6-2
#4-2
#4-2
#4-2
#4-2
#4
#4-2
#4
#4-2
#10
#6
#10 CAGE NUT

Insert the 4 Cage Nuts by setting them in place in the square hole, one side fitting into the square hole and then using a straight blade screwdriver, press in the cage on the opposite side so it snaps into position when pushed into the square hole indicated above (#10 Cage Nut).

Install all the tube sockets aligning them so the Pin 8 of each socket points towards the rear of the chassis. Use #4 – 5/16" screws to fasten them to the chassis from the outside.



CHASSIS LUGS

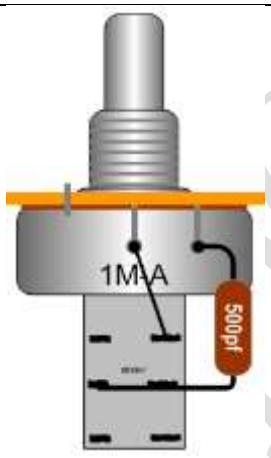
Mount 3 # 6 chassis lugs with #6 X 3/8" screw lock nut. This is the Chassis Star Ground

Mount 1 # 6 chassis lugs with #6 X 3/8" screw and lock nut. This is the Mains Power Ground.

Install the Can Cap bracket with #6 screws then install the dual capacitor 50/50 JJ can cap using the bracket to hold it in place.

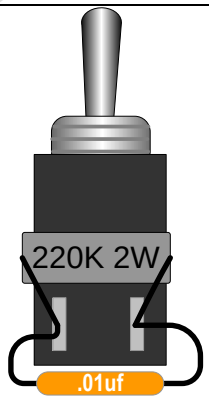
Insert the 4 plastic grommets into the chassis for the wire leads passing through the chassis from the power transformer and output transformer.

Some controls are more easily installed on other components prior to installation. Use the following illustrations as a guideline to pre-build them.



Volume Control

Before installing the Volume Controls, pre-wire the switch with a 500pf bright capacitor as shown.

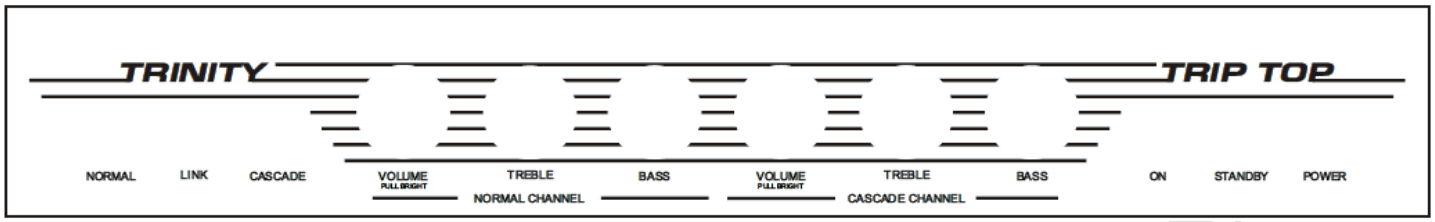


1KV DISC CAP

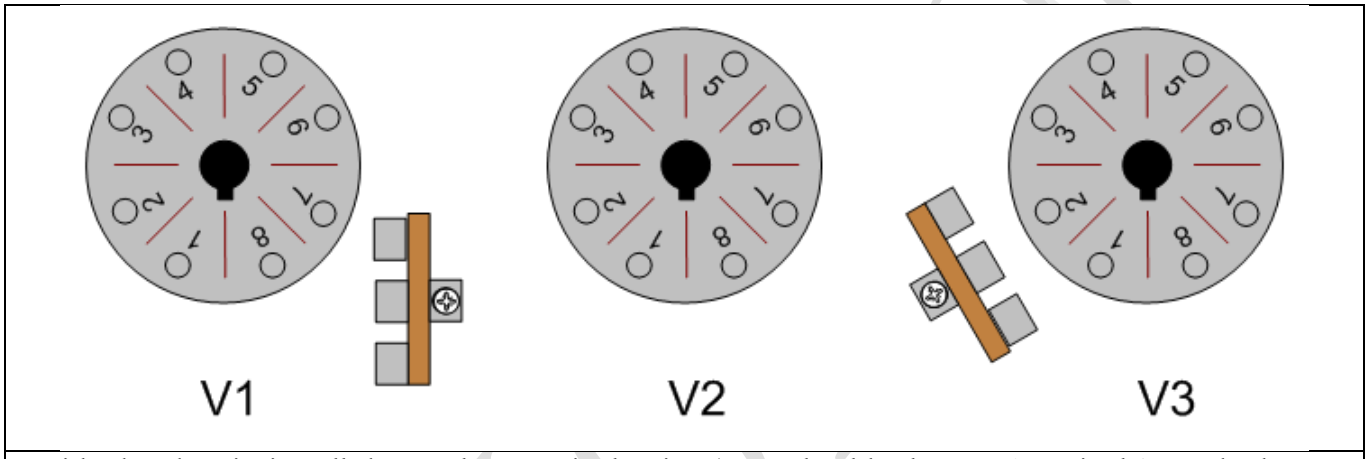
Stand-By Switch

Before installing the Stand-By switch, pre-wire the switch with a .01uf 1Kv capacitor and 220K 2W resistor as shown.

Referring to the Layout diagram, install the controls. Ensure the potentiometers are located in the correct positions according to their values and the layout. There are locating holes cut into the chassis for the potentiometers, so they won't spin if the control ever loosens. . For the two switched volume controls, trim a small mount off the end of this tab so it doesn't protrude past the chassis face when installed. For the input jacks you will need to use the 2 supplied fiber spacing washers on the inside to mount them flush with the front.
Install the power indicator lamp.



TRIP TOP Front View



Inside the chassis, install the 3 3-lug terminal strips (several solder lugs or 'terminals' attached to an insulated strip) for the pre-amp connections. See the above diagram for the areas where these are used. Refer to layout and section on which hardware to use to mount these parts at V1,V3

Install the 200R Hum potentiometer.

***Tip**: To facilitate wiring of the heaters, builders may find it easier to install the following parts once the heaters are wired up.*

Install the IEC mains connector, fuse holder, bias control (10K) potentiometer, DPDT bias switch, switched pre-out jack, impedance selector and output jacks. For the hum pot, bend the tabs back so it fits flush to the chassis.

Use the fibre shoulder washer and flat washer pair, to insulate the Switchcraft switched preamp output jack from the chassis. The fibre shoulder washer goes on the inside; fibre flat washer the outside.
Install the two output jacks making sure they are tightened tightly.

TRIP TOP Rear

2 Wiring

Here is a guideline for wiring the kits with the supplied wire:

- Use 22 gauge colour solid for hook up from board to tubes using the following colour code chart.

22 Gauge Colour		6SL7	6L6 / KT66
Orange	Plates	2, 5	3
Yellow	Grids	1, 4	5
Blue	Cathodes	3, 6	8
White	Controls to board		
Green	Ground		

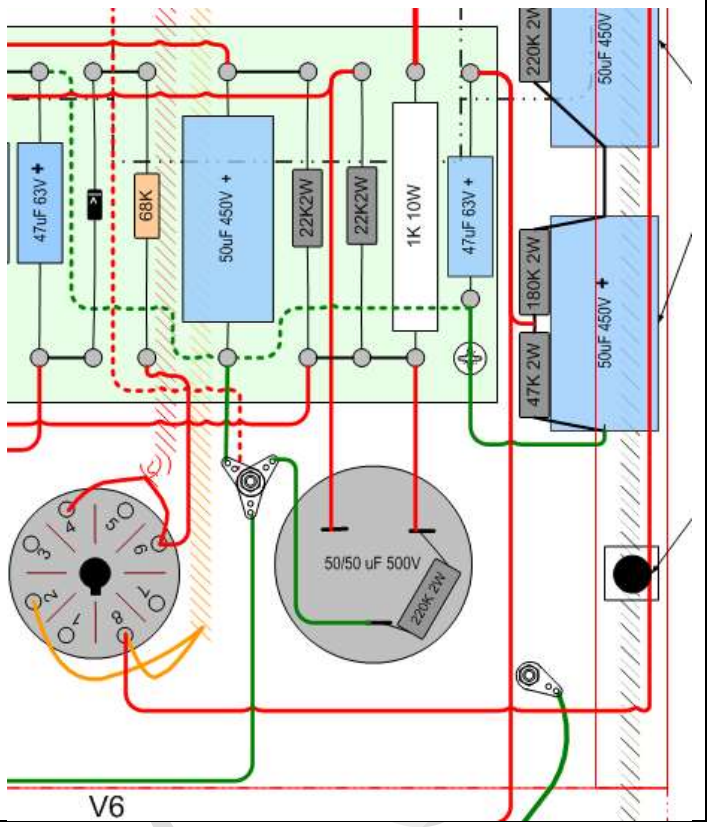
- Use 22 gauge solid pre-twisted Red-Black pair supplied for tube heater wiring
- Use Black, White 18 Gauge, stranded, for power supply hook up - to transformers from IEC socket.
- Re-use cut offs from the transformers for the power supply side.
- Use RG174U for coaxial connections as indicated on the layout

Grounding Scheme

The TRIP TOP use a single star-point grounding scheme where the power side of the amp is connected to a single common ground point, and the preamp part is connected to the same point on the chassis.

For grounding these amps, we strongly recommend that you follow the layout provided. We don't recommend that you deviate.

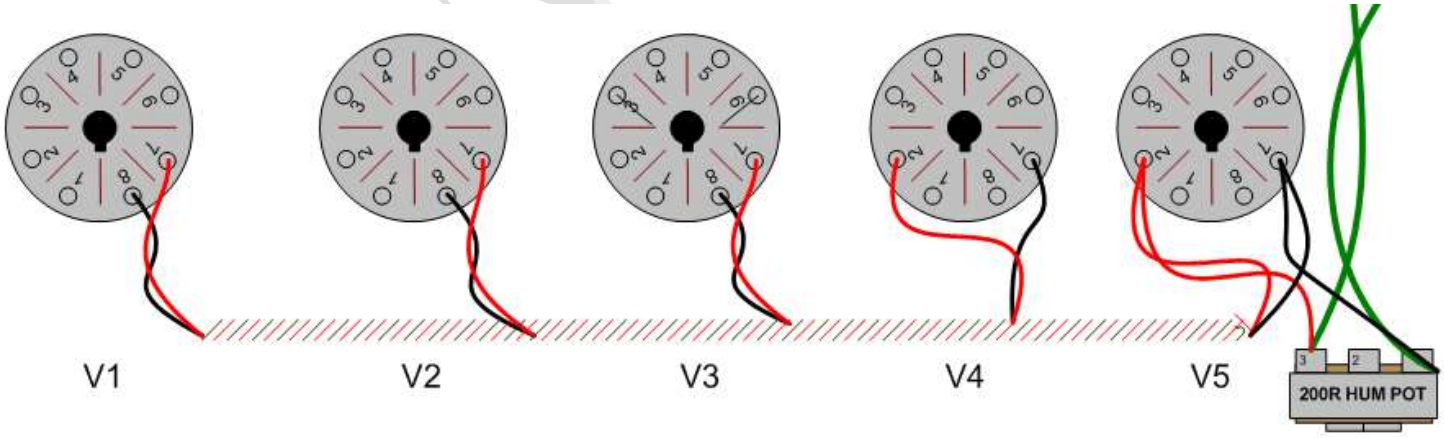
There is also a separate AC supply safety ground point near the IEC connector, which doesn't form part of the actual amplifier circuit. WARNING: THIS CONNECTION IS VITAL FOR SAFETY REASONS.



Heater Wiring

This is tight wiring so set it up correctly and check and then finally install the power transformer and solder everything in place on V5.

Note: After you install the power transformer, the next step, you will connect each of the Green twisted heater wires from the Power Transformer to the outer terminals of the Hum Pot. Then also go from those two terminals to the lower holes in the socket tube pins 7 and 2 of V5. See next step on installing the power transformer.



For connection to the tubes heater wires and hum control left and right terminals, connect two twisted 20 gauge wires to the Upper hole in the socket tube pins 7 and 2 of V5. Then connect these to pins 2 and 7 respectively of Power Tube V4. From there, the wires daisy chain across the preamp tubes, V3, V2, V1 Red wire to pins 7 of each preamp tube and the Black wire to pin 8. This phasing or 'polarity' on the preamp heaters needs to be maintained. The two power tube sockets V5, V4 also need to have their heaters wired in the same phase (using the same colours) to minimize hum.

Connect a short piece of twisted 22 gauge wire from the Upper hole in tube pin 7 and 2 of V5 to the hum control left and right terminals,

It is important to wire the tube filaments carefully. Use the pre-twisted 20 gauge solid core wire to minimize any hum.

3 Install Transformers

Install the power transformer. The Power transformer lies down along the chassis 'long axis'. Align the AC mains leads so they face towards the outside of the chassis. The High voltage (Red - Red/Yellow - Red), Heater leads (Green – Green)and Rectifier Heater leads (Yellow –Yellow) face inwards. Feed the leads through the 2 grommets installed in the chassis. Bolt the transformer in place with the supplied 4 each of 10-32 bolts & KEPS nuts and washers.

On the screw closest to the power switch, install a Terminal strip under the nut. You will need to cut the mounting tab in order to allow it to "open up" to fit the #10 screw.

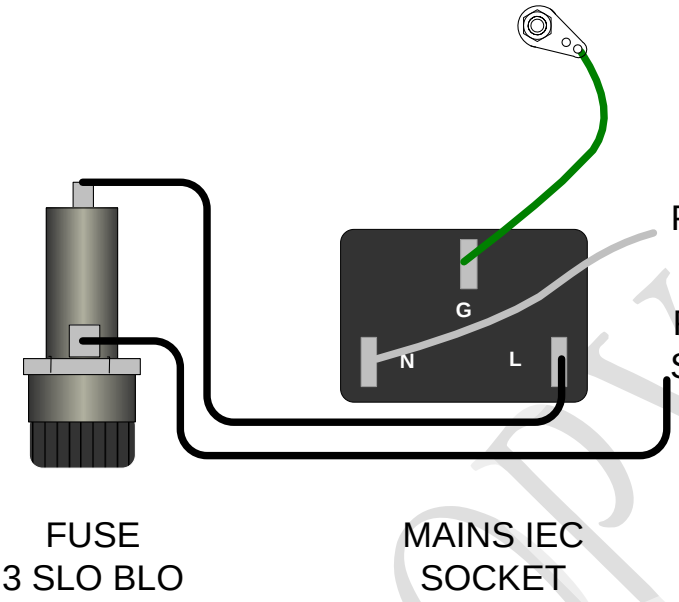
Tightly twist the AC mains lead pairs for your local voltage.

Install the Output transformer. The Output transformer lies down along the chassis 'short axis'. Braid the Primary leads together (Brown – Red – Blue) Braid the secondary winding leads (Yellow (4 ohm), Green (8), Orange (16) Black (Common).

Align the Primary leads so they are pointing towards the front of the chassis. Feed the leads through the grommets installed in the chassis with the Primary and Secondary leads going through separate grommets. Bolt the transformer in place with the supplied 4 each of 10-32 bolts, KEPS nuts and washers. The secondary leads should be in-line with the impedance switch.

4 Power Supply Wiring

Now is the time to wire up the main power feed. Use stranded cut-offs from the transformers or some solid core wire. Start with the IEC socket and ensure it is grounded to the #6 chassis lug on the chassis beside the cap bracket. Tighten the ground tightly. Run a wire from the 'Hot' 'Line' side of the IEC connector to lug on the END of the fuse holder from the SIDE of the fuse holder and to the power switch.



The other side of the IEC socket or 'Neutral' gets connected to the 'Common' side of the power transformer.

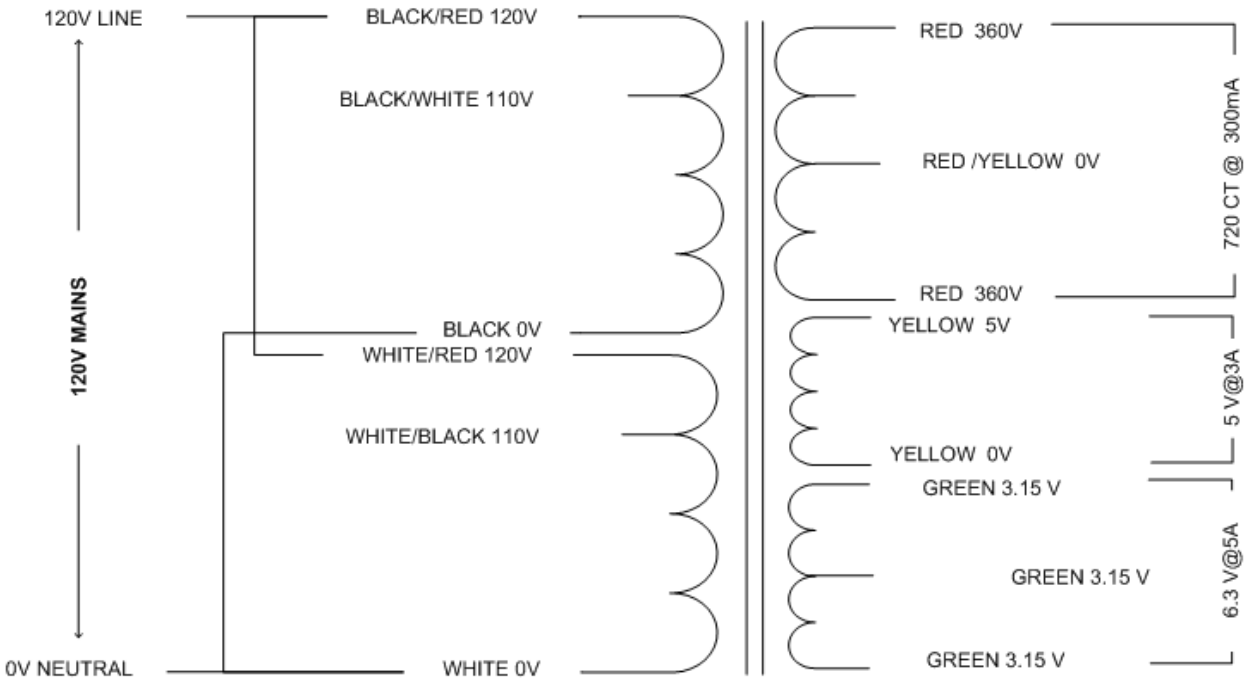
Wiring of Mains Power cords: European vs North America			
	Ground	Hot (L)	Neutral (N)
Europe	Green/White or Green/Yellow	Brown	Blue
North America	Green [USA-plug round prong]	Black [Small flat prong]	White [Large flat prong]
European 230V	Green/White or Green/Yellow	It makes no difference how the other two wires are matched.	

From the Power Transformer, Connect the High Voltage Centre Tap Red-Yellow to the power amp 3 lug, Star Ground point located between the 50/50 uF can cap and V6.

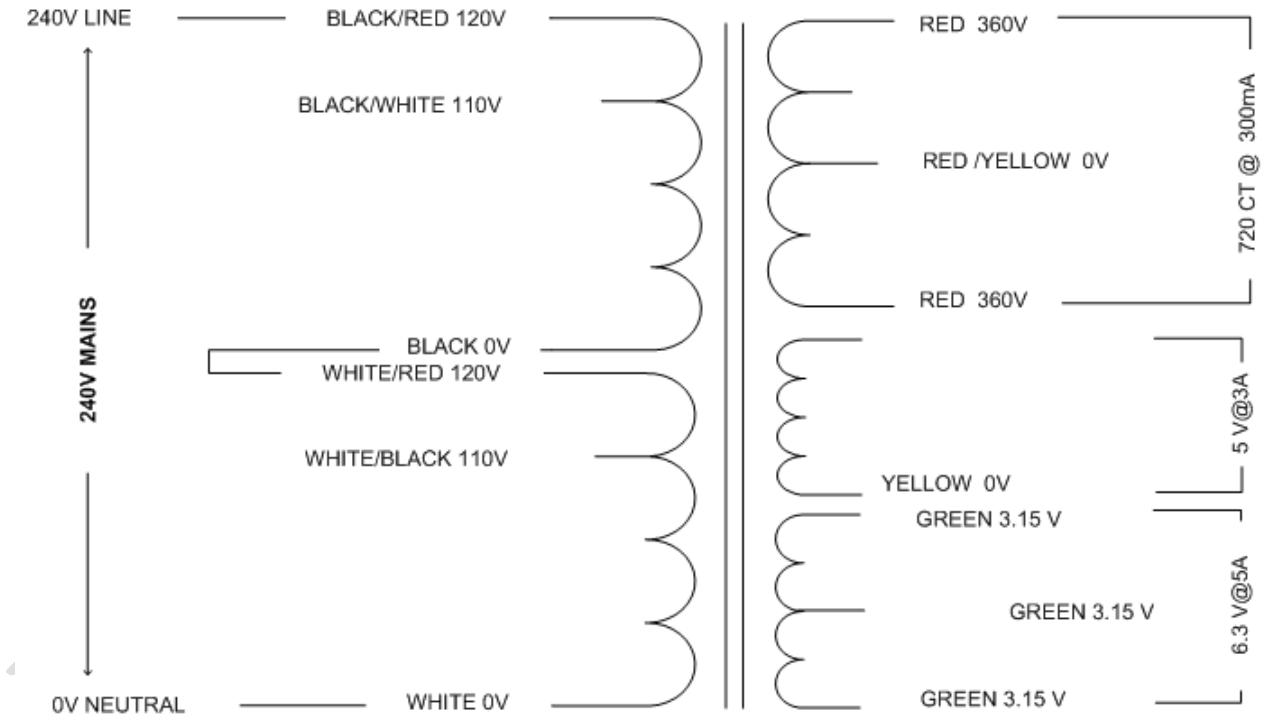
From the Power Transformer, take the Green (6.3V Tube Heater pair) pair of wires and tightly twist them. Route the twisted pair wire through the chassis, following the layout diagram, pressing it flat against the chassis. Cut, strip and solder them to the first power tube, V5, Lower hole of pins 7 and 2.

From the Power Transformer, take the Yellow (5V Rectifier Heater pair) pair of wires and tightly twist them. Cut, strip and solder them to the Rectifier tube, V6, pins 8 and 2.

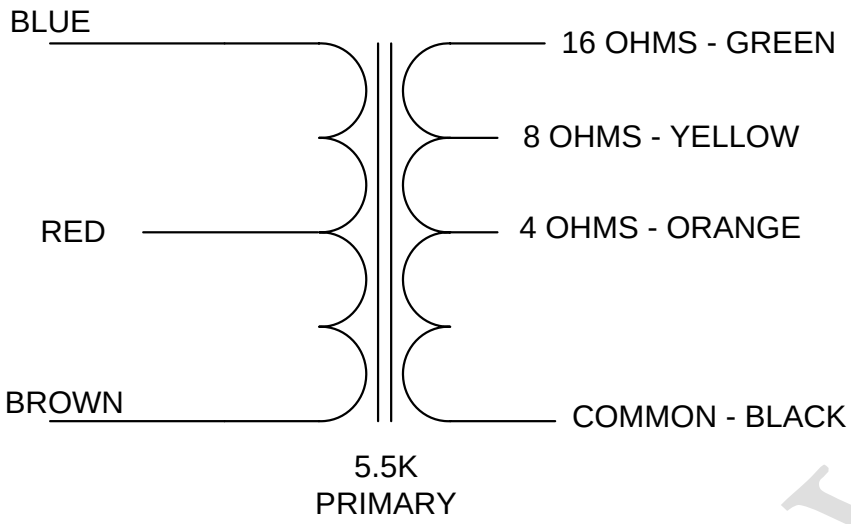
From the Power Transformer, take the Red (High Voltage) pair of wires and tightly twist them.
Route the twisted pair wire around the outside perimeter of the chassis, following the layout diagram, pressing it flat against the chassis. Cut, strip and solder them to the Rectifier tube, V6, pins 4 and 6.



Trinity Amps Trip Top Power Transformer 120V Hook-Up



Trinity Amps Trip Top Power Transformer 240V Hook-Up



Trinity Amps Trip Top Output Transformer

Wiring the Power Switch and Indicator (120V)

The Trip Top has both Power and Standby switches.

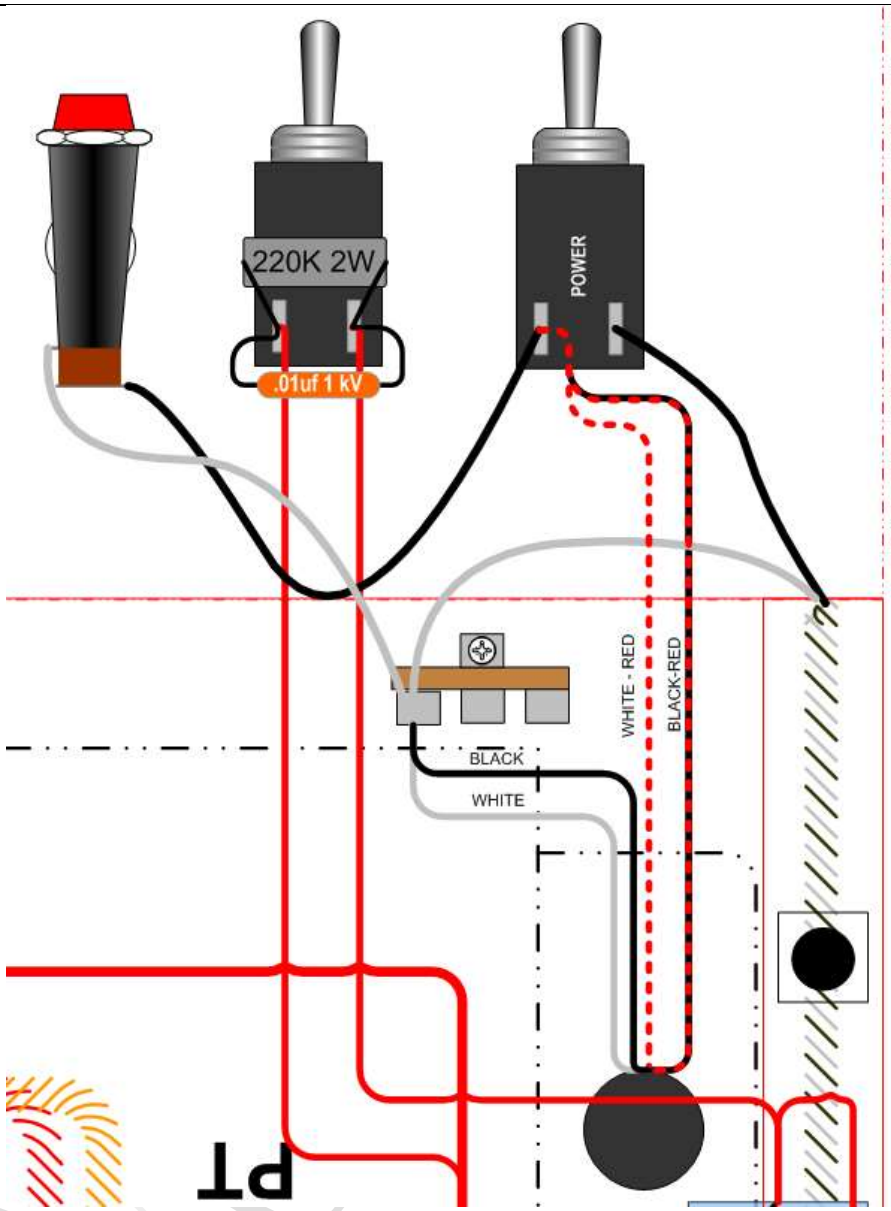
Install the Power Switch so that it is in the desired on position when it is On. The toggle will be in the "UP" when on.

DO NO USE The Centre Lug of the Terminal Strip

Run two 18 ga., stranded wires (BLACK and WHITE) twisted leads from the IEC connector, on the inside corner of the chassis to the front of the amp. Connect the BLACK (Line) to one side of the power switch.

Connect the other side of the Power Switch to both the WHITE-RED and BLACK-RED leads from the Power Transformer and run a third lead to one terminal of the indicator.

Connect the WHITE (Neutral) from the IEC connector to the Terminal strip. Connect the WHITE and the BLACK leads from the power



transformer as well and run a third wire to the other side of the Indicator. Tie Off the unused 110V leads BLACK-WHITE and WHITE-BLACK with heat shrink tubing and cable ties.	

Wiring the Power Switch and Indicator (240V)

The Trip Top has both Power and Standby switches.

Install the Power Switch so that it is in the desired on position when it is On. The toggle will be in the "UP" when on.

DO NO USE The Centre Lug of the Terminal Strip

Run two 18 ga., stranded wires (BLACK and WHITE) twisted leads from the IEC connector, on the inside corner of the chassis to the front of the amp. Connect the BLACK (Line) to one side of the power switch.

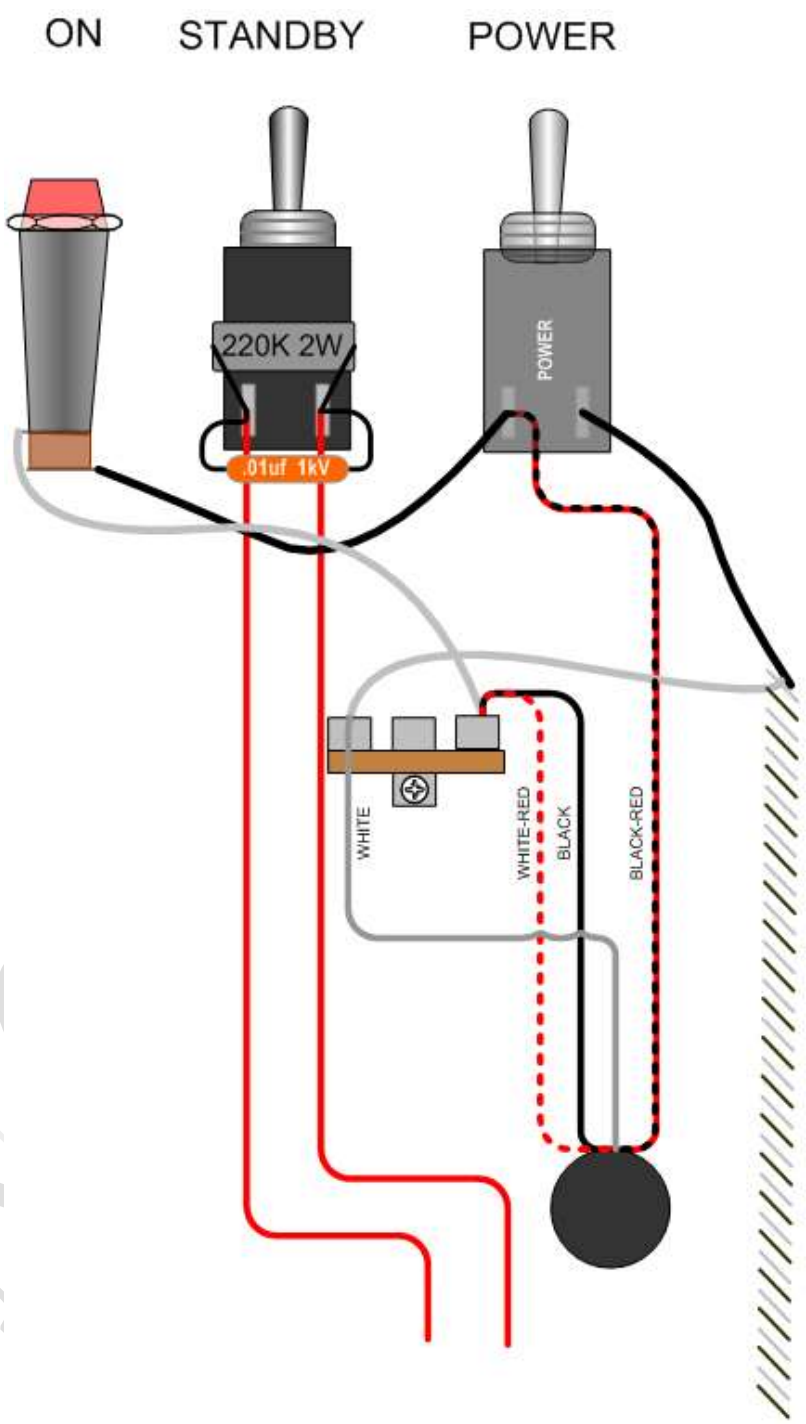
Connect the other side of the Power Switch to both the BLACK-RED lead from the Power Transformer. Run a lead to one terminal of the indicator

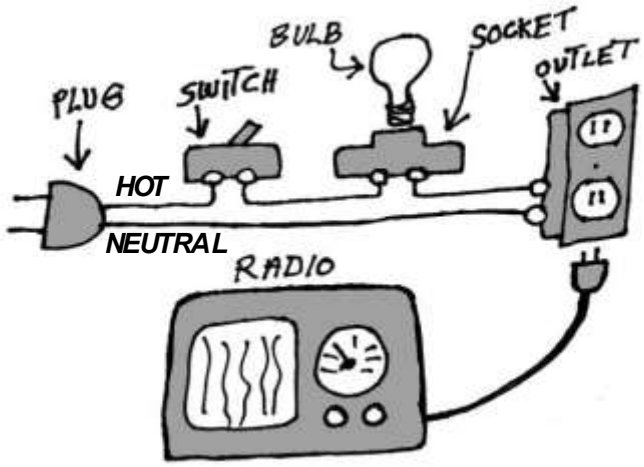
Connect the WHITE-RED and BLACK together at the terminal strip and run a third lead to the other terminal of the indicator.

Connect the WHITE (Neutral) from the IEC connector to the Terminal strip. Connect the WHITE lead from the power transformer as well and run a third wire to the other side of the Indicator.

Tie Off the unused 110V leads BLACK-WHITE and WHITE-BLACK with heat shrink tubing and cable ties.

Note: See Appendix 1 for other Voltage Schematics



Tool Tip: A useful tool to construct is a Current Limiting Device. This is simply a 25-50 watt light bulb wired in series with the main, hot line. The idea behind this circuit is to use a light bulb in series with the outlets you are trying to protect. Simply wire one of the outlets on a light socket, in series with the outlet you want to protect. Theory: If the current draw on the protected outlets gets high, the light bulb will light, indicating a high current draw. Light bulbs are current limiters. They will get to their maximum brightness and then the bulb filament resistance will increase, limiting the circuit current.	

Test the Power Transformer

This is a good time to check your mains wiring to the power transformer and ensure all wires are safely connected or tied off.

Without tubes installed, mains supply **unplugged**, get out an ohmmeter. Use an ohmmeter to verify that the connection points for the Power Transformer (PT) secondaries are not shorted to ground. With no tubes the 6.3VAC (Volts A C) secondary when measured to ground, should not read zero ohms. It will be very low, but not zero.

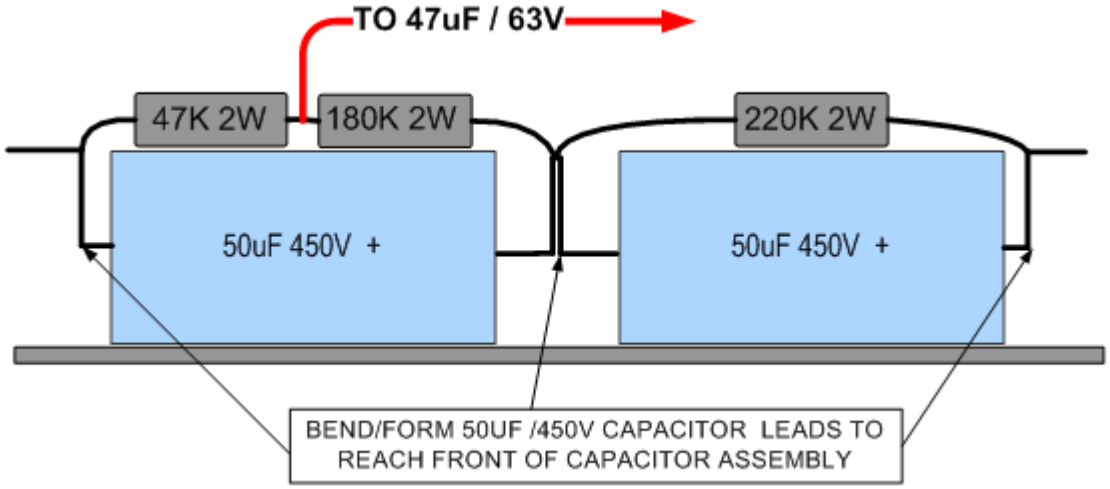
If all is well, install the 3A slo-blo mains fuse (or 1.5A/2A if using 240 mains). Switch on for 1 second just to see the pilot come on nice and bright. If the lamp did not come on, check to see if the fuse blew. If not, you may need to try another lamp and do the 1-second power thing again. If the fuse blows, there is a short on the PT or mains.

Use your AC voltmeter to check for 6.3VAC (actually more like 7 VAC with no tubes installed) at the tube sockets V1-V3 between pins 7-8 and V4- V5 between pins 2-7 and 6 VAC at the Rectifier, V6 socket between pins 2-8.

VERY, VERY carefully, with your AC voltmeter set on maximum, check for 700VAC (with no tubes installed) at the Rectifier, V6 socket between pins 4 and 6 .

If all checks out, you are good to continue to wire up the power supply components.

Assembling the Capacitor Assembly



Capacitor Assembly

This is fiddly work!! Bend the 4, 50uF leads so they come to the front of the capacitor assembly. In doing so, hook the middle capacitor leads together, Negative of one to positive of the of the other, and solder them to form the assembly.
Install a 220K 2W resistor across one - 50uF – 450V axial capacitor.
Install a 180K 2W and 47K 2W resistor pair across another - 50uF – 450V axial capacitor.
Note the orientation in the above figure. 180K "On Top".
This assembly now effectively forms a 25uF - 900V , balanced capacitor. Positive end toward the standby switch (front) and negative end towards the chassis rear.
Connect 2 pieces of Red lead 12" long to the Positive end and a 6" Green lead to the Negative end.
Using two tie wraps looped around the body of each capacitor and through the two holes in the chassis, firmly attach the assembly in place against the inside of the chassis.

Wiring the Stand By Switch

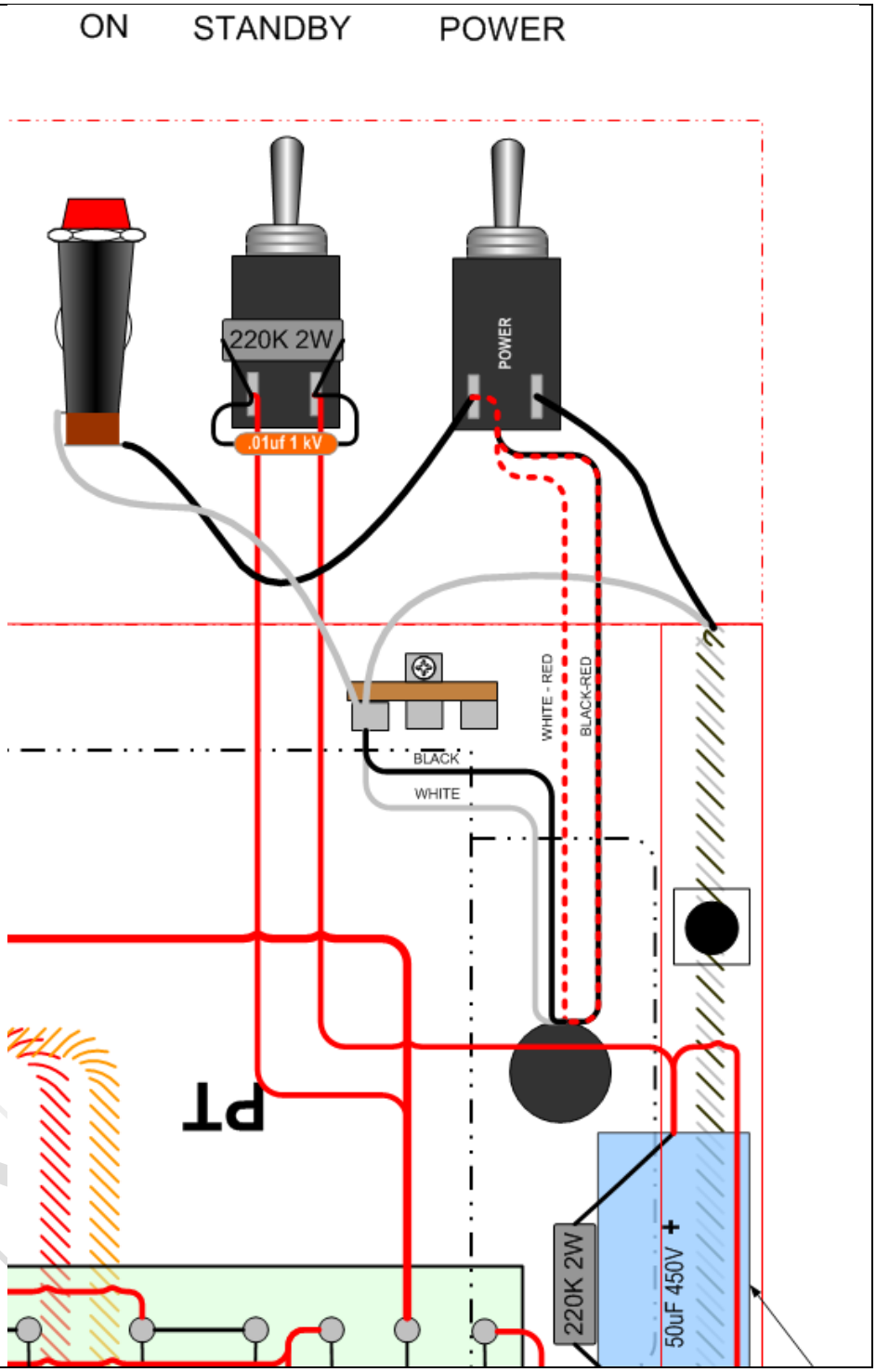
Build the Stand By Switch according to the layout and install it so that it is in the desired on position when it is On. The toggle will be in the "UP" when on.

Connect one of the leads from the Positive end of the Capacitor assembly you made an previously installed, to one switch terminal and connect another 6 inch lead to go from the other switch terminal to the 1K 10W power resistor on the Turret board.

Connect the other lead from the Positive end of the Capacitor assembly to the Rectifier tube, V6 pin 8.

Connect the green lead from the Negative end of the Capacitor assembly to the Star Ground.

Prepare a 6 inch lead to reach from the junction of the 180K-2W and 47K-2W resistor pair to the turret board 47uF – 63V capacitor, when the board is installed)



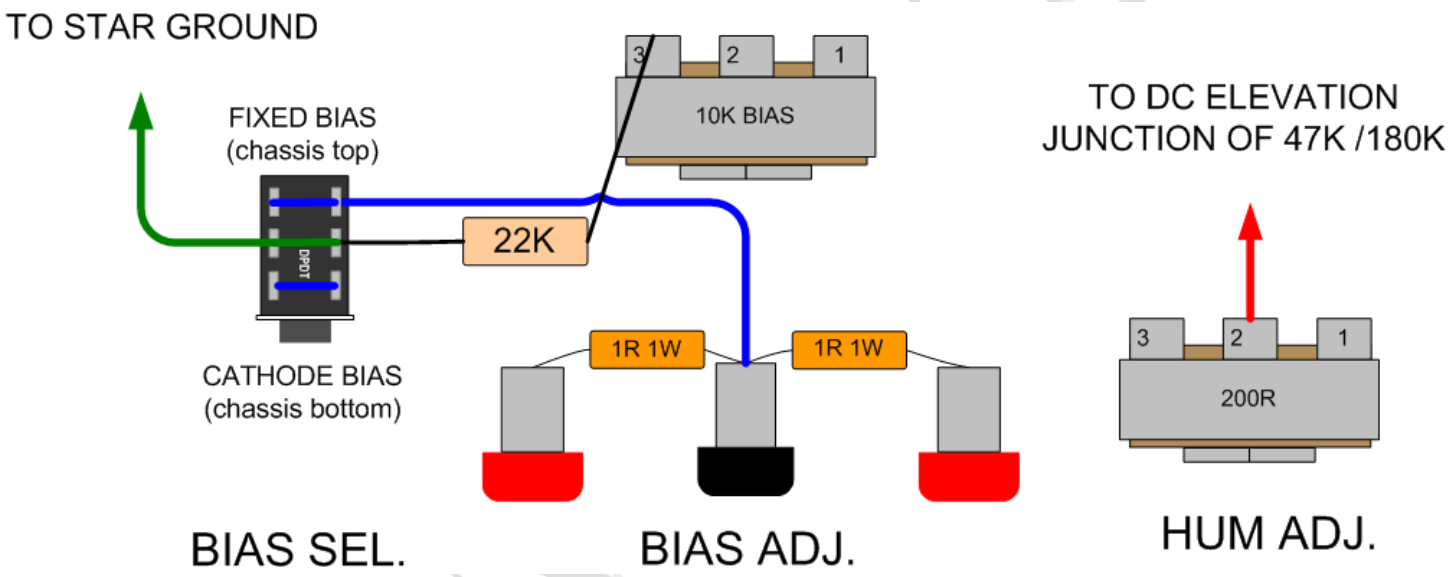
Wiring the Bias Controls

If you haven't already , install the Bias Control pot, Bias Selector Slide switch, Bias Measuring Terminals as well as Hum pot.

Wire the 1R - 1% resistors to the Bias Measuring Terminals. Connect a 15K from the 10K BIAS POT , terminal 3 to the centre lugs of the bias selector slide switch. Connect a green lead from the centre lugs to the star ground.

Connect a lead from the black terminal post to the bottom set of lugs of the bias selector switch. (FIXED BIAS)

Connect a lead from the middle terminal of the Hum Adjustment pot (terminal 2) to the junction of the 47K-2W – 180K-2W Capacitor assembly (or to the turret board).



5 Turret Board Construction

If you do not have a pre-built Trinity Amps turret board, now is the time to build it.

Install the jumper wires indicated in Red on the underside or topside of the board. Which side you use is a personal preference. Do not solder in place yet.

Follow the series of pictures below.

Install the components on the board by following the layout – from left to right.

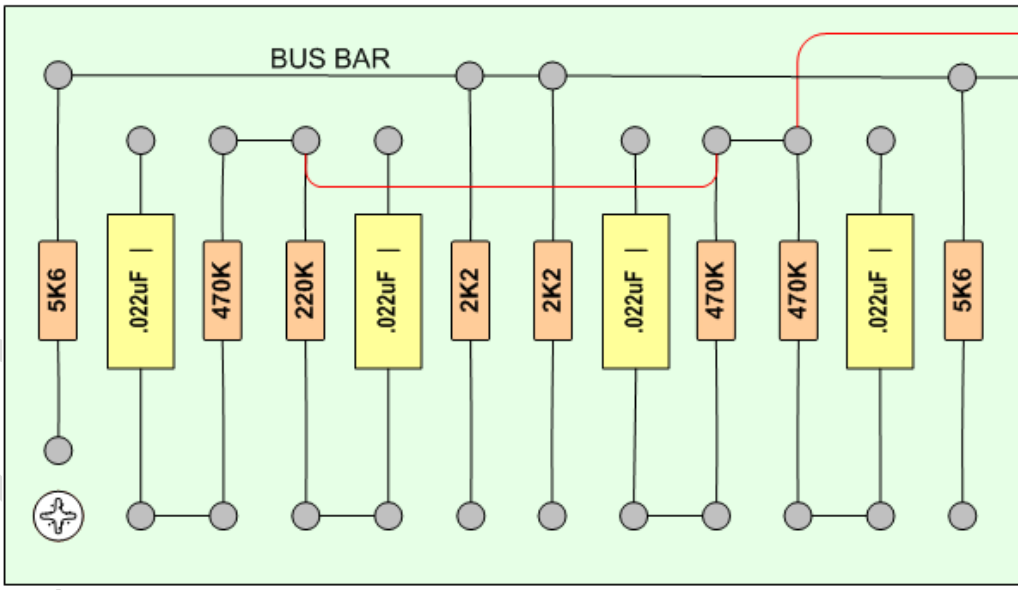
TIP: Run a piece of very fine sandpaper over top of turrets quickly before soldering.

Note: For multiple component leads that must fit into one turret, insert them first and solder once when they are all in place. Bend each component lead at 90 degrees so that it fits into the turret, squarely and neatly. Solder each turret once all component leads that connect to it are in place.

Strip a piece of the supplied 22 gauge solid core wire long enough for each bus bar. Bend it at each end and install it into the two end turrets on the board. Do not solder in place yet. You may want to tack it in place until the other components connected to it are installed.

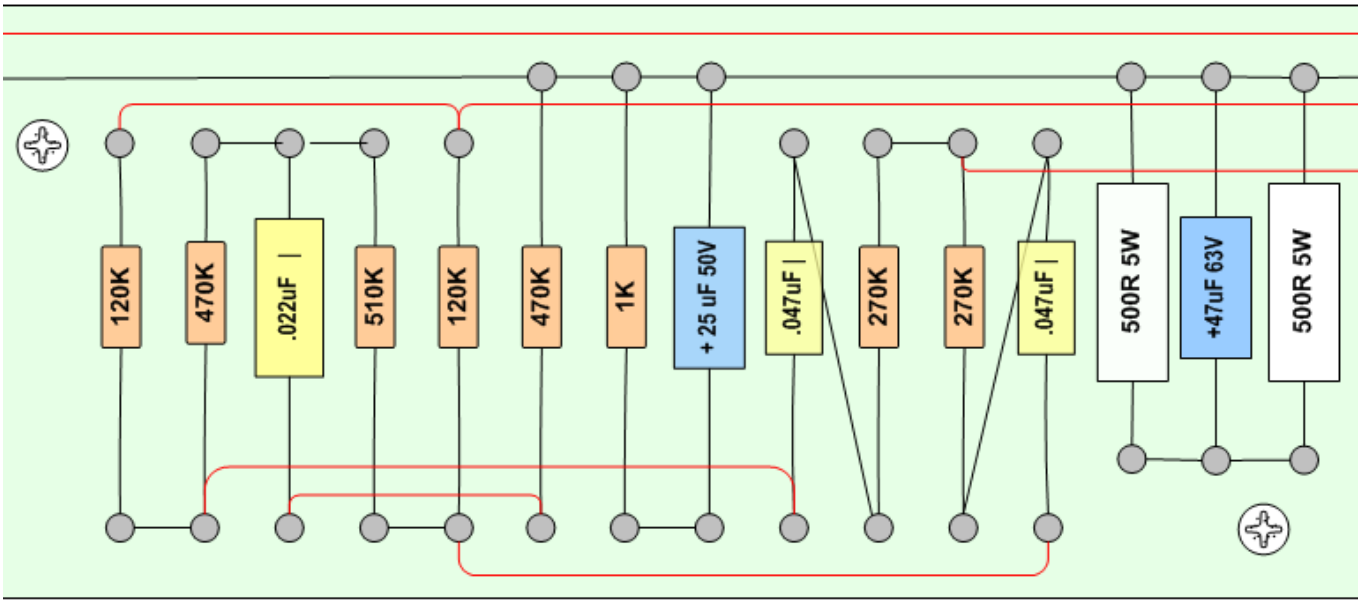
Carefully identify the board components and their values. **Measure the resistor values to confirm they are correct**. **If you can, check the capacitor values as well**. See the section on how to read Resistor and Capacitor codes.

TRIP TOP Board

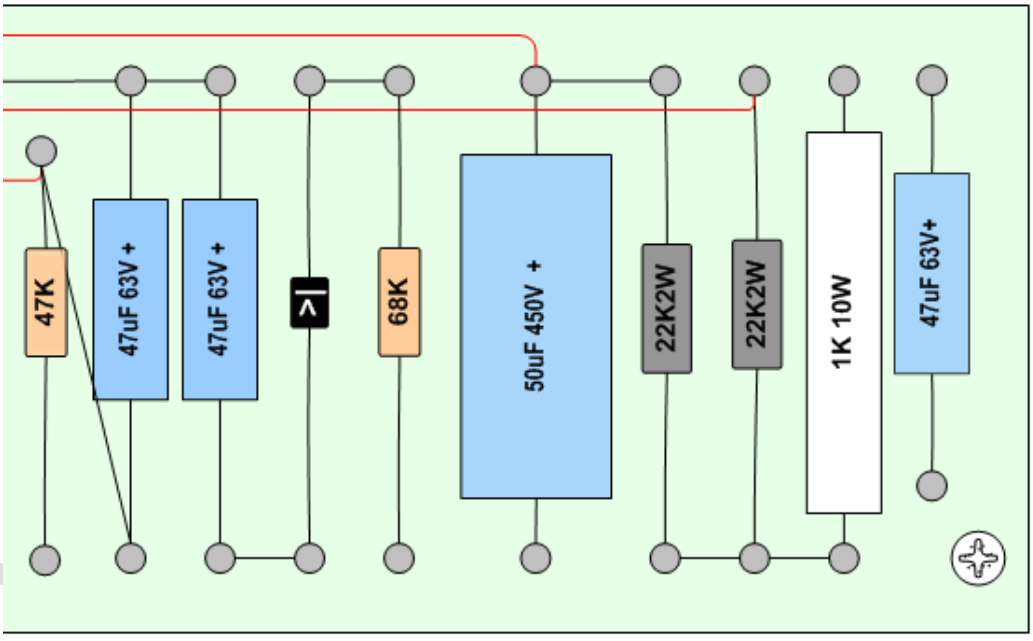


Non-polarized capacitors such as the supplied Mallory 150s or ETRs, do not need to be installed in any particular orientation. However, if you have the equipment, or have SOZO capacitors with the outer foil

marked, you can orient these components to minimize noise. Read the ***Capacitor Orientation*** selection below.



Arrange the board according to the layout diagrams and follow them closely.



Ensure that electrolytic capacitors (power supply, bypass caps) are aligned with the correct polarity on the board. There will be a '+' sign, or indentation to identify the positive end of the capacitor.

Diode Orientation: Pay particular attention to the orientation of the bias supply 1N4007 diode. Even though Rectifier diodes are quite robust and require no special precautions for soldering them, use a minimum amount of heat.

Diodes must be connected the correct way round. The cathode is marked by a line painted on the body of the diode. Diodes are labeled with their code in small print, and you may need a magnifying glass to read it!

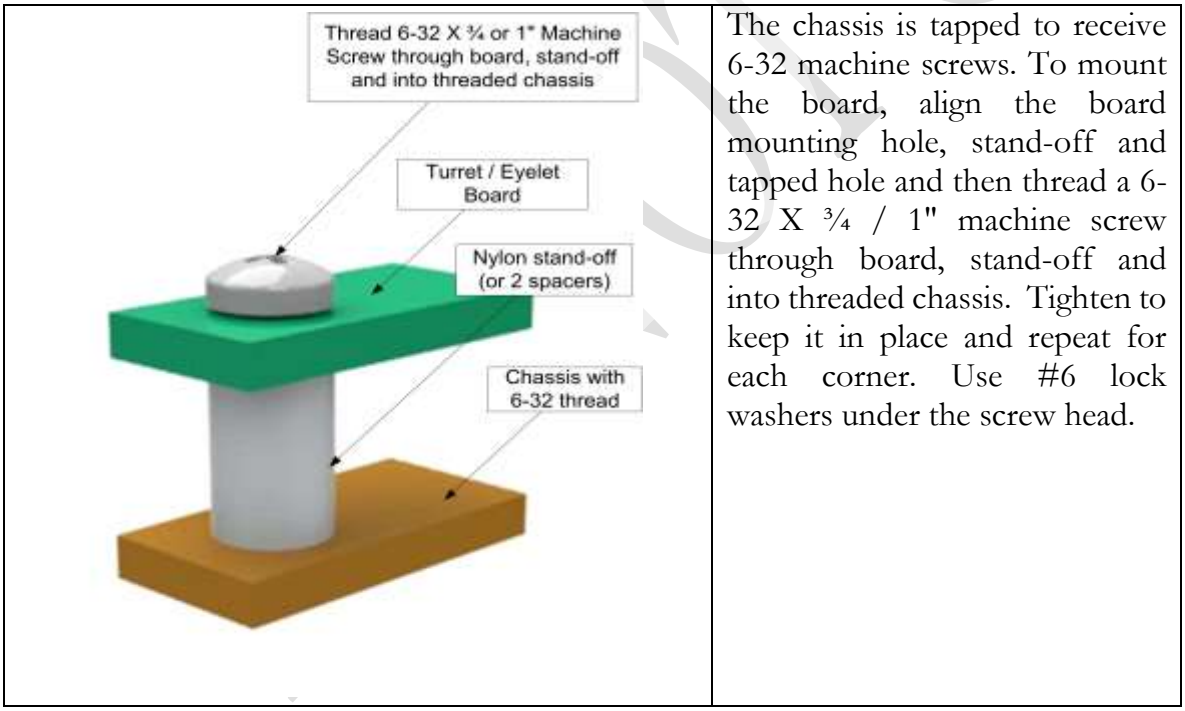
You can use 18-22 gauge stranded wire for connections to ground, standby switch, B+ to output transformer, filter caps etc.. Again, these can be cut-offs from installing the transformers or any provided wire, stranded or solid.

When the board is built, double check all components, jumpers and leads against the layout.

Install Turret Board

If all is correct, carefully install the board into the amp. Locate the 4 -#6 X 1" screws, spacers and lock washers. At one end, put the screw through the lock washer, then the board, then the spacer and screw it into the threaded hole in the chassis. Align the remaining board holes and fully install the board. Loosely tighten the screws until all are located and then tighten screws firmly.

Alternate installation from Trinity Amps forum member *JoeWPgh* : Source 4 #6 nuts. Locate the 4 -#6 X 1" screws, spacers, lock washers and nuts. With the chassis right side up, thread the 4 mounting screws through the threaded holes until tight. Flip the chassis upside down and slip the spacers over the screws. Press the turret board over the screws and attach with the lock washers and 4 #6 nuts.



The chassis is tapped to receive 6-32 machine screws. To mount the board, align the board mounting hole, stand-off and tapped hole and then thread a 6-32 X ¾ / 1" machine screw through board, stand-off and into threaded chassis. Tighten to keep it in place and repeat for each corner. Use #6 lock washers under the screw head.

***Capacitor Orientation**: In the manufacturing of a non-polarized capacitor, Mallory, SOZO, ETR etc., one of the foils ends up on the outside while the other is wrapped on the inside. As a result, the outside foil may be used as a "shield". To minimize amp noise, we can orient the outer foil side in circuit stages to take advantage of this inherent shielding.*
If a signal travels into a coupling capacitor and enters the outside foil side, this will act as a shield, minimizing induced noise interference. Ideally you would be able to connect the outer foil to the incoming signal point or to the lower impedance stage. For capacitors that are used as cathode bypass capacitors or in tone stacks, the outer foil gets connected towards ground. For coupling, the outer foil is oriented towards the previous stage.
Some manufacturers such as SOZO have this polarity marked. Others do not. In this case, if you have access to an oscilloscope, you can quickly determine which lead is the outer foil.

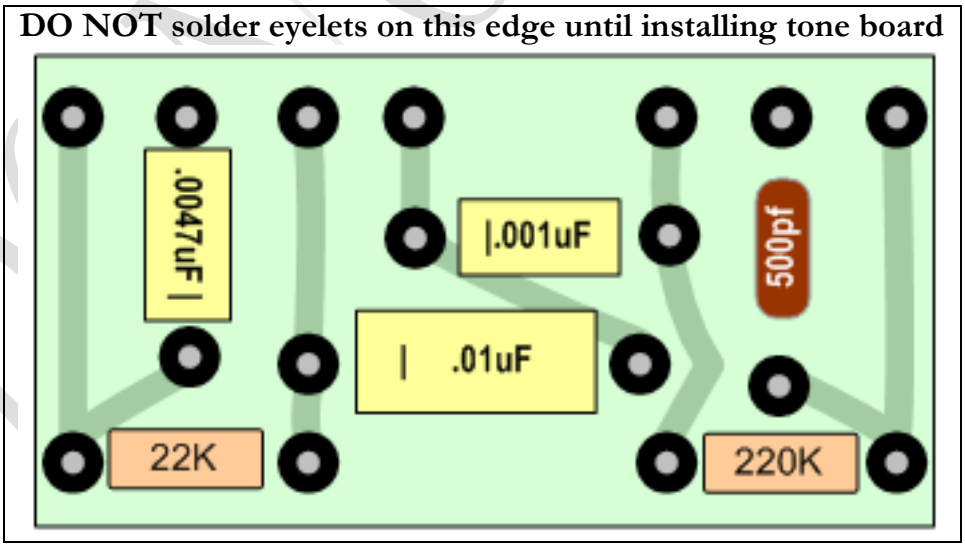
Set your oscilloscope to a low AC setting [10 - 20mV] and hold the capacitor between your fingers to induce noise. Connect the oscilloscope probes to the capacitor leads. One orientation of leads will result in a lower reading. In this case, make note of the lead that is connected to the oscilloscope ground lead (usually has an alligator clip) and that identifies the outer foil. Mark the capacitor with a sharpie and install the cap as per the provided TRIP TOP board layout.

Build the Tone Boards

The Trip Top Tone controls are a Baxandall based design and are contained on two separate tone boards connected directly to the Treble and Bass control potentiometers. These two eyelet boards need to be built and made ready to be installed.

Follow the pictures below and install the components on the board by following the layout.

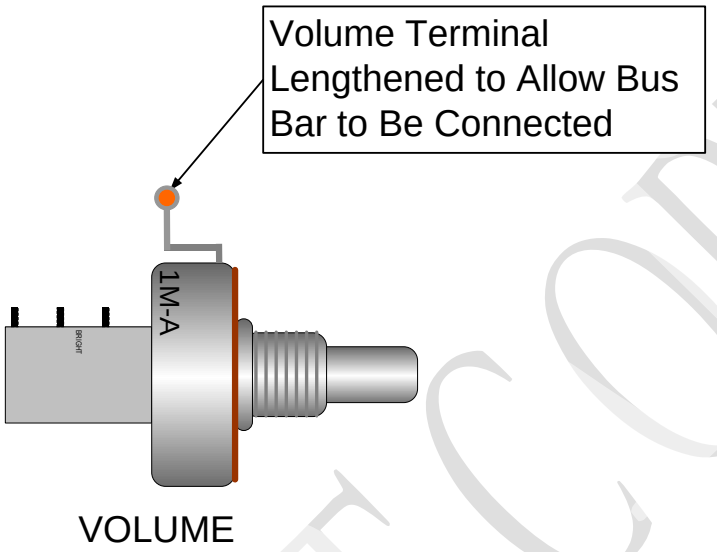
For multiple component leads that must fit into one eyelet, insert them first and solder once when they are all in place. Bend each component lead so that it connects to the correct, connecting component. Solder each eyelet once all component leads that connect to it are in place.
Note: DO NOT solder eyelets along the bottom until installing tone board on controls



Install Control Bus Bar and Components

Locate the copper Ground Bus Bar and Locate the Switched Volume Controls..

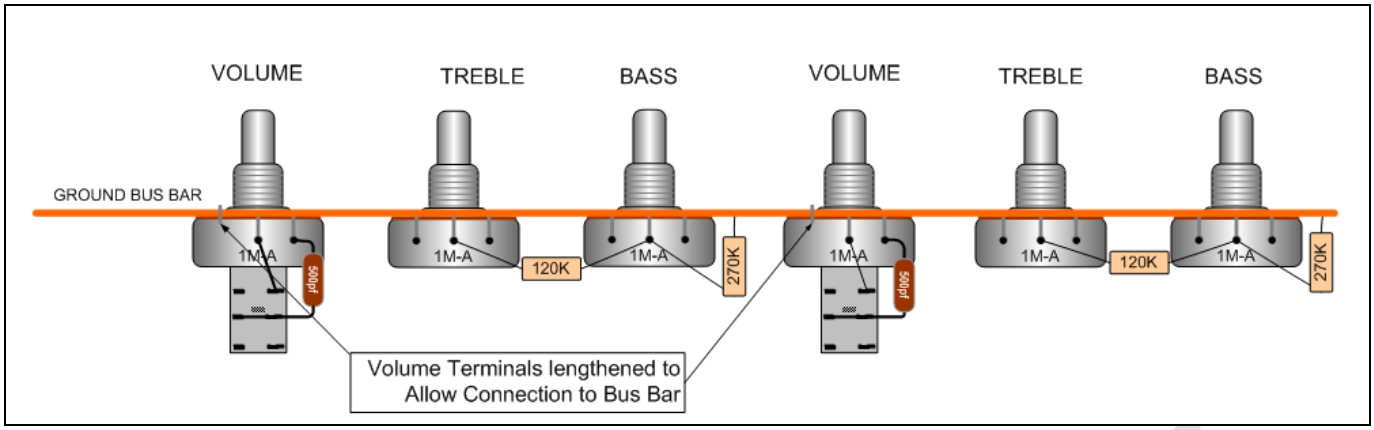
Strip a few lengths (1-1/4" / 30 mm) of some solid core wire. At the left terminal of each Switched Volume Control, twist the length wire onto the terminal and solder it in place. Do this for each control. Take a pair of needle nose pliers and wrap the added wire around the control bus bar, while holding it about ¾" (20mm) from one control.



Repeat for the other control

Align the control bus bar so that it is parallel to the chassis and adjust the wire lengths to suit as necessary. It should not be touching any other control terminal when it is in its final location. Solder it in place.

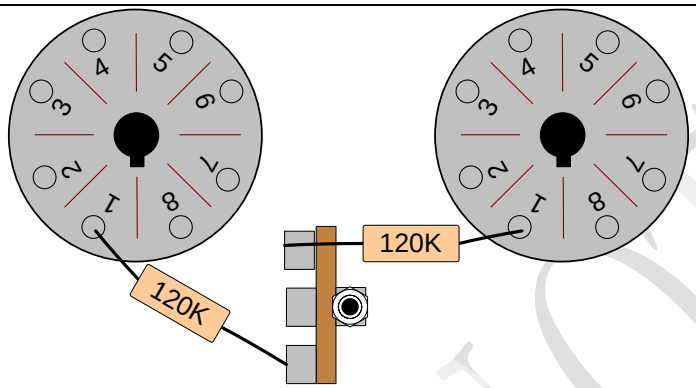
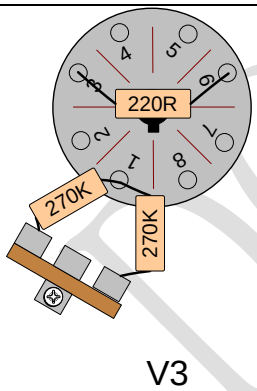
Align the bus bar with the volume terminals and leave about 2" on the end closest to the 3 Input Jacks. Ensure that no other Control terminals touch the Control Bus Bar and solder it in place to the Volume control terminals. Snip off any extra length.

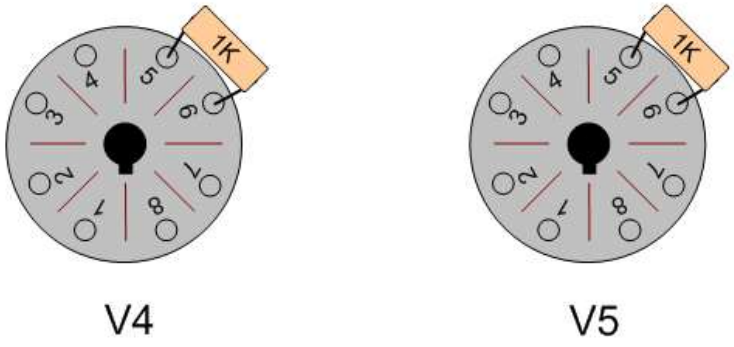


With the Control Bus Bar solidly in place, connect a 270K resistor from the two Bass control terminals and the bus bar.

Connect a 120K resistor between the two middle terminals of the Treble and Bass controls

Install the parts from the terminal strips to the potentiometers or tube sockets.

	Install parts from terminal strip on chassis and parts on chassis. Connect 120K grid stopper resistors from terminal strip to pins 1 of V1 and V2.
	Install parts from terminal strip on chassis and parts on chassis. Connect 2-270K "mixer" resistors from terminal strip to pin 1 of V3. Connect a 220R resistor between pins3 and 6 of V3.

	Connect 1K grid stopper resistors between pins 5 and 6 of V4 and V5.

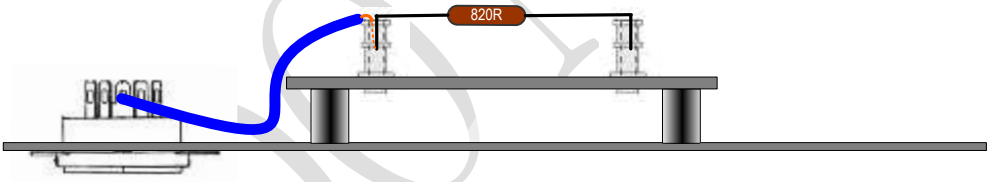
6 Connecting the Turret Board

Now is the time to make the connections from the turret board to the tubes.

Also, some tube sockets require components or jumpers to be installed on them.. Pre-form these components to fit into place and you may use some heat shrink tubing make sure they do not touch other parts or pins. Solder the parts in place following the layout provided keeping in mind what connections to the board still may need to be made.

Start at the V1 end of the amp and work your way sequentially to V6 doing the point-to-point wiring. Board to tube pin 1; board to tube pin 2 etc. Start at V1, pin 1 and move to the far end of the board to V6.

Identify the first turret and its destination socket pin.
Cut a length of the supplied solid core wire so it will easily reach (with some extra) from the turret to the correct tube socket pin while leaving flat to the turret board and against the chassis.
After installing the turret board on it mounting stand-offs, strip about 1/2" / 10 mm off one end and push it into the top of the turret so it touches the component lead. Then solder it well in place at the turret end only.

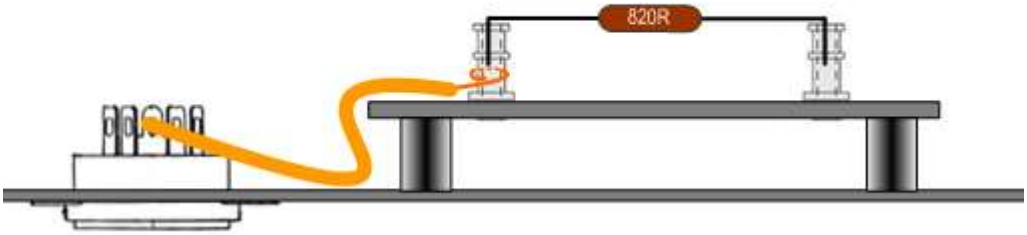


Once cool, press the wire so that it lies flat on the board and chassis with any excess tucked underneath the board.
Repeat for each turret that has a connection to a socket pin or from the turret board to a Toggle Boost switch or terminal strip for screen resistor.

Alternative 2: Instead of connecting the leads to the top of the turret board, you may choose to install the leads before the board is installed, connecting the lead to the turret below the board and then to the tube pin or control. In this case, cut connecting wires to the control side in various colors to about 9" long each and to about 6" long to the tube pin side. Then, following the layout, install the connecting wires through the bottom, as described below, of the board leaving plenty of extra length, wire is cheap, and it'll save aggravation later. Then install the board and connect to the correct pins and control in sequence starting with V1, pin 1.

Strip about 3/4" / 15 mm off one end push it into the bottom of the turret so it touches the component lead and bend it over. Then solder it well in place at the turret top end only.

Alternative 3: Some people like to run the wire from the turret to the socket pin while lying flat to the turret board and against the chassis. Cut the wire about ½" / 10 mm longer and strip the end. Then make a hook at the end and put it through the socket pin. Squeeze the hook with a pair of needle nose pliers so that it is



mechanically tight to the turret.
Solder it well in place. Trim off any excess wire.
Note: This procedure requires more soldering skill and may be more difficult to achieve than the previous methods.

Connecting the Turret Board to Controls

Now is the time to make the connections from the turret board to the potentiometers.

The easiest way to wire these correctly is to follow the layout, and carefully do one terminal connection at a time. Some of these terminals require more than one wire connection, so arrange these accordingly and solder once.

Some controls may require components need to be installed for tone controls etc.. If you haven't already installed these in a previous step, pre-form these components to fit into place and use some heat shrink tubing ensure they do not touch other parts. Solder them in place following the layout provided.

Follow the steps above to connect wires from turrets to controls.

Several connections from the turret board to the potentiometers require the use of co-axial cable for noise reduction. Follow the route on the layout provided and cut coax wire to length.
See Section 9 for details on co-axial cable preparation.
Prepare each end and then solder in place. Ensure the shielded end is grounded only at one end and the unshielded end has heat-shrink tubing to protect against any stray wires touching the core or the chassis. The layout diagram indicates which end shield is connected to ground.

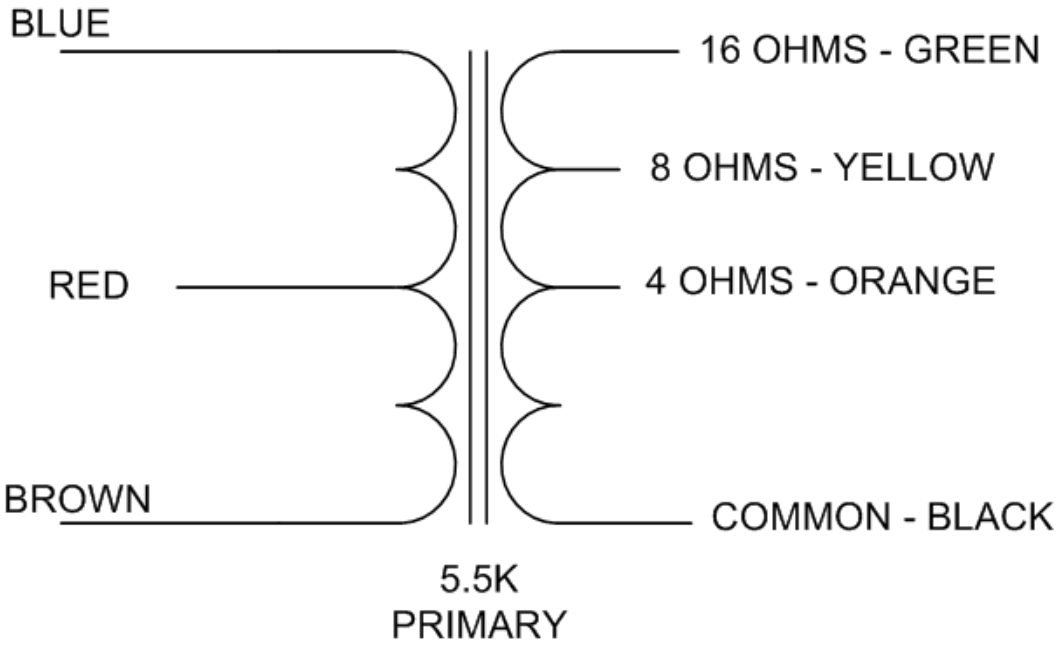
7 Output Transformer - Output Jacks

Refer to the Output Transformer schematic. Braid the Blue, Brown and Red primary leads from the transformer to the output tubes. Leave enough transformer lead length to reverse the leads from one 6L6/KT88 to the other if necessary to eliminate amplifier squealing.

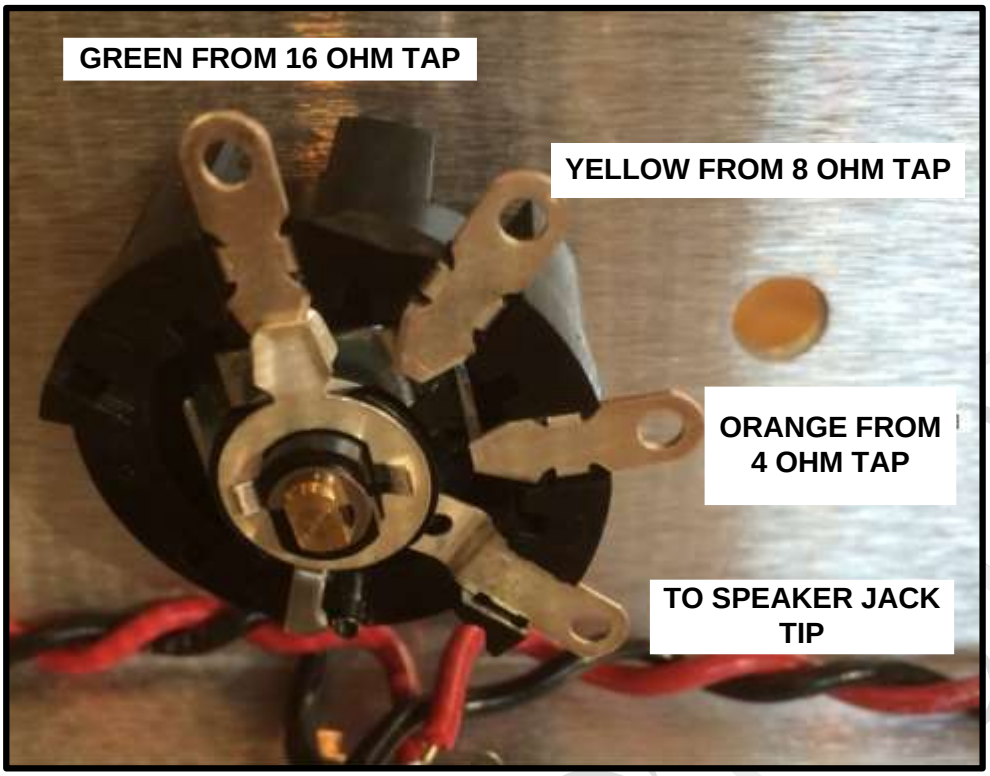
Note: Lengthen the Red lead (Centre tap) so that it will reach the B+ terminal on the far side of the turret board. Do this by soldering in a 4" piece of wire (ideally containing Red), stranded or solid. You can use cut-offs from the power transformer installation. You may also want to lengthen the Blue and Brown for convenience.

Start by soldering the Blue output transformer lead to V4 and the Brown to V5, Pin 3.

Connect the Red lead to the B+ turret at the 1K 10W resistor where the standby lead is connected to the board.



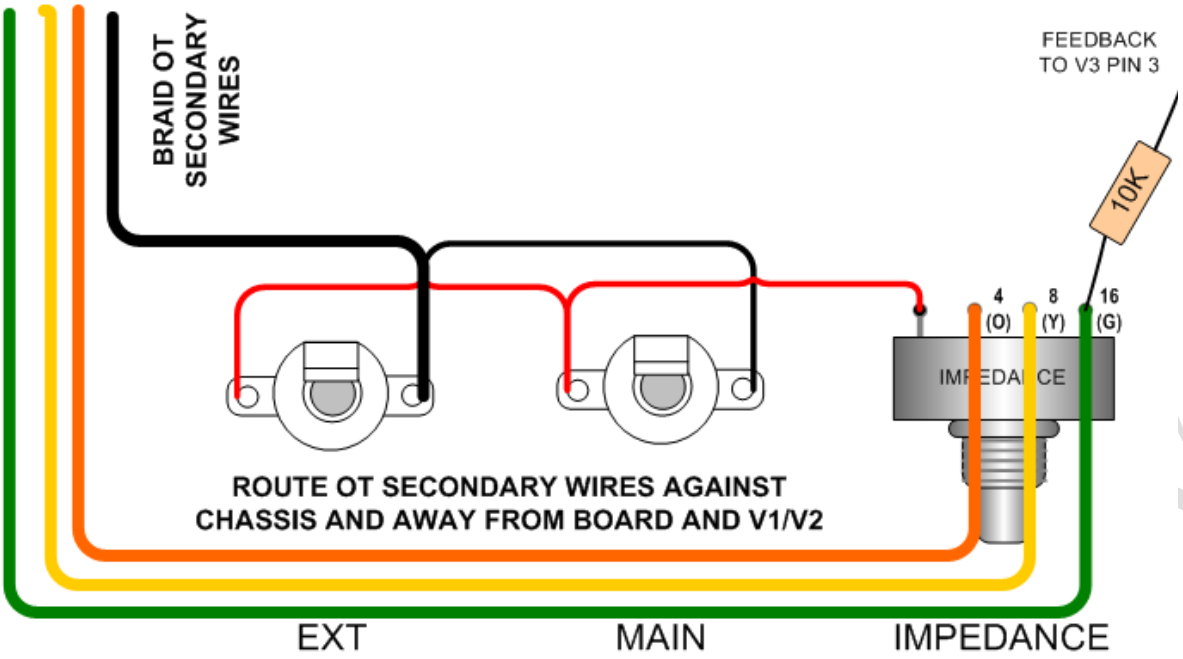
Connect the Impedance Selector and Speaker Output Jacks



Referring to the Output Transformer schematic above, wire up the Impedance Selector and output jacks paying particular attention to the leads for the correct impedance. Refer to the diagram below for the connections.

Solder a 10K Feedback resistor to the 16 ohm tap connection at the switch. This then goes to the Phase Inverter Pin 3, V3, as feedback.

IMPORTANT: ROUTE OT SECONDARY WIRES AGAINST CHASSIS AND AWAY FROM INPUT TERMINAL STRIP, BOARD AND V1/V2

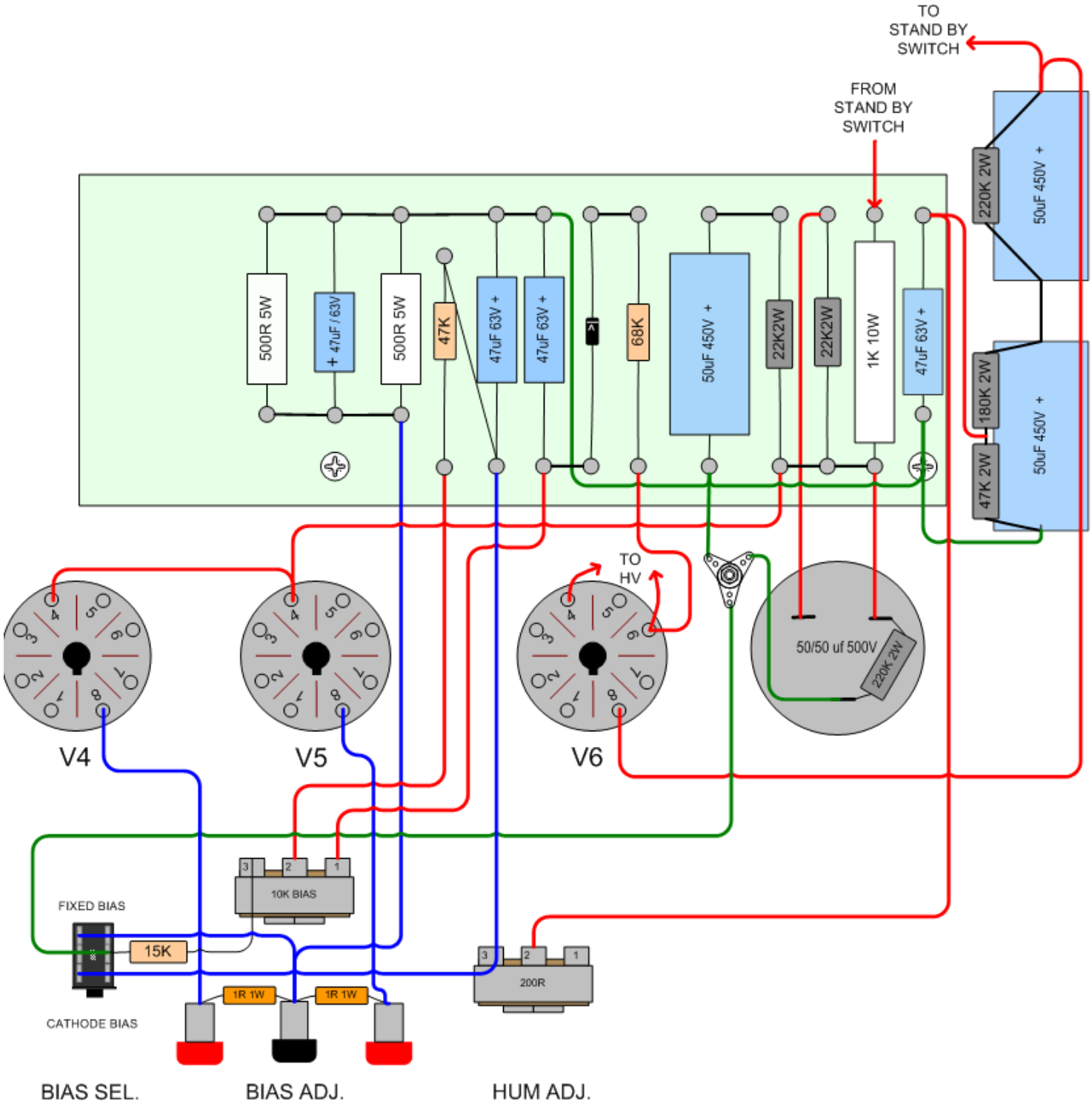


Connect from the center pole of the switch to the Tip position of the pair of output jacks. Use some cut-off stranded wire and strip enough wire to bridge between both jacks. Connect from the output transformer's Common / Black lead to the Ring position of the pair of output jacks. Strip enough wire to bridge between both jacks.

Check your speaker jack with and without a speaker cable plugged in to make sure it isn't shorted.

Connecting the Turret Board to Power Supply

This step needs to be done very carefully as errors with High Voltages can be catastrophic!!
Work slowly and carefully.



Power Supply Grounds

Connect up the Power Supply Filter Capacitors.
If not already done, install the 50+50uF can cap onto the chassis. It is held in place by a large clamp bolted to the chassis. **Take special note of the polarities of the can caps**. Identify the two positive terminals and orient the cap connectors as per the layout diagram.

Using Green coloured wire.

1. Starting with the 50-50 Can Cap, connect the Negative terminal to the Star Ground.
2. Connect the ground bus at the last turret to the Star Ground.
3. Connect the 50uF Axial capacitor Negative end on the board, to the Star Ground.
4. Connect the 47uF 63V Axial capacitor Negative end on the board, to the Star Ground.
5. Connect the Star Ground to the negative end of the Capacitor Assembly.
6. Check that the centre lugs of the Bias Selector switch are connected to the Star Ground

Power Supply High Voltage

Using Red coloured wire.

1. Connect one half of the 50-50 Can Cap to the 1K 10W power resistor on the board.
2. Connect a 220K 2W Bleeder Resistor from the terminal in Step 1 to the negative terminal.
3. Connect the other half of the 50-50 Can Cap to the opposite side, 22K 2W power resistor on the board.
4. Connect the centre terminal of the Hum Adjustment pot to the Positive side of the 47uf 63V axial capacitor.
5. Connect Pin 8 of the Rectifier socket, V6, to the Positive end of the Capacitor Assembly.
6. Connect Pin 8 of the Rectifier socket, V6, to the 68K bias voltage dropping resistor on the board.
7. Connect the centre terminal of the BIAS POT to the 47K resistor on the turret board
8. Connect the outside (1) terminal of the BIAS POT to the Negative end of the 47uF/63V axial capacitor.
9. Join pins 4 of V4 and V5 together. Continue to connect them to a 22K 2W resistor turret.

Bias Supply

Using Blue coloured wire.

1. Connect the 500R / 50uf Positive end / 500R on board to the common / black Bias Measuring Terminal. There should be a connection to the BIAS SELECT - FIXED terminals. If not, make one.
2. Connect Pin 8 of V4 to one Red Terminal
3. Connect Pin 8 of V5 to the other Red Terminal.
4. Connect the 47K/47uF junction on the turret board bias supply to the CATHODE terminals of the of the BIAS SELECT switch.
5. CHECK YOUR WORK AGAINST THE LAYOUT DRAWING.

8 Test the Power Supply

Once you have wired up your power supply it is a good time to test that all is connected correctly. This step assumes you tested and passed the AC aspect of your power transformer earlier. In the following steps, B+ is going to go to full voltage **SO BE EXTREMELY CAREFUL**.

Connect your AC voltmeter to the power transformer's High Voltage secondary which is soldered to the Rectifier tube socket across pins 4-6 . Turn the power on just long enough to get a reading to verify it is correct. You should get a value 10 to 20% higher than the rated output voltage of 700 VAC. Measure all the other AC voltages (Heater to Rectifier and Tubes V1-V6 to ensure they are within spec of the provided transformer schematics and specs.

If you get a value less than the rating, shut down the amp and check the fuse and wiring to find where the issue is. Typically, there is a wrong connection to ground somewhere.
If you get a proper AC value from the HV secondary, turn the BIAS POT and observe a change in negative DC voltage AT THE 10K BIAS ADJUST pot's wiper, in the -50V DC range. This confirms the BIAS control is functional. If not, recheck your wiring.
NOTE: If when biasing your amp you feel the bias range is insufficient and need more bias, replace the 22K resistor with a 15K resistor if not already installed.

Now power down and install a 5AR4 Rectifier tube.

BE VERY CAREFUL at this point. Your B+ will charge up for this power up.

Hook your Volt Ohm Meter (VOM) set to DC Voltage (600V or greater) and power up again.

1. Very carefully measure from Rectifier V6, Pin 8 to ground. You should have a DC reading of over 500 Volts DC with no other tubes installed.
2. Very carefully measure the voltage to ground at the **Negative** end of the 47uF 63V axial Bias capacitor. You should have an approximate Negative DC reading of -60 Volts DC with no other tubes installed.
3. Very carefully measure the voltage to ground at the **Negative** end of the other 47uF 63V axial Bias capacitor. This should vary from approximately -40 VDC to -60 VDC as the Bias Adjustment Pot is turned. If it doesn't, re-check your wiring. This is critical for the fixed bias mode to work properly.

If this is confirmed, power down, remove Rectifier tube knowing the Trip Top DC supply is within spec.

Once you have wired up your power supply it is a good time to test that all is connected correctly. This step assumes you tested and passed the AC aspect of your power transformer earlier. In the following steps, B+ is going to go to full voltage **SO BE EXTREMELY CAREFUL**.

Connect your AC voltmeter to the power transformer's High Voltage secondary which is soldered to the Rectifier tube socket across pins 4-6 . Turn the power on just long enough to get a reading to verify it is correct. You should get a value 10 to 20% higher than the rated output voltage of 700 VAC. Measure all the other AC voltages (Heater to Rectifier and Tubes V1-V6 to ensure they are within spec of the provided transformer schematics and specs.

If you get a value less than the rating, shut down the amp and check the fuse and wiring to find where the issue is. Typically, there is a wrong connection to ground somewhere.
If you get a proper AC value from the HV secondary turn the BIAS POT and observe a change in negative DC voltage in the -50V DC range. This confirms the BIAS control is functional. If not, recheck your wiring.

Now power down and install a 5AR4 Rectifier tube.

BE VERY CAREFUL at this point. Your B+ will charge up for this power up.

Hook your Volt Ohm Meter (VOM) set to DC Voltage (600V or greater) and power up again.

4. Very carefully measure from Rectifier V6, Pin 8 to ground. You should have a DC reading of over 500 Volts DC with no other tubes installed.
5. Very carefully measure the voltage to ground at the **Negative** end of the 47uF 63V axial Bias capacitor. You should have an approximate Negative DC reading of -60 Volts DC with no other tubes installed.
6. Very carefully measure the voltage to ground at the **Negative** end of the other 47uF 63V axial Bias capacitor. This should vary from approximately -40 VDC to -60 VDC as the Bias Adjustment Pot is turned. If it doesn't, re-check your wiring. This is critical for the fixed bias mode to work properly.

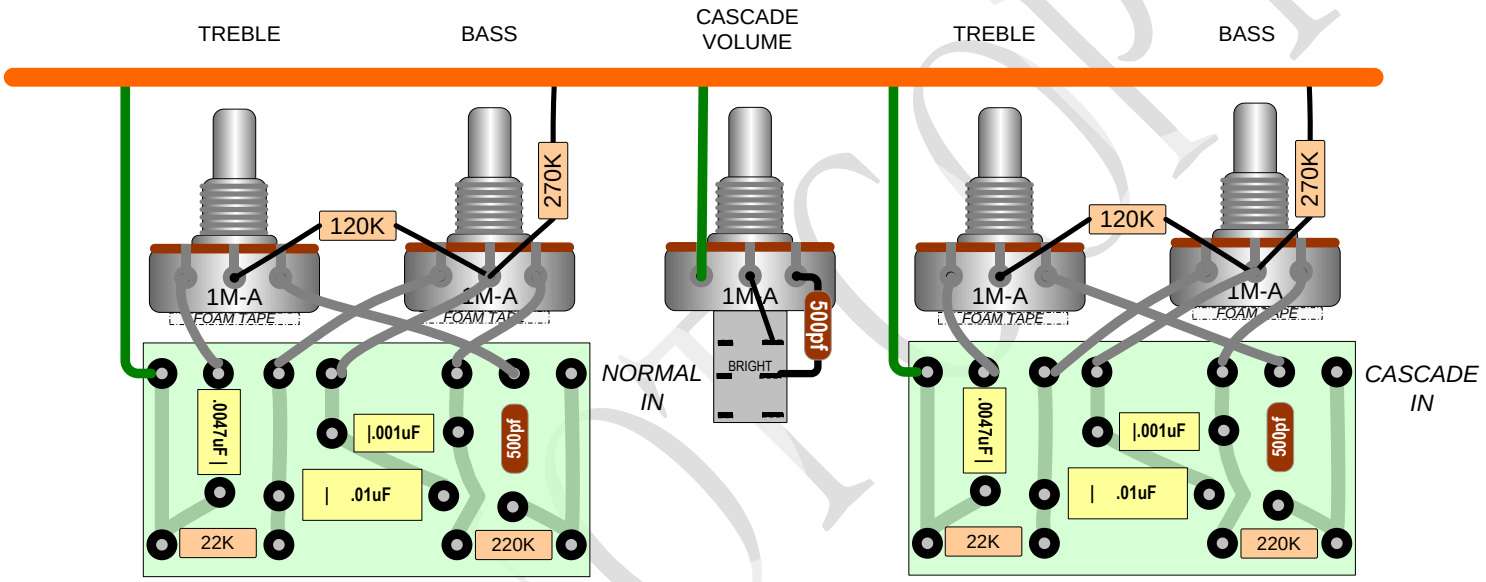
If this is confirmed, power down, remove Rectifier tube knowing the Trip Top DC supply is within spec.

Connecting the Tone Boards

The two channels are wired differently (cascaded and normal).

***Note**: Put a ¾" piece of sponge rubber insulation on the back of each Treble & Bass control. This will insulate them from the Tone Boards.*
Lay a tone board with components facing towards you and make the 5 connections to the Normal Channel Treble and Bass controls with white leads. Make one connection to the Control Bus Bar with a green lead. Leave a little extra lead length so that when you are completed, you can tuck the tone board, into the chassis and up close to the controls. In the final position, the Tone Board components will be facing towards you. Repeat this procedure for the Cascade Channel tone board.

***Note:** If you prefer, because the eyelet tone boards are reversible, you can mount the components on the opposite side and flip them so they face away from the controls.*



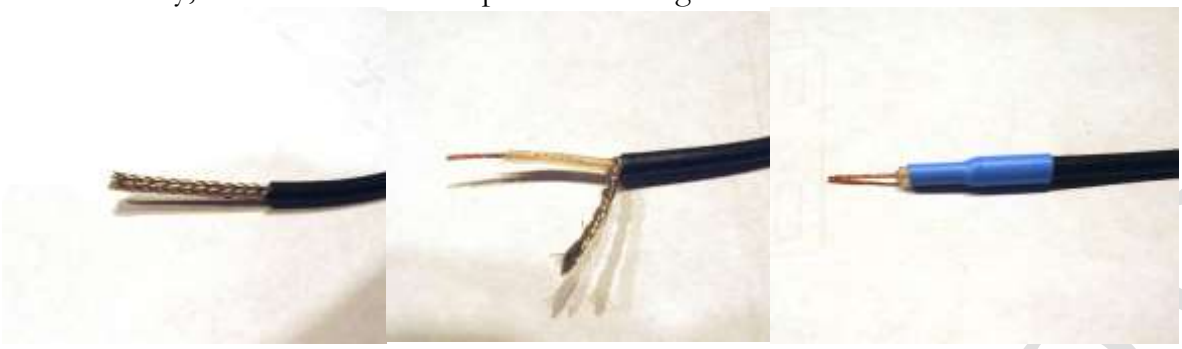
9 Input Jacks

Remove and assemble the input jacks as per layout with the 3.3M resistors and jumpers in place. Then install and wire up the input jacks. Use shielded wire from the input jacks to the tube Grid Resistors and be careful when wiring switched input jacks. It is easiest to remove the jacks, wire them with the resistors and jumpers and then reinstall them. The ground wires on the input jacks go to the pre-amp ground bus wire and to the turret board ground at the input end.

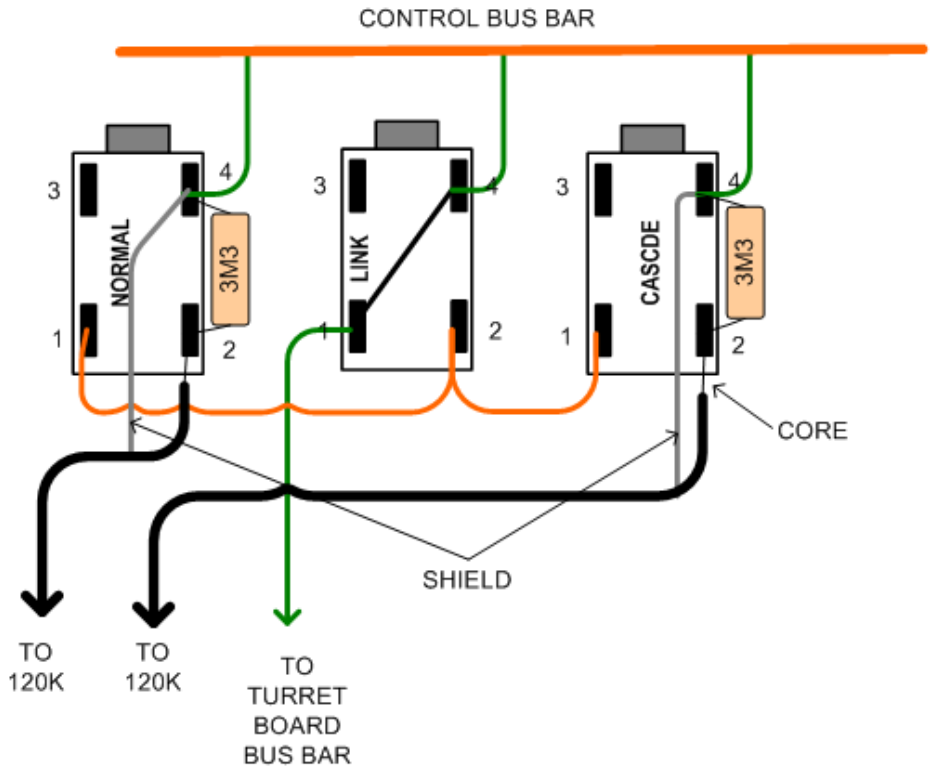
Prepare co-axial cable for connections

1. Cut back the outside plastic covering at both ends by about 5/8" to reveal the braided shield.

2. At one end, pull back the shield and cut it off at the 5/8" mark. Put some heat shrink around the end covering the area where it was cut off.
3. At the other end, pull back the shield but poke a very fine screwdriver or pick into the shield and work out a 'hole'. Fish the inside conductor through this hole and pull it through.
4. Twist the braid together.
5. Finally, cut back the outside plastic covering on the inside conductor at both ends by about 1/4"



Cliff Jacks - Cliff Jacks have 2 normally closed contacts inserted and 4 terminals. The contacts open when a ¼" plug is the plug and into the jack. The Tip connection is at the very end of referred to is normally 'positive' polarity. This is sometimes ground or as the 'Hot' side. The other part of the plug is typically 'common'.



At the input jack end, connect the shields to the ground point on the jacks, which in turn go directly to the turret board Ground Bus Bar. Connect the jack grounds to the Control Bus Bar.
Do not connect the shields at both ends of the cable or you will induce hum.

Measure enough shielded cable to reach from the input jacks to the 120K Grid resistors on the terminal strip for V1 and V2, routing the cable around the end of the turret board. Prepare the shielded cable for connection and put some heat shrink over the end to ensure there is no chance the shield will connect to ground or touch the tube pins. Solder the shielded cable Core conductor to each 120K resistor on each tag and the input jack terminal.

10 Final checkout

When you finish assembling the amp, double-check the wiring and the components.

Test continuity for all the connections from turret board to control pot or tube pin. Set your meter to continuity and follow the layout diagram to make sure all the connections are correct. Trace or highlight the connections on a copy of the layout provided with the kit to ensure the amp is wired correctly. Check everything at least once! Touch each component's lead and touch the lead at the other connection.

You can often measure the resistors resistance on the board to confirm they are correct. If they are not, it may be because of the interaction with a capacitor as in bypassed bias circuits.

Measure the resistance from each part that has a ground connection to the chassis. Put your probe on the parts lead. All readings should be between 1 ohm and 0.1 ohm typically.

Make sure the Mains ground at the chassis is **VERY** tight.

Setting the Hum Control Pot

Set the control in mid position as starting point. Once the amp is operating correctly, rotate the control to minimize any hum and use your ears to tweak for lowest hum levels coming from the Trip Top. There should be very little hum.

Power Up

REMEMBER: DO NOT OPERATE YOUR AMP WITHOUT A LOAD SUCH AS A SPEAKER

The following the procedure to follow for the first power up of a new amp. Don't give in into the temptation to "fire it up" as soon as the last solder joint is cold.

Complete all the basic circuit checks already mentioned before soldering the transformers into the rest of the circuit. **If you haven't tested the Power Transformer, go back and do it now.**

Note: If you see or smell smoke when you turn on the amp, turn it off immediately and re-check the connections. It is common for new tubes to emit an odour upon initial start-up.

Install a 3 AMP SLO BLO fuse for 120V operation, 2A for 220-240 VAC Operation
Install the Rectifier tube, V6, 5AR4.

THIS IS IMPORTANT: Before powering up **INSPECT DIODE and FILTER CAPS**. You MUST have the **diodes and cap polarities correct**. This is critical but an easy mistake. If either the diodes or caps are wired in reverse, you can destroy the caps, diodes and possibly the power transformer!

Power on the amp. Flip on Power Switch and watch the following things as quickly as possible and roughly in this order:

- pilot lamp comes on brightly; and
- High AC Voltage secondary goes to nearly the same value as it did with the lines unsoldered

If any of these does not happen, shut off the amp immediately and find the problem by looping back to the beginning of this checklist. If these check out, power down.

KEEP IN MIND that every time you power up from now on that B+ will be high. In all the following steps, B+ MUST be discharged to safely continue messing with the amp guts. The included 220K 2W bleeder resistor will take at least a minute to bring B+ down to safe levels. **Measure the B+ to be sure!**

Now hook your DC voltmeter between B+ terminal on the turret board and ground. Power on the amp, flip on Standby again and check the B+ voltage. With no tubes installed, all the filter caps will charge up to the same voltage. The voltage should be very close to 40% higher than the raw AC. Assuming you measured, say, 700VAC across the full secondary in the above steps, then each half is delivering 360VAC. B+ will be ~40% above this, which is ~500VDC.

If all is well, check that B+ is at the OT Red wire at the primary taps. Without the power tubes installed, the OT primary should be at B+. If not, something is wrong at the OT. Power down immediately and check for shorts of the OT primary. This should not be the case, however. An OT short should have been caught by

now by checking B+ levels in the previous steps. This is really just a final sanity check to really make sure the trannies aren't going to be killed by any mistakes. If all is good, power down.

Now we're ready to put some tubes in. Power down and install all the 6SL7 signal tubes V1-V3.
Power on the amp, flip on Standby and leave the amp on for a few minutes and make sure neither tranny is getting warm. The OT should stay dead cold and the PT should get just a little warm supplying the pilot lamp and heaters.
If there are no signs of overheating, smoking etc., proceed to the next step.

Put the Power tubes in.

1. Power down
2. Install the 6L6 power tubes V4-V5.
3. ***Hook up a speaker or dummy load*** for the OT. Use an old or less valuable speaker to get started.
4. Turn volume and gain pots all the way down and tone controls to center.
5. Turn the 10K bias control pot all the way down (fully counter-clockwise) to start (most negative grid voltage possible).

CATHODE BIAS

Cathode Bias Setting: In cathode bias position, the power tubes are self-biased and the negative voltage from the bias supply is removed.

Set the Bias Selector slide switch to select Cathode Bias.
Power on the amp, flip on Standby again and watch for the following signs:

1. pilot lamp comes on brightly;
2. all tube filaments light up;
3. there is no sign or smell of smoke and components are not overheating
4. tube plates do NOT glow red (overheat) paying attention to power tubes.
5. measure the voltage on the single black terminal on the rear panel. This is the common cathodes (Pin 8 V4,V5). It should read approximately Positive 30-35 VDC.

If not, inspect the cathode connections and the grounding on the 500R 5W bias resistors and 47uF bypass capacitor.

With the amp running correctly, you can now test all the voltages and compare them with the voltage chart. Measure and write down the B+ levels at each filter cap. Also write down cathode and plate voltages at all stages and also the screen grid voltage at the power tubes. Compare all the DC voltages to those on the supplied Voltage Chart

FIXED BIAS

As previously mentioned, make sure the negative bias voltage is being generated and check that it gets to the power tube grids via the two 270K resistors and is adjustable with the BIAS POT .
Confirm that the 10K bias control pot is turned all the way down (fully counter-clockwise) to start (most negative grid voltage possible).

Set the Bias Selector slide switch to select **Fixed Bias**.

Power on the amp, flip on Standby again and watch for the following signs:

1. pilot lamp comes on brightly;
2. all tube filaments light up;
3. there is no sign or smell of smoke and components are not overheating
4. tube plates do NOT glow red (overheat) paying attention to power tubes.

Fixed Bias Setting: Check power tube current and bias soon after power up to make sure all is well. Test again after the amp has sat idle for 5 minutes.

1. Set your meter to the mV scale. With the 10K bias control pot all the way down (fully anti-clockwise), insert the black (negative) test probe into the Black bias test point jack. Put the other into one of the Red bias test point jacks.
2. You should have a small reading in mV. Since you are measuring across a 1 ohm resistor, then this is the equivalent ma bias. i.e. 10mV on your meter is reading 10 mA bias.
3. Slowly turn the Bias Adjustment Control pot with a small screwdriver until the readings are as follows:

TUBE	MINIMUM CURRENT	MAXIMUM CURRENT
6L6 Bias	30 mA	50 mA
KT-88 bias	50 mA	70 mA

You should be able to hear a little hiss or hum from the speaker. Of course, hopefully this is at a low level, requiring you to put your ear up next to the speaker to hear it. If hiss and hum is loud at this point, there are problems. If there is dead silence, something is likely wrong, too.

With the bias set correctly, you can now test all the voltages and compare them with the voltage chart. Measure and write down the B+ levels at each filter cap. Also write down cathode and plate voltages at all stages and also the screen grid voltage at the power tubes. Compare all the DC voltages to those on the supplied Voltage Chart.
As a rule of thumb, the triode gain stages should have ~1V on the cathode, 0V on the grids and ~1/2 to 1/3 B+ on the plates. If the DC voltages are not in the ballpark (within 50% of the general rule just stated), take some time to check the circuitry of the offending stage. If you have a cathode follower in the signal path, the grid should be at the plate voltage of the previous stage and the cathode should be about a volt higher.

If all seems in order, and the fuse has not blown, turn the volume up a small bit. Plug in a guitar input cable, and touch one end. You should get a louder hum, this is a good sign. If you get this far, it's time to plug in your guitar and take the amp for a test run.

NOTE: If when biasing your amp you feel the bias range is insufficient and need more bias, replace the 22K resistor with a 15K resistor if not already installed.

Minimizing Hum

Once the amp is operating correctly, turn the Hum Control Pot and use your ears to tune for lowest hum levels coming from the Amp.

Hopefully, there are no problems but if you think there are e.g. hum, squeal etc., then move on to the troubleshooting section of this manual.

Trinity TRIP TOP Voltage Charts

6L6GC VOLTAGE MEASUREMENTS

MAINS VOLTAGE			121 VAC		6L6GC Power Tubes; Heyboer PT; 68K Bias R. 22K Bais Tail R			
B+			452 VDC		Fixed Bias X Cathode Bias			
TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1 6SL7 (cascde)		178.0	2.3		190.0	1.9		
V2 6SL7 (normal)		114.0	1.2		183.0	2.2		
V3 6SL7 (PI)		224.0	2.5		212.0	2.2		
V4 6L6			449.0	427.0				CATHODE 32***VDC***
V5 6L6			449.0	427.0				CATHODE 32***VDC***
V6 5AR4				364 VAC		364 VAC		

MAINS VOLTAGE			121 VAC		6L6GC Power Tubes; Heyboer PT; 68K Bias R. 22K Bais Tail R. Amp biased for 70% plate dissipation			
B+			466 VDC		X Fixed Bias			
TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1 6SL7 (cascde)		188.0	2.4		199.0	2.0		
V2 6SL7 (normal)		119.0	1.3		192.0	2.4		
V3 6SL7 (PI)		235.0	2.6		225.0	2.4		
V4 6L6	-43.0		464.0	447.0				FIXED 45 ***mA***
V5 6L6	-43.0		464.0	447.0				FIXED 45 ***mA***
V6 5AR4				364 VAC		364 VAC		

*

6550 VOLTAGE MEASUREMENTS

MAINS VOLTAGE			121 VAC		6550 Power Tubes; Heyboer PT; 68K Bias R. 22K Bais Tail R			
B+			444 VDC		Fixed Bias X Cathode Bias			
TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1 6SL7 (cascde)		172	2.2		183.0	1.8		
V2 6SL7 (normal)		110.0	1.2		176.0	2.1		
V3 6SL7 (PI)		217.0	2.4		185.0	2.2		
V4 6550			440.0	408.0				CATHODE 39 ***VDC***
V5 6550			440.0	408.0				CATHODE 39 ***VDC***
V6 5AR4				363 VAC		363 VAC		

MAINS VOLTAGE			121 VAC		6550 Power Tubes; Heyboer PT; 68K Bias R. 22K Bais Tail R. Amp biased for 70% plate dissipation			
B+			449 VDC		X Fixed Bias Cathode Bias			
TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1 6SL7 (cascde)		177.0	2.3		188.0	1.8		
V2 6SL7 (normal)		113.0	1.2		182.0	2.2		
V3 6SL7 (PI)		222.0	2.5		192.0	2.3		
V4 6550	-48.0		448.0	421.0				FIXED 45 ***mA***
V5 6550	-48.0		448.0	421.0				FIXED 45 ***mA***
V6 5AR4				363 VAC		363 VAC		

KT88 VOLTAGE MEASUREMENTS

(KT88s can be treated as 6550s. See App. 1)

MAINS VOLTAGE			VAC		KT88 Power Tubes; Heyboer PT; 68K Bias R. 22K Bais Tail R			
B+			VDC		Fixed Bias X Cathode Bias			
TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1 6SL7 (cascde)								
V2 6SL7 (normal)								
V3 6SL7 (PI)								
V4 KT88								CATHODE ***VDC***
V5 KT88								CATHODE ***VDC***
V6 5AR4								

MAINS VOLTAGE			VAC		KT88 Power Tubes; Heyboer PT; 68K Bias R. 22K Bais Tail R. Amp biased for 70% plate dissipation			
B+			VDC		X Fixed Bias Cathode Bias			
TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1 6SL7 (cascde)								
V2 6SL7 (normal)								
V3 6SL7 (PI)								
V4 KT88								FIXED ***mA***
V5 KT88								FIXED ***mA***
V6 5AR4								

WARNING

Please Read this Information Carefully

The projects described in these pages utilize **POTENTIALLY FATAL HIGH VOLTAGES.** If you are in any way unfamiliar with high voltage circuits or are uncomfortable working around high voltages, **DO NOT RISK YOUR LIFE BY BUILDING THEM.** Seek help from a competent technician before building any unfamiliar electronics circuit. While efforts are made to ensure accuracy of these circuits, no guarantee is provided, of any kind!

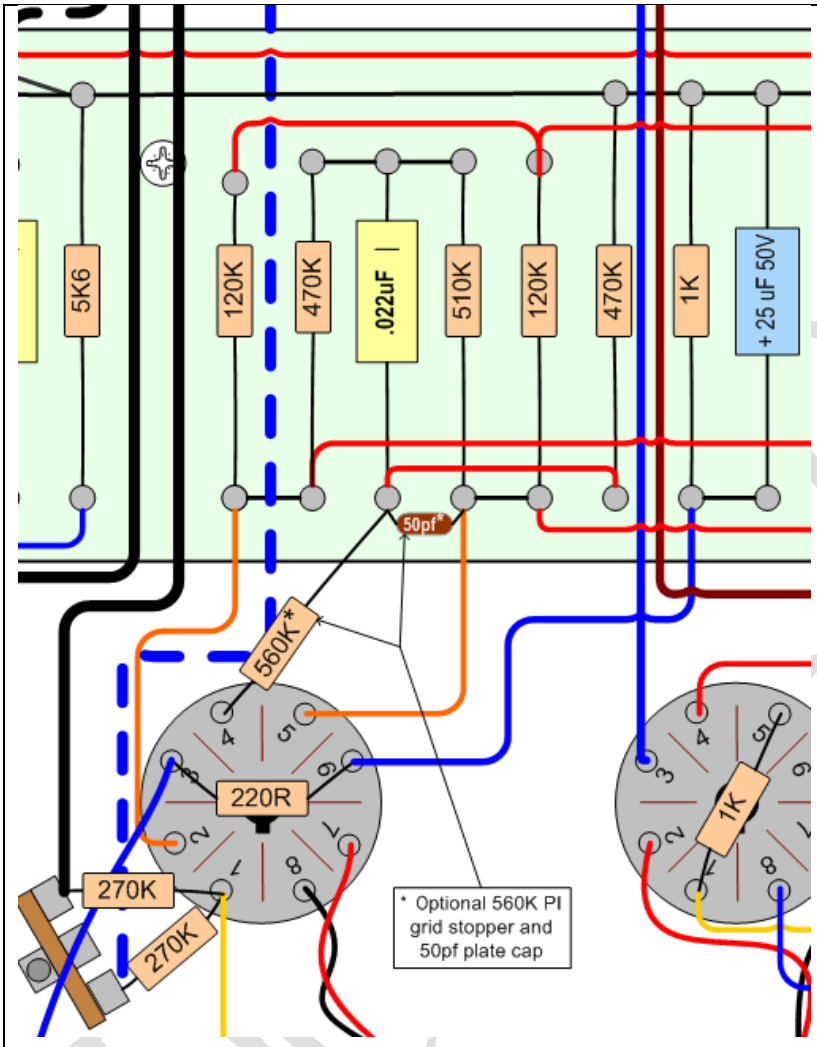
USE AT YOUR OWN RISK: TRINITY AMPS EXPRESSLY DISCLAIM ALL LIABILITY FOR INJURY OR PROPERTY DAMAGE RESULTING FROM THIS INFORMATION! ALL INFORMATION IS PROVIDED 'AS-IS' AND WITHOUT WARRANTY OF ANY KIND.

Builders Guide General Troubleshooting

For a discussion on Guitar Amp Troubleshooting, please refer to our support page document **Builders Guide General Troubleshooting**

Distortion

The Floating Paraphase Inverter design is used ***on*** many Ampeg amps. It is very rarely seen in guitar amplifiers, although Ampegs are ***the*** exception.



In some builds, the Floating Paraphase Inverter **CAN** introduce some oscillation based distortion. It could just be that the design is 50 years old**, a** little odd and quite uncommon.
Here is a simple mod of two optional parts to prevent the issue. You may not even notice it!
There is no effect on tone or response etc. It is quite transparent and the waveform of the signal is cleaner as a result.

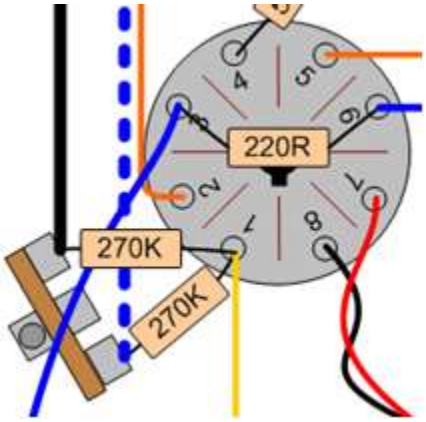
METHOD: Add a 560K 1W grid stopper resistor to V3 pin 4 where there is a normally a solid wire from the board to pin 4 and also put a 50 pf cap from the .022uf cap (that now feeds that grid stopper) and the adjacent 510K that connects to the plate of V3 pin 5.
You may be able to use just the 50 pf cap, but the grid stopper is good design and primary defense against such problems. Try 460K-560K first.

If you still experience noise issues at the extremes, here a few other mods you can try.

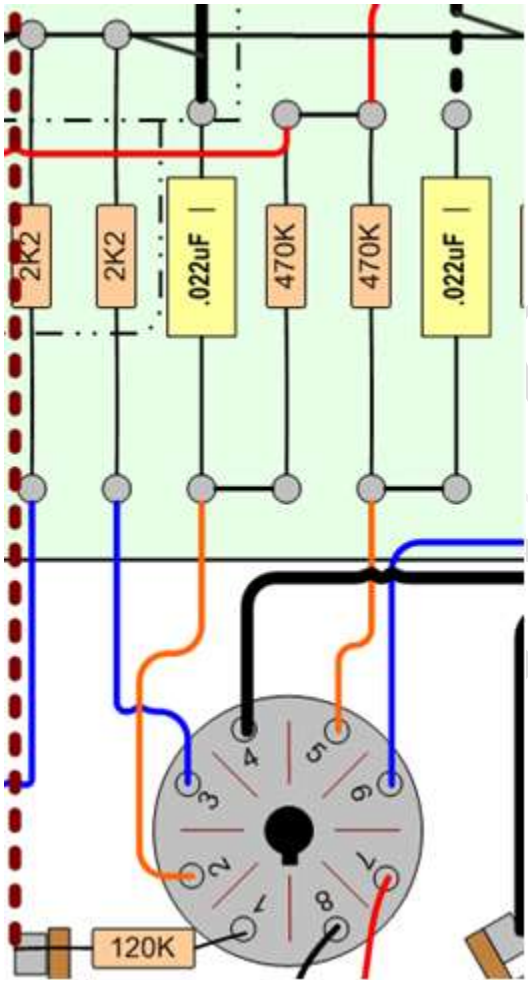
7 in of Aluminum tape to tape down OT Primary & Secondary leads in place on chassis

Optional as required

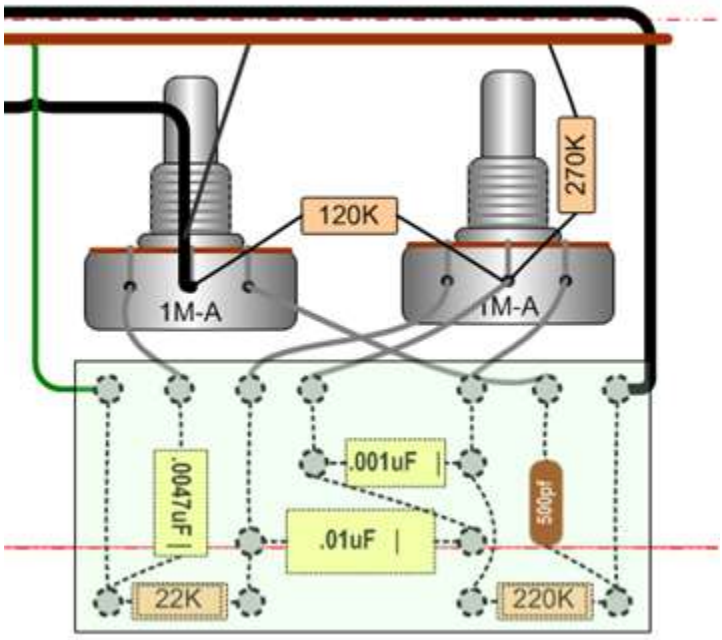
2 - 470K PI mix-grid resistors from both channels to V3, pin 1. Replacing the designed 270K.



2 - 220K plate resistors reduce gain of normal channel V2 pin2 & pin 5 (replace 470K located on turret board)



1 - 1K across (in parallel with) 120K tone stack resistor to lower top end boost of tone stack



Rx Extra Parts used as required after confirming Amp is built as per latest Layout

1	560K PI grid resistor V3, pin 4
1	50p plate cap V3, pin 4-5 (or from .022uf to plate)
7 in	Aluminum tape to tape down OT Pri & Sec leads in place on chassis
2	470K PI mix-grid resistors from both channels to V3, pin 1
2	220K plate resistors reduce gain of normal channel V1 pin2, pin 6 (located on turret board)
1	1K across 120K tone stack to lower top end boost of tone stack

Tone Tweaking

Below are some further modifications you might try in order to change the tone and response of your TRIP TOP. Reprinted with permission from Aron from diystompboxes.com

These are simplistic modifications you can do to your amp, let your ears be your guide:

- Change coupling caps; changing to smaller values reduces bass, changing to larger values adds more bass. Reducing the value of coupling caps can help eliminate "flabby" bass syndrome.
- Change cathode bypass caps. Adding a cathode bypass cap to a stage that doesn't have one will let the stage have more gain. Just like coupling caps, making the value larger adds bass - generally 25uF allows almost all bass through, .68uF are used in some Marshalls for a more midrange boost and 1uF and 5uF are used in some high end fusion type amps. Again, smaller values can help reduce "flabby" bass.
- Change cathode resistors - larger values reduce gain, smaller values give more gain. A "trick" is to connect a 5K+pot wired as a variable resistor instead of the standard cathode resistor - now you can turn the pot and dial in the perfect tone. After dialing the sound, remove the resistor and pot and measure it. Substitute the nearest standard value resistor in place of the pot plus a resistor.
- Add grid stopping resistors to help tame oscillation. If you have oscillation with your amp, you can sometimes help it by installing grid stopping resistors. The grid stoppers can also subtly roll off high end as well.
- Add high frequency roll off caps in parallel with the plate resistor. This is sometimes used to "mellow" out a stage (reduces highs).
- Adjust the grid leak resistor. Reduce the value to attenuate the signal into the stage to control the gain.
- Use a shielded cable from your input jack to the first gain stage. This can reduce RF, buzz and general reduce noise.
- Replace all plate resistors (and resistors of 100k or above) with metal film types. This can help reduce hiss..

Running KT88 Tubes in the TRIP TOP

The KT88/6550 can work in a TRIP TOP. You may have to make a couple of bias changes. This will have more power, headroom and volume than the standard TRIP TOP.

The variable bias allows you to set bias of the KT88 setting to get around 50 mA/mV max. on the power tubes, at 450v. If you can't get this bias range, you may have to change the bias resistor to get into range. If so, contact Trinity Amps for assistance.

Output Power Measurements

After almost 3 years and hundreds of hours of playtime, there has been zero problems with one particular TripTop build. The KT88 tubes have not exhibited any problems.

6L6GCs were run exclusively for the first year of operation. KT88s were then used for two more years. Even with the KT88s, the power transformer is barely warming.

Bench measurements were taken on this amp.

1. All measurements were taken using the normal channel.
2. Fixed bias was used, cathode bias resulted in lower values.
3. Bias on each set of tubes was set to 70% dissipation.
4. Voltage output did not vary much when frequency was varied but both tubes lost a bit of output as frequency dropped below 500Hz. In both cases it was less than a volt down to 50Hz.
5. A 4 ohm resistor was used as the output load.
6. Measurements were taken using an oscilloscope at the point of visible distortion in the waveform.
7. Higher power is possible with distorted waveforms.
8. The following formula was used to calculate power out: (Vp-p/2 * 0.707)^2 / 4 ohms

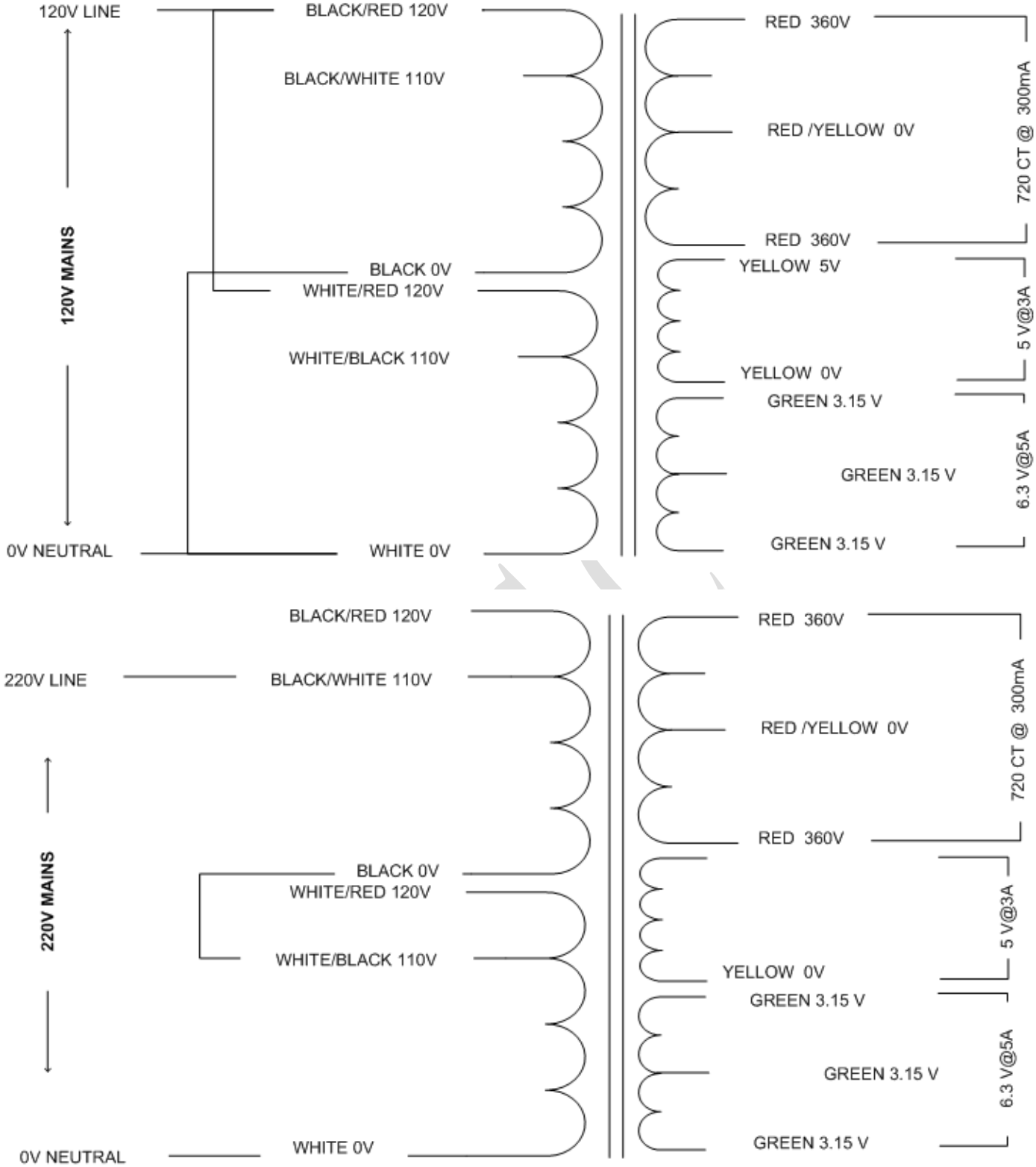
To summarize the results:

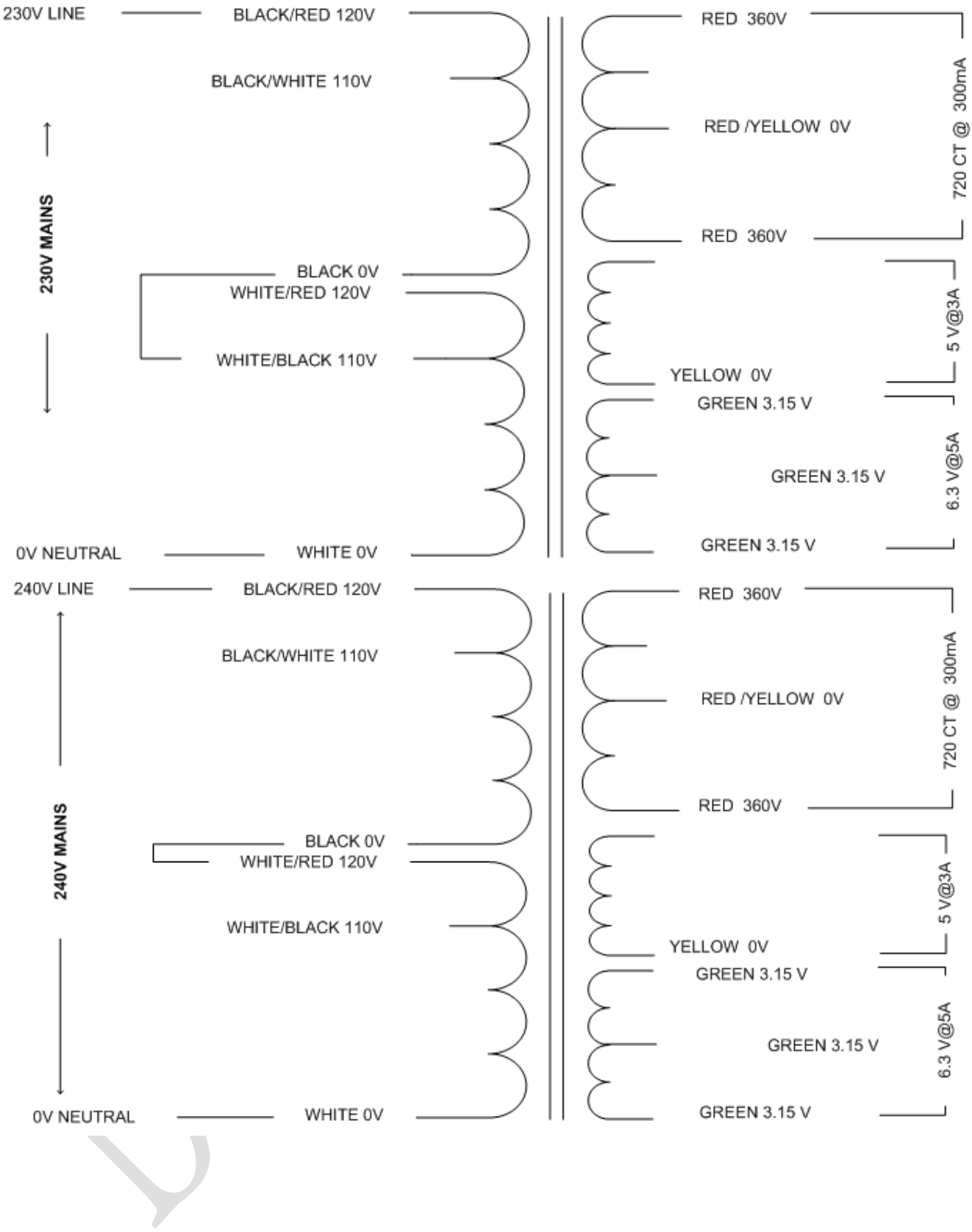
KT88
Diode Rectification
Plate Voltage = 490 Vp-p
Bias Current = 50 mA
Peak voltage = 46.0 Vp-p at 1KHz
Output Power = 66.1 Watts

6L6GC
GZ34 Rectifier
Plate Voltage = 473 Vp-p
Bias Current = 43 mA
Peak voltage = 40.4 Vp-p at 500Hz
Output Power = 51 Watts

Appendix 1 – Power Transformer Schematics

Trinity Amps HTS-11944 B15 plus PT Power Transformer HOOK-UPs




230V LINE
BLACK/RED 120V
BLACK/WHITE 110V
230V MAINS
BLACK 0V
WHITE/RED 120V
WHITE/BLACK 110V
0V NEUTRAL
WHITE 0V
RED 360V
RED /YELLOW 0V
RED 360V
720 CT @ 300mA
YELLOW 0V
GREEN 3.15 V
5 V@3A
GREEN 3.15 V
GREEN 3.15 V
6.3 V@5A
240V LINE
BLACK/RED 120V
BLACK/WHITE 110V
240V MAINS
BLACK 0V
WHITE/RED 120V
WHITE/BLACK 110V
0V NEUTRAL
WHITE 0V
RED 360V
RED /YELLOW 0V
RED 360V
720 CT @ 300mA
YELLOW 0V
GREEN 3.15 V
5 V@3A
GREEN 3.15 V
GREEN 3.15 V
6.3 V@5A

Appendix 2 - Vacuum Tube Bias Tables

6L6GC (and variants, like the 7581A) 23 watts MAX
6550 27 watts MAX
KT88 can be treated as 6550s, although these tubes can handle more current. Check with your Tube Supplier.
The ultimate test is to view the tubes' plates IN THE DARK, after they have been powered up for 15-20 minutes. If you see any red spots, back the current off a bit. *Large* red blotches, or even the entire plates turning red, is what you want to watch out for.

6L6GC - 30W	Hot (70%)	Avg (60%)	Cool (50%)
400V	53mA	45mA	38mA
425V	49mA	42mA	35mA
450V	47mA	40mA	33mA
475V	44mA	38mA	32mA
500V	42mA	36mA	30mA

6550 - 35W	Hot (70%)	Avg (60%)	Cool (50%)
400V	61mA	53mA	44mA
425V	58mA	49mA	41mA
450V	54mA	47mA	39mA
475V	52mA	44mA	37mA
500V	49mA	42mA	35mA

KT88	Hot (70%)		
400V	61mA		
425V	58mA		
450V	54mA		
475V	52mA		
500V	49mA		

Appendix 3 - How to read Resistor Color Codes

First the code

Black	Brown	Red	Orange	Yellow	Green	Blue	Violet	Gray	White
0	1	2	3	4	5	6	7	8	9

How to read the Color Code

First find the tolerance band, it will typically be gold (5%) and sometimes silver (10%).

Starting from the other end, identify the first band - write down the number associated with that color; in this case Blue is 6.

Now 'read' the next color, here it is red so write down a '2' next to the six. (you should have '62' so far.)

Now read the third or 'multiplier' band and write down that number of zeros.

In this example it is two so we get '6200' or '6,200'. If the 'multiplier' band is Black (for zero) don't write any zeros down.

If the 'multiplier' band is Gold move the decimal point one to the left. If the 'multiplier' band is Silver move the decimal point two places to the left. If the resistor has one more band past the tolerance band it is a quality band.

Read the number as the '% Failure rate per 1000 hour'. This is rated assuming full wattage being applied to the resistors. (To get better failure rates, resistors are typically specified to have twice the needed wattage dissipation that the circuit produces.) 1% resistors have three bands to read digits to the left of the multiplier. They have a different temperature coefficient in order to provide the 1% tolerance. At 1%, most error is in the temperature coefficient - i.e. 20ppm.

Appendix 4 - How to read Capacitor Codes

Large capacitor have the value printed plainly on them, such as 10.uF (Ten Micro Farads) but smaller disk types along with plastic film types often have just 2 or three numbers on them?

First, most will have three numbers, but sometimes there are just two numbers. These are read as Pico-Farads. An example: 47 printed on a small disk can be assumed to be 47 Pico-Farads (or 47 puff as some like to say)

Now, what about the three numbers? It is somewhat similar to the **resistor code**. The first two are the 1st and 2nd significant digits and the third is a multiplier code. Most of the time the last digit tells you how many zeros to write after the first two digits, but the standard (EIA standard RS-198) has a couple of curves that you probably will never see. But just to be complete here it is in a table.

milli, micro, nano, pico

1 mili Farad (or any other unit) is 1/1,000th or .001 times the unit. (10^{-3})

1 micro = 1/1,000,000 or 0.000 001 times the unit (10^{-6})

1 nano = 1/1,000,000,000 or 0.000 000 001 times the unit (10^{-9})

1 pico = 1/1,000,000,000,000 or 0.000 000 000 001 times the unit (10^{-12})

Table 1 Digit multipliers	
Third digit	Multiplier (this times the first two digits gives you the value in Pico-Farads)
0	1
1	10
2	100
3	1,000
4	10,000
5	100,000
6 not used	
7 not used	
8	.01
9	.1

Now for an example: A capacitor marked 104 is 10 with 4 more zeros or 100,000pF which is otherwise referred to as a 0.1 μF capacitor.

Most kit builders don't need to go further but there is sometimes a tolerance code given by a single letter.

So a 102K is a 1,000 pF with +/-10% tolerance

Typical Capacitor Markings			
Code	pf	nf	uF
510	51	0.051	.0000510
181	180	0.18	.00018
501	500	0.5	.0005
102	1000	1.0	.001
122	1200	1.2	.0012
152	1500	1.5	.0015
202	2000	2.0	.002
222	2200	2.2	.0022
472	4700	4.7	.0047
502	5000	5.0	.005
103	10000	10	.01
123	12000	12	.012
203	20000	20	.02
223	22000	22	.022
473	47000	47	.047
104	100000	100	.1
684	680000	680	.68

Table 2 Letter tolerance code	
Letter symbol	Tolerance of capacitor
B +/	0.10%
C +/	0.25%
D +/	0.5%
E +/	0.5%
F +/	1%
G +/	2%
H +/	3%
J +/	5%
K +/	10%
M +/	20%
N +/	0.05%
P +100%	0%
Z +80%	20%

Appendix 5 - FAQ

Q: Where can I find more help and support?
A: Sign up at the Trinity Amps Forum and check the "Resources" section or post a question in the TRIP TOP forum.

NOTE: B+ stands Battery Plus == B+ and came from the old days of tubes. B+ is measured at the intersection of the rectifier DC output and the first filter cap.
On a TRIP TOP, it is measured between the 1kK 10 Watt Power resistor and chassis ground. It should be about 460 VDC with tubes, with 120 VAC mains.

Q: Does it make a difference as to what orientation I choose to make sure the power switch operates correctly, i.e. on is on and off is off?
A: It does it make a difference as to what orientation you choose to make sure the switches operate correctly. Put a switch in any position and measure the resistance across two terminals on the side. "ON" is where resistance is zero. Then rotate the switch so that DOWN is ON (UK style).

Q: The picture and layout show a grounding screw next to the IEC plug, the chassis is not drilled for one. Can I run the ground to the common star ground that the power transformer.
A: To meet electrical safety code, the mains ground must be connect by itself to the chassis. It is best to drill a hole to connect the 120 V ground to a bolt that fastens to the chassis.
Don't run the 120 V ground to the common star ground.

Q: I assume that the shield is only attached to the pot; it is NOT connected to the tube socket?
A: Yes. Do not connect shield at both ends on the TMB volume pot OR input cables.

Q: For the impedance switch, do I use the 5 amp or 20 amp wiring? From the layout I would guess the 5 Amp.
A: Use 5 A for the impedance switch. The amp is fused at 3A anyway, so 5 is plenty.

Q: The wire looks to be two basic sizes, "thin" and "thick". From the pictures, it looks like the "thin" is used for the pot wiring and the "thick" is for the tube sockets. Is this correct?
A:
Use 22 Gauge solid for hook up to tubes;
Use 20-22 Gauge, twisted tightly for tube heater wiring;
Use 22 Gauge solid/stranded for hook up to pots/front panel; and
Use 18 gauge, stranded, 600v for power supply hook up - to transformers, rectifier, standby etc.
Tip: Re-use cut-offs from the transformers for power supply hook up.

Q: What should I use for the jumper wires on the back of the turret board?
A: Use the provided solid 20 ga or the stranded supplied for jumpers,

Q: For the input jacks:

a): I should be using the shielded wire which is the thick gray/black wire that you supplied about 3' of. Does the shield braid from both lines go to the common tip lug on the lower jack while the core line goes to the individual tip lugs on both jacks? I want to make sure I am interpreting the drawing correctly.
b). The other end of the shield does NOT get connected to the tag strip at V1, correct?
c). Each pair of input jacks gets only one resistor, correct? Can I lace one lead of the resistor through both jacks for the connection?
A: Take a look at the drawing of the input jacks. That should help you out. Use the shielded wire which is the heavy black wire. The core goes to the hot. At the other end, the shield does NOT get connected to the tag strip at V1.

Q: How do you wire up the impedance switch? The layout shows 4 lugs on the switch while the actual switch has two concentric rings of lugs, 4 inner and 12 outer.
A: The impedance switch inner & outer lugs are in pairs - 4 inside & 3 each for the outside. Connect the output jack to one of the inner lugs, and then connect each output tap from the transformer to the outside lugs that are 'paired' with that inner lug. You can confirm the 'pairs' by checking the resistance between the inner lug and outer lug at different switch positions.

Q: How are the three terminal tag strips next to V1 were supposed to be mounted, looked at the pictures on line and found they go under the V1 socket mounting nuts.
A: Yes. They are part of the socket mounting. Use the 4-40 nuts supplied to fasten them down.

Q: I assume you don't have to use both of the fiber/rubber washers when mounting the cliff jacks; I can get only one on, is this normal?
A: Yes

Q: Is there hardware provided for the grounding? Screws, star washers, nuts, etc.?
A: Yes, these should be in the kit.
Note: The power grounds should go to the separate hole to mount the grounding points.

Q: Is it easier to wire the pots up outside of the chassis on a cardboard with the pots spaced correctly, or can it be done easily in the chassis?
A: You can wire them in place, it's not too difficult. It is recommended that you wire the input jacks outside of the chassis with the approximate spacing to fit the panel.

TIP: It is easy to solder up the input jacks by putting them "inside out". Use a set of jack locations to the right of the normal channel and mount the jacks in their final orientation, but mounted outside of the chassis with the mounting screw inside the chassis. This keeps the orientation and spacing correct and provides a lot of room to solder the resistor, jumpers grounding wire and shielded wires. Then, when done, remove the completed jacks, mount them correctly inside the chassis and tighten up the mounting screws and solder up the other end of the shielded wires to the tag strips at V1.

TIP: More, larger format, colour pictures and the schematic & layout that are helpful in the build are posted on the Trinity Forum – Resources Section. Right click on them to download if you want print in large, colour format.

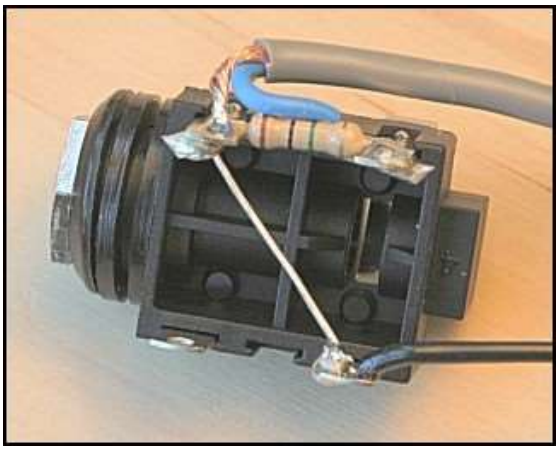
TIP: Sometimes it is hard to decode the resistors colours. It is a good idea to check the resistances of these parts before assembly.

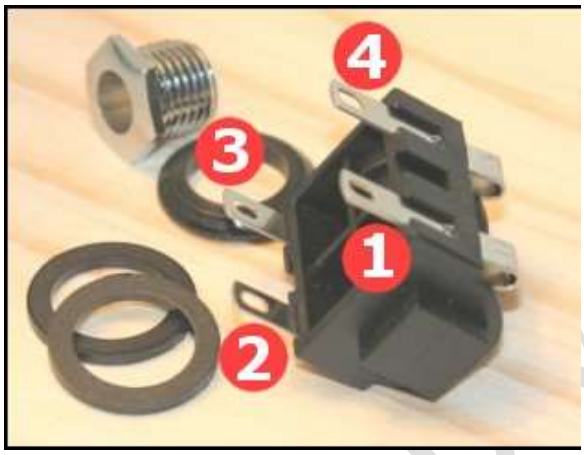
TIP: Use insulation tubes from the wiring on the resistor / cap leads around the tubes and pots by using longer pieces of insulation stripped from the supplied 22 ga wire.

TIP: Heater Wires: Stranded wire is very hard to twist tightly. Stranded or solid doesn't make much difference. Solid wire stays in place better once it's positioned and a bit easier to feed through holes. If they aren't well twisted make sure they are tight against the chassis. Use 20 ga solid for heaters. It is rated for more than 5A/600Volts.

Appendix 6 - Cliff Jacks Explained

Here's a Cliff-style jack wired for a single input.





With no guitar plugged in, there's continuity to ground for lugs 2 and 4 (a direct connection) and also for lug 1 (it's not switched and therefore mechanically connected to lug 2 with the crossover wire). With a guitar plugged in, the switching breaks, and now there's only continuity between lugs 2 and 4 and ground. Of course, with a guitar plugged in, you'll read a resistance of 6-12K for lug 1 to ground - depending on your pickups. If your guitar's Volume pot is at zero, you'll find continuity to ground instead.

You should get continuity between the tip and chassis with nothing plugged in because of the shorting jack and the cross over wire. From 18W Forum – loverocker & ebe

Appendix 6- TRIP TOP Bill of Materials

DESCRIPTION	QTY.	CHECK
TRIPTOP BASS AMP WITH TRANSFORMER SET, CHASSIS, PANEL		
TRIPTOP RESISTORS	1	
METAL FILM RESISTORS - THROUGH HOLE 1WATT 1 OHMS 1%	2	
CARBON FILM RESISTORS- THROUGH HOLE 220 OHMS 5%	1	
WIREWOUND RESISTORS - THROUGH HOLE 500 OHMS 5% TOL	2	
CARBON FILM RESISTORS- THROUGH HOLE 1K OHMS 0.05	3	
WIREWOUND RESISTORS - THROUGH HOLE 1.0K OHMS 5% TOL	1	
CARBON FILM RESISTORS - THROUGH HOLE 2.2K OHMS 5%	2	
CARBON FILM RESISTORS - THROUGH HOLE 5.6KOHMS 5%	2	
CARBON FILM RESISTORS- THROUGH HOLE 10K OHMS 0.05	1	
CARBON FILM RESISTORS- THROUGH HOLE 15K OHMS 5%	1	
CARBON FILM RESISTORS- THROUGH HOLE 22K OHMS 5%	2	
METAL OXIDE RESISTORS 22K OHMS 5% TOL	2	
CARBON FILM RESISTORS- THROUGH HOLE 47K OHMS 5%	2	
METAL OXIDE RESISTORS 47K OHMS 5% TOL	1	
CARBON FILM RESISTORS- THROUGH HOLE 68K OHMS 0.05	1	
CARBON FILM RESISTORS- THROUGH HOLE 120K OHMS 5%	6	
METAL OXIDE RESISTORS 180K OHMS 2W	1	
CARBON FILM RESISTORS- THROUGH HOLE 220K OHMS 0.05	3	
METAL OXIDE RESISTORS 220K OHMS 5% TOL	3	
CARBON FILM RESISTORS- THROUGH HOLE 270K OHMS 5%	6	
CARBON FILM RESISTORS- THROUGH HOLE 470K OHMS 0.05	5	
CARBON FILM RESISTORS- THROUGH HOLE 510K OHMS 5%	1	
CARBON FILM RESISTORS- THROUGH HOLE 3.3M OHMS 5%	2	
TRIPTOP CAPACITORS	1	
CAPACITOR - 500V SILVER MICA ± 5% CAPACITANCE: 500 PF	4	
CAPACITOR - MALLORY 630V 150S AXIAL LEAD CAPACITANCE: .001 UF	2	
CAPACITOR - MALLORY 630V 150S AXIAL LEAD CAPACITANCE: .0047 UF	2	
CAPACITOR - MALLORY 630V 150S AXIAL LEAD CAPACITANCE: .01 UF	2	
CERAMIC DISC CAPACITORS .375LS .01UF 1KVDC 10% 8MM LEAD DIA	1	
CAPACITOR - MALLORY 630V 150S AXIAL LEAD CAPACITANCE: .022 UF	5	
CAPACITOR - MALLORY 630V 150S AXIAL LEAD CAPACITANCE: .047 UF	2	
CAPACITOR - 50V AXIAL LEAD ELECTROLYTIC 25 µF	1	
ALUMINUM ELECTROLYTIC CAPACITORS - AXIAL LEADED 47UF 63VOLTS 20%	4	
CAPACITOR - 450V AXIAL LEAD ELECTROLYTIC CAPACITANCE: 47 UF	3	
CAPACITOR - JJ ELECTRONICS 500V 50/50UF ELECTROLYTIC	1	
RECTIFIERS 1000V 1A RECTIFIER GLASS PASSIVATED	1	
CAPACITOR CLAMP - 1.375" DIAMETER	1	

TRIPTOP POTENTIOMETERS	1	
POTENTIOMETER - FENDER 10K LINEAR BIAS SCREW	1	
POTENTIOMETER - ALPHA AUDIO 3/8" BUSHING RESISTANCE: 1 MOHM	4	
POTENTIOMETER 1M OHMS PLAIN DPDT SOLDER LUGS	2	
200 OHM LINEAR, SCREWDRIVER SLOT 2 WATTS	1	
TRIPTOP SOCKET	1	
SOCKET - BELTON MICALEX 8 PIN OCTAL MIP	6	
TRIPTOP JACKS	1	
SCREWS & FASTENERS SHOULDER WASHER 3/8"	1	
SCREWS & FASTENERS WSHR FBR 3/8".625"	1	
JACK - SWITCHCRAFT ¼" MONO 2-CONDUCTOR OPEN CIRCUIT	2	
JACK - SWITCHCRAFT 1/4" MONO 2-CONDUCTOR SHUNT TIP	1	
JACK - CLIFF 1/4" MONO SOLDER LUG	3	
TRIPTOP CHASSIS HARDWARE	1	
FUSE - SLOW-BLOW 250V 3AG 0.25" X 1.25" AMPERAGE: 3AMPS	1	
SCREW TYPE FUSE HOLDER 10A 250VAC CSA	1	
IEC RECEPTACLE - FOR POWER CORD	1	
TEST PLUGS & TEST JACKS BANANA JACK RED	2	
TEST PLUGS & TEST JACKS BANANA JACK BLACK BU-31602-0	1	
GROMMETS & BUSHINGS GROMMETS & BUSHINGS SB 500-6 BLK	4	
TERMINAL STRIP - 3 LUG 2ND LUG COMMON HORIZONTAL	3	
NEON INDICATOR 120VAC RED	1	
SWITCH - CARLING TOGGLE SPST ON-OFF SIDE SOLDER LUGS	2	
RF CONNECTOR ACCESSORIES LOCKWASHER	2	
SWITCH - SWITCHCRAFT SLIDE DPDT JAZZMASTER/JAGUAR	1	
KNOB SKIRTED POINTER WHITE LINE	6	
KNOB - CHICKEN HEAD SET SCREW COLOR: BLACK	1	
SWITCH - ROTARY 1 POLE 3 POSITION	1	
TRIPTOP FASTENERS	1	
MACHINE SCREW PHILLIPS PAN HEAD 4-40X5/16 L	20	
HEX NUT EXT TOOTH LOCKWASHER 4-40	3	
TERMINALS TERMINALS LUG LOCKING MATTE TINNED#4	2	
MACHINE SCREW PHILLIPS PAN HEAD 6-32X3/4 L	4	
MACHINE SCREW PHILLIPS PAN HEAD 6-32X3/8 L	4	
HEX NUT EXT TOOTH LOCKWASHER 6-32	4	
INTERNAL TOOTH LOCK WASHER #6 CHROME	4	
STANDOFFS & SPACERS .375 STD SPACER	4	
TERMINALS TERMINALS LUG LOCKING MATTE TINNED#6	4	
MACHINE SCREW PHILLIPS PAN HEAD 8-32X3/8 L	1	
HEX NUT EXT TOOTH LOCKWASHER 8-32	1	
TERMINALS TERMINALS LUG LOCKING MATTE TINNED#8	1	

MACHINE SCREW PHILLIPS PAN HEAD 10-32X3/8 L	8	
HEX NUT EXT TOOTH LOCKWASHER 10-32	8	
SAE FLAT WASHER #10	8	
MACHINE SCREW PHILLIPS TRUSS HEAD 10-32X1-1/4 L	4	
ANCHOR (CAGE) NUT 10-32	4	
TRIPTOP WIRE	1	
22 GUAGE SOLID CORE WIRE (VARIOUS COLOURS)	16	
22 GAUGE TWISTED PAIR RED/BLACK	4	
BELDEN RG174/U COAXIAL CABLE	16	
18 GUAGE STRANDED WIRE BLACK	1.5	
18 GUAGE STRANDED WIRE WHITE	1.5	
HEAT SHRINK TUBING 1MM	4	
HEAT SHRINK TUBING 3MM	4	
HEAT SHRINK TUBING 6MM	4	
CABLE TIE 4 IN BLACK 18 LBS	14	
TRIPTOP RX PARTS	1	
CARBON FILM RESISTORS- THROUGH HOLE 1K OHMS 0.05	1	
METAL FILM RESISTORS - THROUGH HOLE 220K OHMS 1% 50PPM	2	
CARBON FILM RESISTORS- THROUGH HOLE 470K OHMS 0.05	2	
METAL FILM RESISTORS - THROUGH HOLE 560K OHMS 1% 50PPM	1	
CAPACITOR - 500V SILVER MICA ± 5% CAPACITANCE: 500 PF	1	
CAPACITOR - 500V SILVER MICA ± 5% 47 PF	1	
ALUMINUM TAPE	10	
FOAM TAPE	4	
CORD - POWER 18 AWG 3 CONDUCTOR DETACHABLE BLACK IEC LENGTH: 8 FT	1	
TRIP TOP TURRET BOARD	1	
COPPER 18 GA SOLID BUS BAR	1	
TRIP TOP TONE BOARD	2	
FOAM TAPE 1/4"X .125"	4	
TRIPTOP STAINLESS CHASSIS .062 IN	1	
HEYBOER B15 300 mA, 50/60 HZ PWR TRAN	1	
HEYBOER B15 PLUS OUTPUT TRANS EZ	1	

Trinity Amps Schematics and Layouts