The Trinity Amps

OSD

Overdrive Special Design

Amp Builder's Guide

For the sole personal use of Trinity Amps Customers.

January 2022, Version 22.1

www.trinityamps.com

Thank You

Thank you for purchasing your OSD 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 from 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: **stephen@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 cannot 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.

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 www.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	14Dec17	FIRST RELEASE
1.01	26Dec17	Note added to modify terminal strips and mounting ground lugs
1.02	27Dec17	Added description of Power/Stand-by switch installation with washer; Tone Tweaking note enhanced.
1.03	29Dec17	Mod instructions around installing 5K Trim Pot and PI components section (A. McKay) Added addendum for insulating the mounting screw in PI section close to Trim Pot.
1.04	31Dec17	Added note on tying off 100V Black/White and White / Black when not use in 120 or 240V implementations
1.05	29Jan18	Updated Relay testing procedure (J. Ianieri)
1.06	30Jan18	Corrected SEND JACK connection to Master Volume (not eyelet board) (C. Gwyn)
1.07	5Feb18	Updated orientation of Relays on board. (K. Matsumoto)
1.08	12Feb	Removed jumper on mid control pins 2-3 . (C. Gwyn)
1.09	9Mar	Corrected parts list for Preamp Components (2) section to 2- 10uF bypass caps and 1 – 150K 1% resistor. (B.Manker)
1.10	14Mar	Corrected Rock/Jazz switch terminal numbers to "Solder a jumper between pins 1 and 4 on the DPDT switch". Corrected description and quantity of DPDT Mini Toggle Switch to '3' in BOM (M. Johnson)
1.11	19Mar18	Updated jumper wires p.54 (M. Johnson)
1.12	22Mar18	Changed procedure to connect lead from DPDT JAZZ/ROCK switch terminal 2 (was 3) to PAB RELAY 2, NC terminal (B. Manker). Corrected 240V hook-up and PT schematics. Appendix with all mains voltages supported (N. Kehlet)
1.13-1.14	7Aug18	Updated BOM per feedback from R. Vaivads
1.15	9Aug18	Corrected TRIM Control pot wiring and FX board installation
1.17	22Oct18	Updated BOM
1.18	4Dec18	Updated per feedback from R. Vaivads: .clarified bias pot install; updated drawings for 600V OD caps; updated BOM
1.19	22Dec18	Updated for new (black) relay board installation and testing.
1.20	10Jan19	Updated OD RELAY connections to eyelet board (R. Vaivads)
1.21	15Feb19	Updated all relay drawings in manual
1.22	19Feb19	Updated OSD COM Relay connections thru manual
1.23	10Mar	Update 240V connection text. Corrected PI Components text; added 1 stand-off to BOM (V. Sundberg)
1.24	6Apr19	Note added about FX return connection location option and PI balancing with matched triode tube.
1.25	14Feb20	Updated BOM; added layouts for board wiring
1.26	9Apr20	Fixed wring of OT impedance selector switch p. 48 (W. McGrath)
1.27	24Apr20	Updated to install Optional Tube Fx Loop; removed FET loop.
1.291	2Feb21	Updated Trim Control Pot wiring
21.1	24Feb21	New version First Release

21.2	9Jun21	Added General Dumble Tweaking section
21.3	19Jul21	Clarrifed board mounting
21.4	18Aug21	Corrected BOM: 24K-> Carb. Film, and matched to assy instructions
21.5	25Oct21	Clarified relay testing; jumper installation tips; typo in Bass control wiring; BOM inconsistencies; heater wiring at power tubes. (A. Woiwood)
21.6	26Oct21	Modified the Presence control layout to reduce 1 lead.
22.1	11Jan22	Added Managing Power Transformer extra leads

About the OSD

Dumble amplifiers are synonymous with the rarest finest boutique amplifiers. Alexander "Howard" Dumble started building the legendary amplifiers in the 60's in southern California. Over time he designed and hand-built and tweaked many amps that were used by Stevie Ray Vaughn, Eric Johnson, Carlos Santana, John Mayer, Robben Ford, Larry Carlton etc..

The Overdrive Special (ODS) is by far Dumble's most well-known and popular amp. As a result they are Dumble's most produced amp with approximately 250 built. With previously owned ODS' easily selling for over $100,000 USD these days online they are not your average basement rockers amp.

The Trinity Amps OSD is modelled after the 100W Dumble ODS #124 with just a few less frills. It boasts a nominal 24W output in a compact format of only 15-1/2 in W X 7-1/2" in H X 9-1/2 in D and 25 lbs., two channels - Clean and Overdrive. The amp uses using 6V6 output tubes in fixed bias mode. Since most on-stage set-ups are miked, 100 watts power is almost never required and 24 watts is both sufficient and surprisingly loud even for medium gigs, especially in this design. This lower wattage helps keep volume levels manageable and makes it very useful in a studio. There is also an option to run 6L^ for slightly higher (33 watts)power.

The preamp has three 12AX7 tubes which are used for the Clean channel, Overdrive channel and the Phase Inverter. On the back of the amp there is a control to configure Overdrive channel Trim. The Overdrive channel and Pre-Amp Boost (PAB) are activated with a footswitch connected to the back of the amp. There is also a passive effects loop, like in the originals. This is very effective if, for example, you want to inject some reverb. We have used a Holy Grail Reverb pedal here and it works very well.

The "spanky" clean preamp has a percussive nature is extremely inspirational. This preamp stays nice and clean and allows you to crank the power amp to achieve a highly percussive tone that taps into the compression and sustain of the power amp tubes.

The magic of the OSD comes from the Overdrive channel sound. The Overdrive channel provides a very smooth, sweet sustaining distorted tone. Activating the Overdrive circuit adds two additional gain stages and the result is an Overdrive that ranges from clean and harmonically rich to smooth and thick with ample saturation.

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**

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 20 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:

25 watt pencil tip soldering iron

60/40 rosin core solder

wire stripper

wire cutter

needle nose pliers

screwdrivers (Philips, standard)

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 eyeletboards, 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 eyelet boardany 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 a 9-pin tube socket are numbered 1 to 9 in a clockwise direction when a tube or socket is viewed from the bottom. Note that there is a gap between pins 1 and 9. 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 gap between pins 1 and 8.

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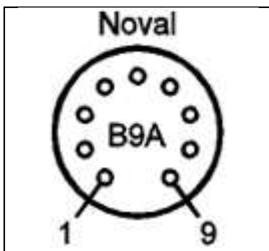
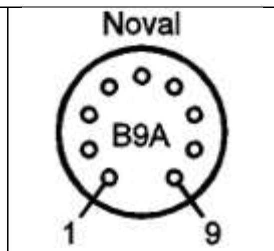
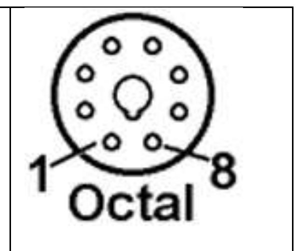
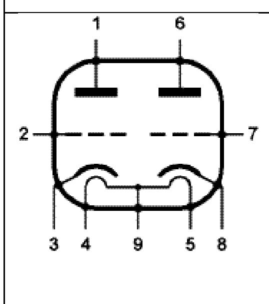
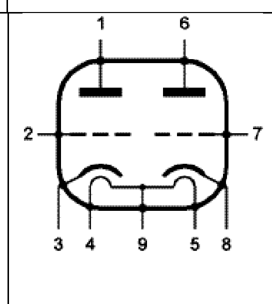
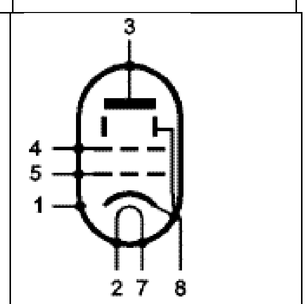
<tr><td></td><td></td><td></td></tr>
<tr><td>12AX7</td><td>12AT7</td><td>6V6 /KT66</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>12AX7</td><td>12AT7</td><td>6V6</td></tr>
</table>

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.

Check Your Kit

Check your kit carefully against the Bill Of Materials (BOM) contained in this manual. If you find any damaged or missing components, or have a question about substitutions, please contact Trinity Amps immediately to arrange a replacement.

OSD Build Steps Summary

1. Install hardware.
2. Install all the terminal strips on the tube socket mounting screws.
3. Install the components between the terminal strips and a tube sockets starting with v1 and moving across to v5; Install components on the V2, V4, and V5 tube sockets.
4. Install components on the Send Return jacks.
5. Install the ground bus on the control pots.
6. Put components on the input jack, jazz switch, rock switch, volume control bright cap, treble control, bass control and master control with components connected to them and the ground bus.
7. Build the RELAY board and install it in the chassis.
8. Install the power transformer and output transformer.
9. Wire the power transformer primary leads and grounds. Test the power transformer and RELAY board.
10. Build the eyelet board and install it in the chassis.
11. Wire the 3 ground points from board to chassis
12. Wire the Tube Sockets.
13. Wire the Controls and Input Jack.
14. Wire the RELAY board to the foot switch chassis socket.
15. Complete the power transformer secondary wiring.
16. Complete the wiring of the output transformer and impedance switch.
17. Wire the heater wires.
18. Double check that all the connections are made according to the layout and it is neat and tidy.
19. Build the footswitch box, cable and DIN connector.
20. Plug in the foot switch, and follow the start-up procedure.

1. Install all the Hardware

1. Ensure that all ground points and holes for jacks are clean to bare metal before installing any hardware. Use a scraper and small wire brush to remove any overspray. There may be areas that need scraping; specifically the speaker jack holes, Fx loop jack holes and the IEC ground point.
2. Install preamp tube sockets. The preamp tubes are mounted with pin 9 facing the circuit board. **NOTE:** V1 has a 3-lug and 1-lug terminal strip mounted with the socket and V2 has a 3-lug strip. You may need to trim or bend mounting tabs to get the exact configuration required. See next section.
3. Install power tube sockets. Power tubes are mounted with the alignment notch towards the rear of the chassis. **NOTE:** V4 and V5 have a ground lug and1-lug terminal strips. See next section.
   3.1. Install 3 #6 ground lugs with #6 X 3/8" and KEPS nut. PW1, PW2, PRE1; Install 1 #8 MAINS GROUND LUG, POW1 with #8 X 3/8" and KEPS nut
4. On the top of the chassis, install the:
   4.1. 10K BIAS pot with lugs aligned towards the rear of the chassis.
   4.2. TEST points – 2 – RED and 1- BLACK with lugs aligned perpendicular to the chassis
   4.3. BIAS selector DPDT switch aligned parallel to the rear of the chassis
5. In the rear of the chassis install the:
   5.1. IEC power entry socket and H.V. FUSE holder
   5.2. IMPEDANCE selector - leave the impedance selector slightly loose for now.
   5.3. 2 SPEAKER jacks aligning the tip downwards.
   5.4. 2 SEND & RETURN jacks aligning the tip downwards.
   5.5. OD TRIM (250KL) pot with lugs facing upwards and with a washer on the outside between the nut and chassis.
6. On the Front of the Chassis Install
   6.1. PILOT light – the RED jewel screws in from the outside - align the lugs facing upwards. Tighten securely in place
   6.2. POWER and STAND-BY toggle switches. The dress nut typically goes on the outside - align the lugs facing upwards.

NOTE: If there is excessive gap between the switch and the mounting hole, use the supplied 20ga wire washer or take a .040" piece of solder wire (or any similar diameter wire) and wrap it around the threaded portion of the switch to form a perfect circle. Then cut it across the <u>overlapping</u> two ends at the same time to form a round "washer". Insert the switch from the inside, with hexagon nut and lock-washer in place against the chassis. Adjust the hex nut so just the threaded portion is exposed outside of the chassis. Expose just enough to fit the round "dress nut". Slide the "washer" onto the threaded portion and press it into the gap. Put on the "dress nut" and finger tighten. Tighten the "hex nut" inside, until securely in place.

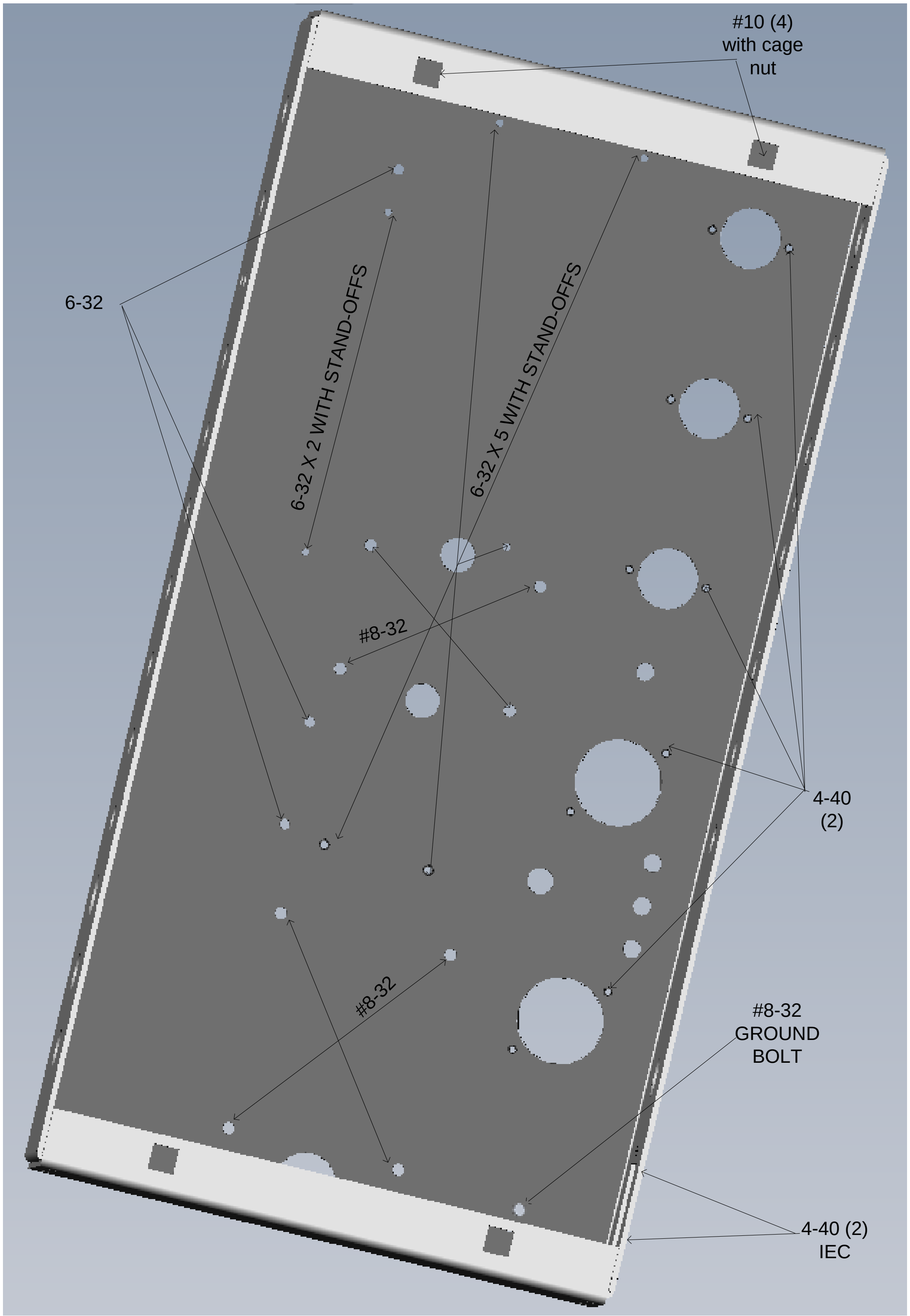
6.3. CONTROL potentiometers. Sort out the 7 Control potentiometers that go on the front of the chassis. VOLUME (1MA with DPDT switch), TREBLE (250KB), MIDDLE (250KA), BASS (500KA), LEVEL (250KA), RATIO (100KA), MASTER (1MA), PRESENCE (2KL). Ensure the potentiometers are located in the correct positions according to their values and the layout. Bend/break any locking tabs that exist. Install each Control Pot with a washer on the outside between the nut and chassis.

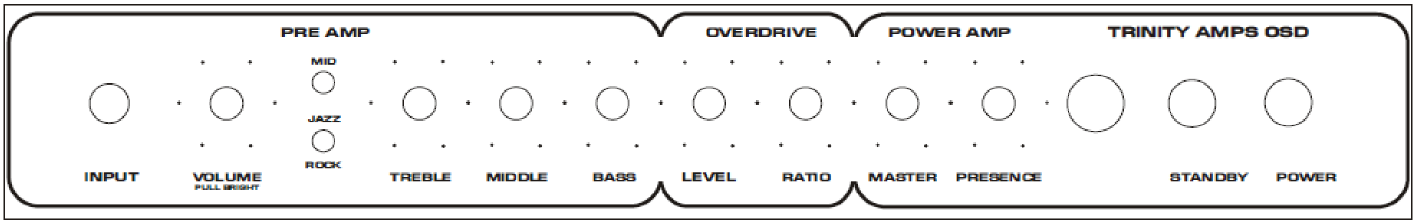
6.4. INPUT JACK. Install with lugs facing upwards. The Chrome hut and plastic washer go on the outside. Leave it slightly loose for now as you will want to remove it to assemble it later. You probably will need only 1 fiber washer on the inside to mount them flush with the front of the chassis.

6.5. ROCK and JAZZ toggle switches but leave them slightly loose for now as you will want to remove them to assemble it later.

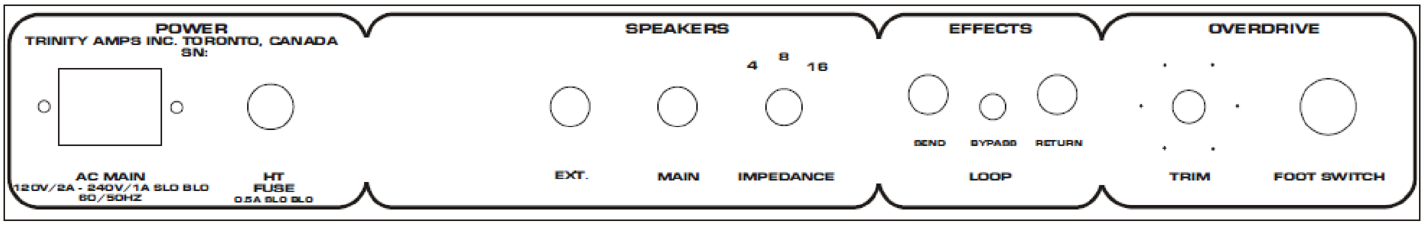
7. Insert 2 - ½" plastic bushings for the output transformer leads . Insert 7/8" plastic bushing for the power transformer leads.
8. Check your work. Make sure that all hardware is securely tightened as required and that all pots and switches operate smoothly.

Part	Qty	Where to use
4-40 X 5/16 (no nuts reqd.)	20	Mount tube sockets in threaded chassis
4-40 KEP nuts	5	Mounting terminal strips
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 any* ***non-threaded holes*** *with lock nut*
6-32 X 3/8"	3	Mount power ground # 6 chassis lugs with KEP nuts.
6-32 X 1-¼	5	Mount eyelet board to chassis using stand-off. Use with lock washer under screw head.
8-32 X 3/8"	1	Mount Mains ground **ONLY**. Use KEPS nut with #8 chassis lug.
8-32 X 3/8"	8	Mount Output and Power trans. With KEPS nuts.
8-32 lock nuts	9	8 "KEPS" for power transformer; 1 KEP nut for ground bolt.
10-32 X 1-½	4	Mount chassis to cabinet. Use cage nuts in square holes pressed into chassis.


#10 (4)
with cage
nut
6-32
6-32 X 2 WITH STAND-OFFS
6-32 X 5 WITH STAND-OFFS
#8-32
4-40
(2)
#8-32
#8-32
GROUND
BOLT
4-40 (2)
IEC



OSD FRONT VIEW



OSD REAR

Note Some components are more easily installed when they are pre-installed on other components prior to installation. In building the amp, you may want to remove some parts to build these sub-assemblies.

For example the Input Jack, Volume control. Be prepared to remove these parts to build these sub-assemblies.

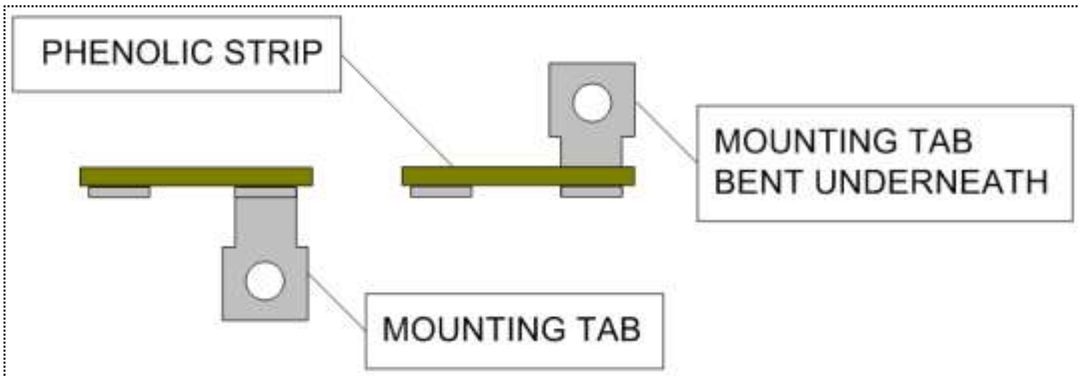
2. Install Terminal Strips

There are 5 special terminal strips that need orientation and installation. Each terminal strip is mounted on the screw holding the tube socket in place, but with the addition of a 4-40 KEPS nut.

NOTE: Some terminal strips are opposite handed to what is ideally required. Although they will fit, you should bend the mounting tab so it points the opposite way. (i.e. it protrudes from the other side.)

1. Use a pair of pliers to securely hold the mounting tab at the phenolic strip.
2. Use a second pair of pliers to hold the other end of the tab with the mounting hole and **tightly** bend the tab so it points the opposite way and under the phenolic strip.

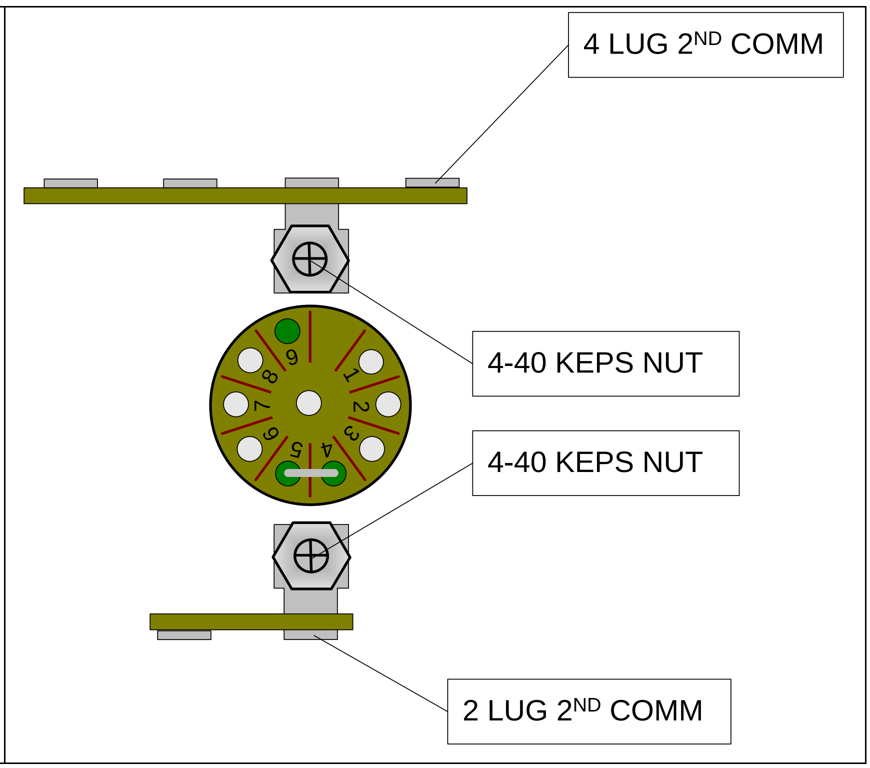
   Note: this process even better if the strip is held in a vise and a small hammer is used to bend/flatten the mounting tab. See pictorial example below

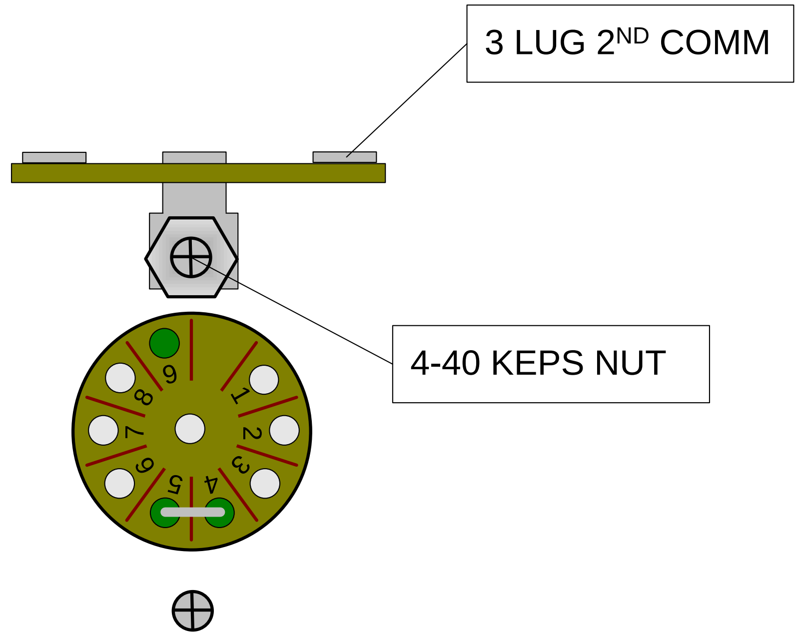
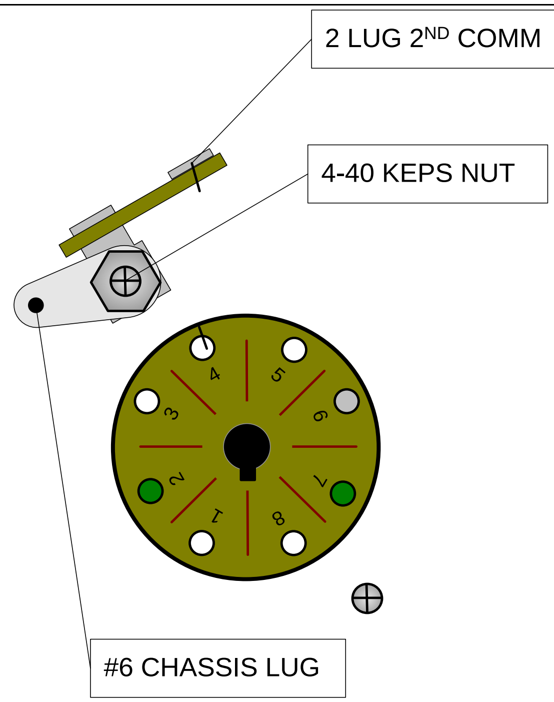


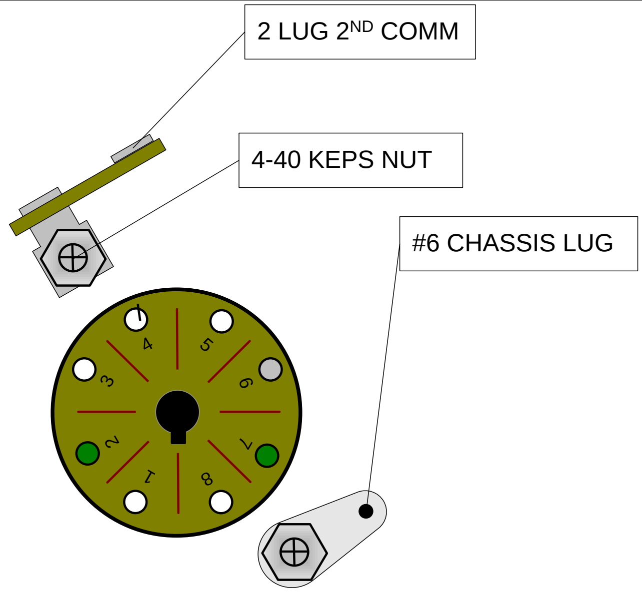
V1 requires a 4 lug 2nd common terminal strip installed on the inside (closest to eyelet board) screw.

You will need to cut a 5 lug terminal to suit. Use a pair of wire cutters to do this.

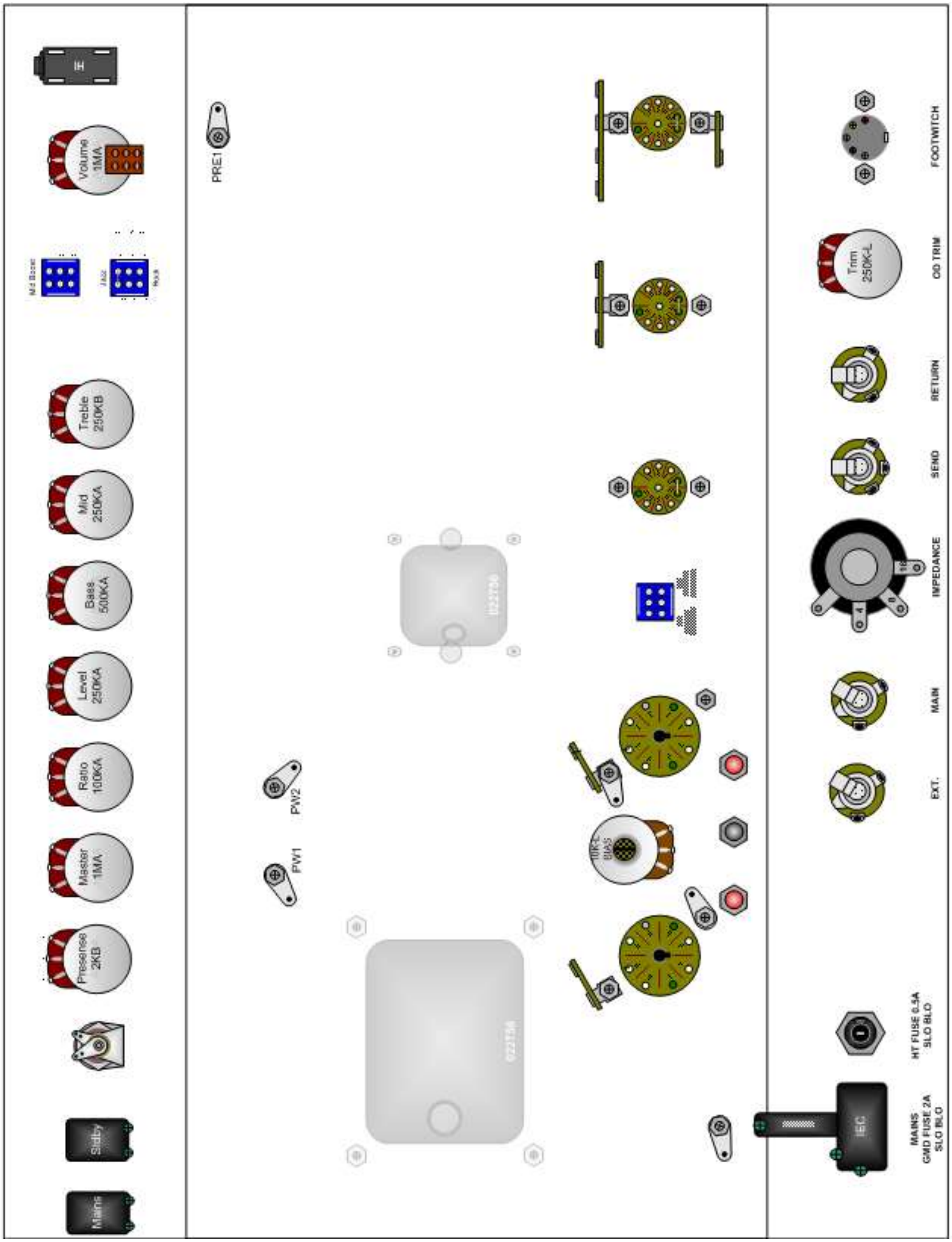
V1 requires a 2 lug 2nd common installed on the outside screw.



V2 requires a 2 lug 2nd common terminal strip installed on the inside (closest to eyelet board) screw.	
V4 requires a 2 lug 2nd common terminal strip plus a chassis lug installed on the inside (closest to eyelet board) screw.	

V5 requires a 2 lug 2nd common terminal strip installed on the inside (closest to eyelet board) screw. On the opposite side, a chassis lug is required.	

Your chassis should look like this.



3. Install Terminal Strip Components

Install the components between the terminal strips and a tube sockets starting with v1 and moving across to v5; Install components on the V2, V4, and V5 tube sockets. In cases where many parts and leads will need to fit into the eyelet or lug, you will want to resist filling the eyelet with solder at this point time.

V1 Components

Locate the following parts:

1-33K Resistor

2-22M Metal Film Precision Resistor

1-220K Resistor

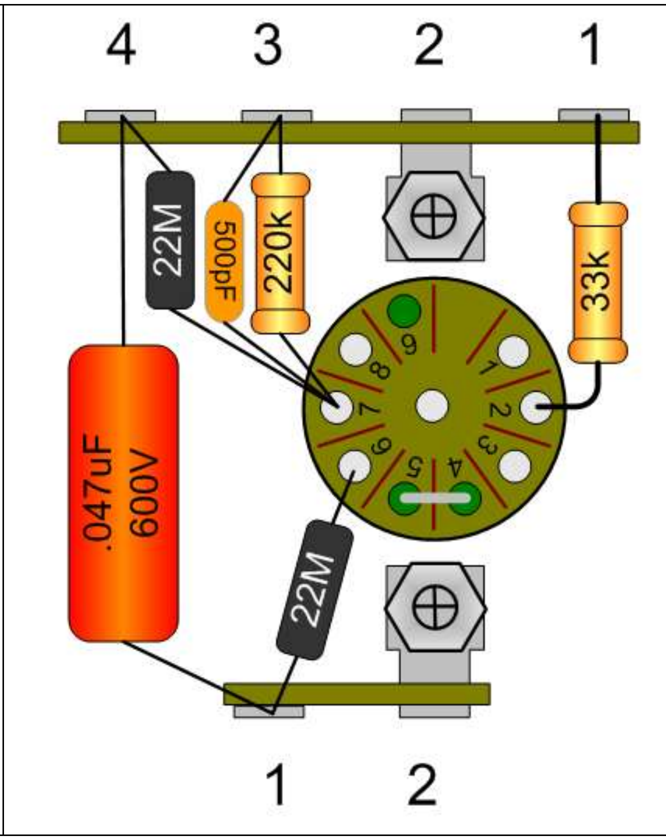
1-500pf Ceramic Capacitor

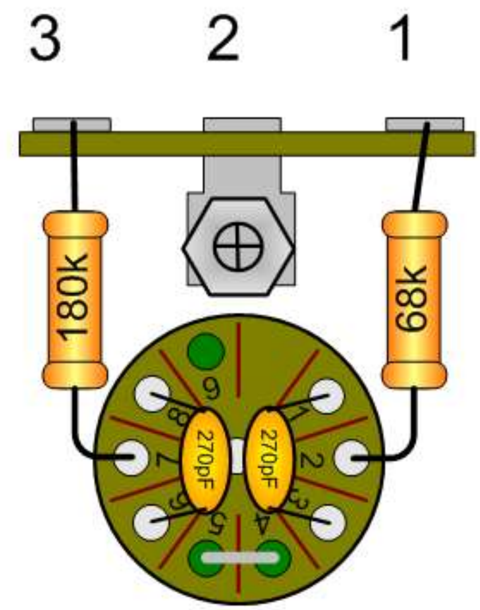
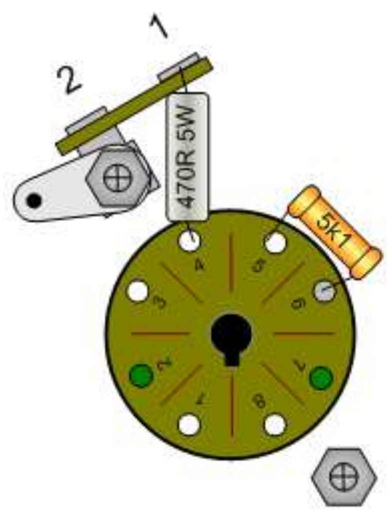
1-.047uf OD Capacitor

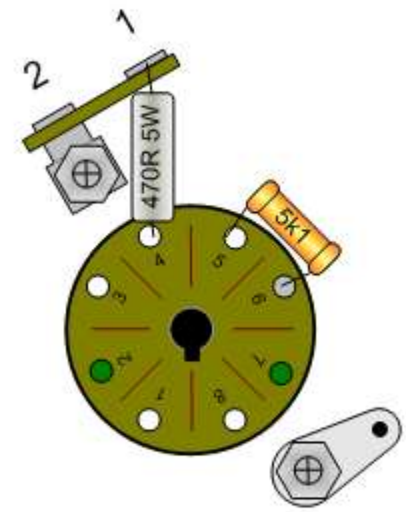
On the first lug (1) , form and install the 33K to pin 2 Solder at the lug and pin 2.

On the third lug (3), form and install the 220K and 500pf to pin 7. Form and install one 22M to lug 4 and to pin 7. Solder all three at pin 7.

Form and install the .047uf to the fourth lug (4) and lug 1 on the adjacent terminal strip. Form and install another 22M from lug 1 to pin 6. Solder lug 4, lug 1



V2 Components Locate the following parts: 1-180K Resistor 1-68K Resistor 2-270pf Ceramic Capacitor On the first lug (1) , form and install the 68K to pin 2 Solder at the lug and pin 2. On the third lug (3), form and install the 180K to pin 7. . Solder at the lug and pin 7. Form 2 - 270pf caps to fit between pins 6-8 and pins 1-3. Solder the caps to the pins.	
V4 Components Locate the following parts: 1-5K1 Resistor 1-470R Resistor On the first lug (1) , form and install the 470R to pin 4 Solder at the lug and pin 4. Form a 5K1 to fit between pins 5-6. Solder the resistor to the pins.	

V5 Components Locate the following parts: 1-5K1 Resistor 1-470R Resistor On the first lug (1) , form and install the 470R to pin 4 Solder at the lug and pin 4. Form a 5K1 to fit between pins 5-6. Solder the resistor to the pins.	

4 Install Components on the Send Return Jacks and Bias Points

In cases where many parts and leads will need to fit into one eyelet or lug, you will want to resist filling the eyelet with solder at this point time.

Send Return Components

Locate the following parts:

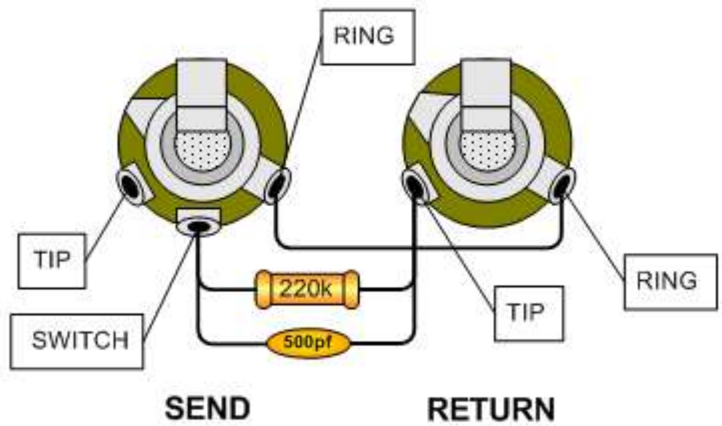
1-220K Resistor

2-500pf capacitor

Connect a jumper wire from the Send Ring lug to the Return Ring lug. Solder in place

Form and connect a 220K resistor from the Send Switch lug to the Return Tip lug.

Form and connect a 500pf capacitor from the Send Switch lug to the Return Tip lug. Solder in place



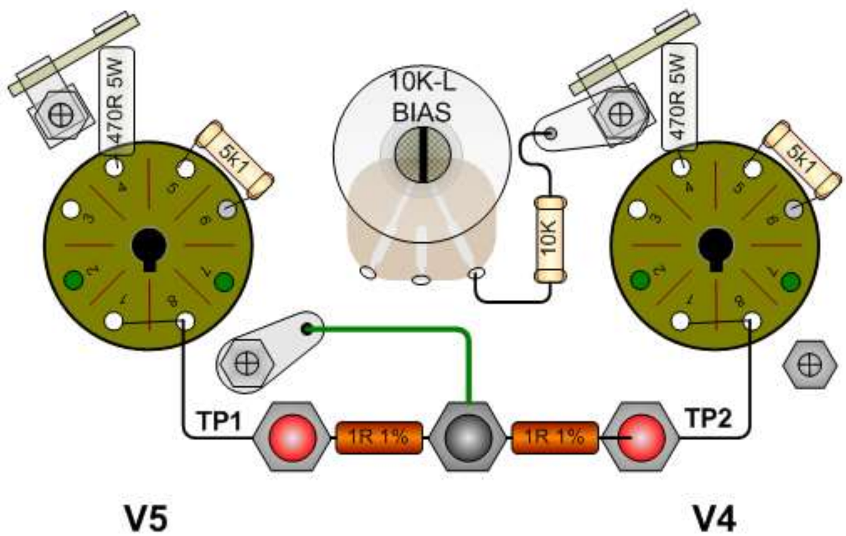
Test Point Wiring

Locate the following parts:

1-1R, 1% Resistor; 1-10K Resistor. *Confirm they measure 1 ohm.*

Feed the 1R resistors through the terminals of the Test Point jacks.

Connect a GREEN jumper wire from the BLACK (middle) test jack terminal to the ground lug attached to socket 5. Solder in place.



Connect a BLACK jumper wire from each RED (outside) Test Point jack terminal to pins 8 and 1 of socket 4 & 5. Solder in place

Connect a 10K 1W resistor from the ground lug attached to socket 4, to the right-most terminal of the 10K BIAS-TRIM POT.

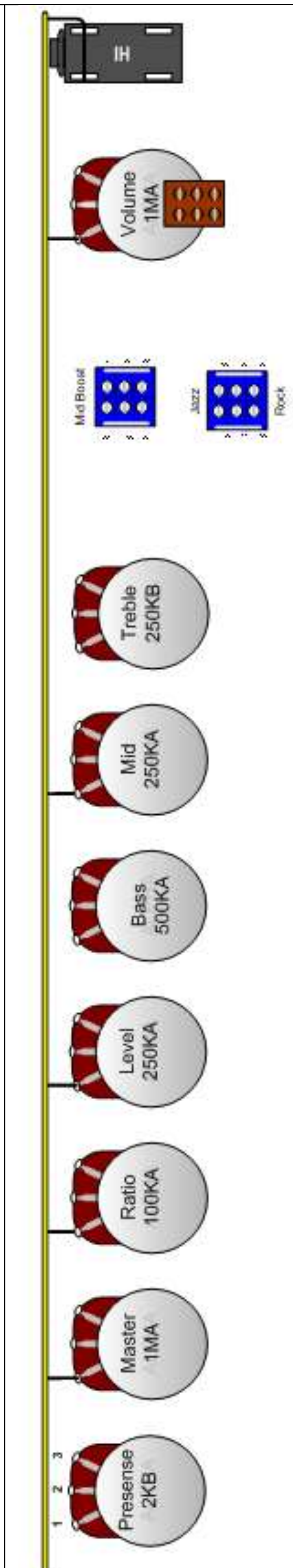
5 Install the ground bus

Locate the Copper Rod Bus Bar and trim it to length between the Presence control to the Input jack.

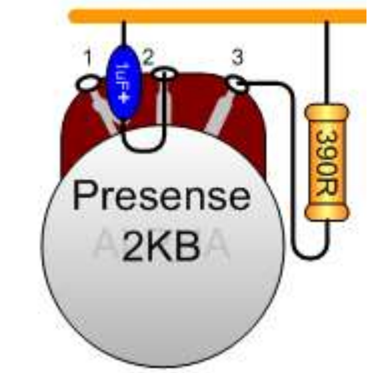
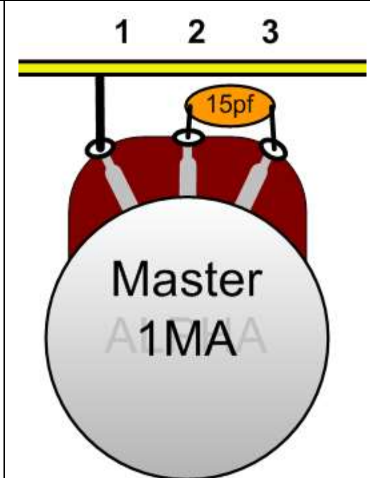
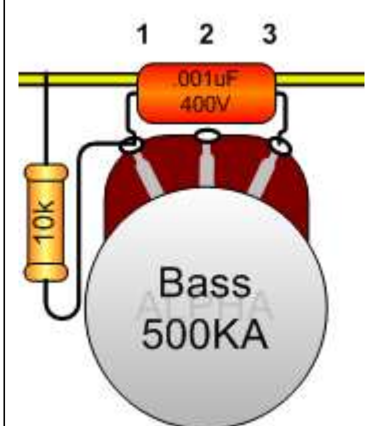
Note: Make sure the bus, when installed bar does not extend beyond the chassis or touch the chassis.

Note: Ensure the bus bar is very clean before soldering to ensure excellent contact and connection. Use fine steel wool or fine sandpaper to clean it well. This is very important.

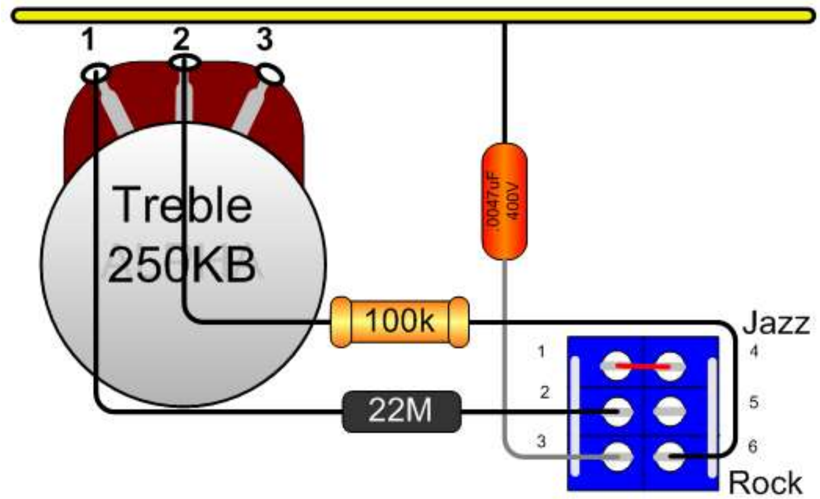
- Cut 6 - 2" long pieces of solid, 22 gauge, bare wire.
- Solder a 2" piece to each number 1 lug of the Master, Ratio, Level, Mid and Volume controls and the Input jack lugs closest to the chassis and volume control
- Align the bus bar ¼" from the top of the Master control and wrap the bare wire from lug 1, 360 degrees around the bus bar. Solder it in place.
- Align the bus bar ¼" from the top and parallel to all the chassis edge. Wrap the wire from lug 1 of the Volume control 360 degrees around the bus bar. Solder it in place.
- Repeat for the Ratio, Level, Mid controls.
- When all are soldered in place, the bus bar should be very solidly held in place.
- Connect a wire from the input jack two front terminals up to and around the bus bar as done in the previous steps.
- Complete the assembly by connecting a GREEN lead the bus bar close to the VOLUME control and connected to the PRE Ground lug.



6 Connect Components to the ground bus

<table>
<tr><td>Locate the:
1- 390R resistor
1 – 1uf tantalum capacitor
Inspect the 1uf tantalum capacitor and locate the POSITIVE lead. Be sure to install it onto the control potentiometer according to the layout diagram. and picture beside. +'ve side goes away from the GROUND bus.
Form and solder the 1uF tantalum capacitor and solder between Presence Control lug 2 to Ground bus.
Form and connect the 390R resistor between Presence Control lug 3 to Ground bus
Ensure the control end leads do not touch ground. Insulate as required.</td><td></td></tr>
<tr><td>Locate the 15pf capacitor
Form and connect a 15pf capacitor between Master volume control lug 2 and 3</td><td></td></tr>
<tr><td>Locate the
1 - .001uf capacitor
1 - 10K resistor
Form and connect a .001uf capacitor between Bass control lug 1 and 3 Solder lug 3.
Form and connect a 10K resistor between Bass control lug 1 and the Bus bar. Solder to lug 1 and the bus bar. 3</td><td></td></tr>
</table>

NOTE: You may find it easier to remove the DPDT switch and put some of the components in place and reinstall the switch.



Locate the

1 - .0047uf / 4700pf capacitor (could be a 4700pf ceramic disc or .0047uf orange drop)

1 - 100K resistor

1 – 22M resistor

1/16" dia. heat-shrink tubing or PVC cut-offs from 22ga wire

Familiarize yourself with the DPDT JAZZ/ROCK switch terminals numbered 1-6 in the diagram.

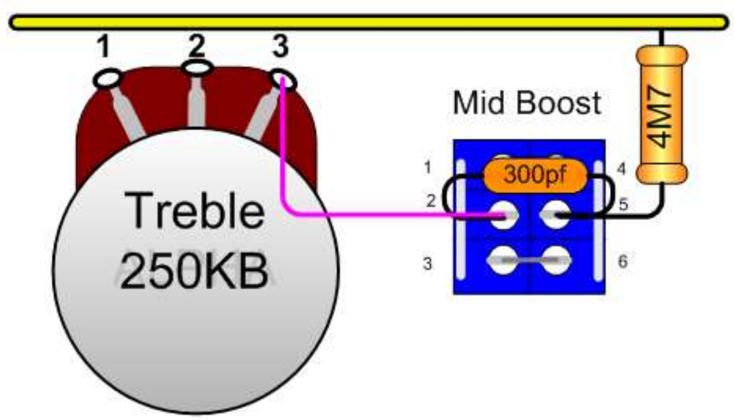
Form a .0047uf capacitor between terminal 3 of the Jazz/Rock DPDT switch and the Bus bar. Insulate the leads with heat-shrink or PVC tubing and put in place. Wrap the capacitor lead around the bar. Solder to terminal 3 and the bus bar.

Form a 22M resistor between Treble control lug 1 and Jazz/Rock DPDT switch terminal 2. Insulate the leads with heat-shrink or PVC tubing and put in place. Solder in place.

Form a 100K resistor between Treble control lug 2 and Jazz/Rock DPDT switch terminal 6. Insulate the leads with heat-shrink or PVC tubing and put in place. Solder in place.

Solder a jumper between pins 1 and 4 on the DPDT switch.

NOTE: You may find it easier to remove the DPDT switch and put some of the components in place and reinstall the switch. You may also prefer to add leads at the same time and just wrap them out of the way until they were needed.

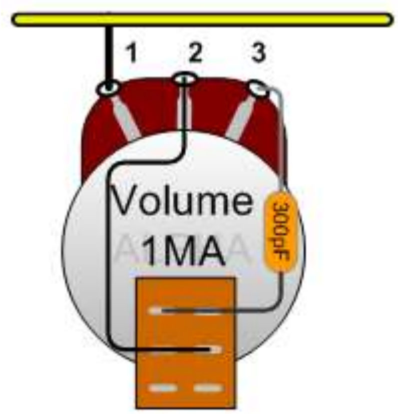
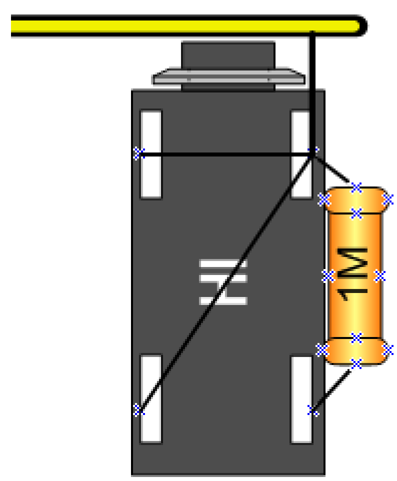


Locate the

1 - 300pf capacitor

1 – 4M7 resistor

Familiarize yourself with the DPDT MID-BOOST switch terminals numbered 1-6 in the diagram.

Form a 300pf capacitor between terminal 2 and terminal 5 of the Mid Boost DPDT switch. Do not solder in place yet. Form a 4M7 resistor between terminal 5 of the Mid Boost DPDT switch and the bus bar. Insulate the leads with heat-shrink or PVC tubing and put in place. Wrap the resistor lead around the bar. Solder to terminal 5 and the bus bar. Connect a jumper between terminal 3 and 6 of the Mid Boost DPDT switch. Solder both ends in place. Connect a jumper from lug 3 of the treble control to terminal 2 of the Mid Boost DPDT switch. Solder both ends in place.	
Locate the 1 - 300pf capacitor Familiarize yourself with the Volume Control Push-Pull DPDT switch. Form a 300pf capacitor between the first row of terminals of the DPDT switch and the Volume Control lug 3. Solder in place. Connect a jumper from lug 2 of the Volume control to the second row of terminals of the DPDT switch. Solder both ends in place.	
Locate the 1 - 1M resistor Familiarize yourself with the Cliff Input Jack.. Form a 1M resistor so one end fits between Jack terminals 3 and 2. The other end of the resistor goes into terminal 4. . Tack Solder in place. Form a solid wire from the 1M lug to the bus bar and through to the adjacent jack lug. Solder everything in place .	

7 Build the RELAY board

Locate the:

1 - RELAY PCB
1 - Linear Voltage Reg 1A
2 - Al. El. Cap. - 3300uf 10V
1 - Multilayer Cer. Cap Leaded 0.1uf
2 - Standard LEDS - RED
2 - Low Signal RELAY PCB Thruhole
2 - Carb. Film Res. - 510 Ohms
1 - Bridge Rectifiers Bridge Rect 1.5a,50v
2 - Rectifiers 1000V 1A Glass Passivated

General: On the PCB locate and then insert each component then bend the leads slightly, just enough to keep it in place while you turn it over and solder it in place. While keeping your soldering iron at a 45 degree angle to your work, let the tip of your iron contact both the lead of your component and PCB at the same time. Apply the solder from the opposite side from the tip. Heat the surfaces until solder flows freely to the tip side of the work. Be careful not to overheat the pad as this can damage the PCB by lifting the pad from the board.

When finished soldering, let the joint cool and then snip off the excess leads.

RELAY BOARD - BARE

First install the 2 – 510R resistors.

Next, install the 2 – IN4007 diodes paying attention to the correct orientation of the marked end. Diode Orientation: Pay particular attention to the orientation of the diodes when they are installed. 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, and circuit diagrams may be labeled 'a' or '+' for anode and 'k' or '-' for cathode (yes, it really is 'k', not 'c', for cathode!). 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!

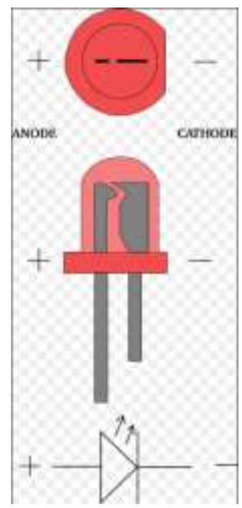
Install the 0.1uf power supply capacitor

Familiarize yourself with the Bridge Rectifier. There is a positive (+)orientation to this. Device and it is very important. Locate it correctly (long lead is positive) and insert it into the PCB. The Positive lead faces the 3300uF filter caps. Solder it in place.

Familiarize yourself with the LED. LEDs have one flat side (cathode) and one anode, the long lead, which is positive. The PCB pad for the anode is square and is printed onto the PCB.   These LEDs are optional but will help to test the amplifier RELAY circuitry so they are recommended to be installed.

Bend the leads to 90 degree at about ¼" from the LED base.

Install the cathode and anode leads into the correct holes by looking at the PCB printing. You will see a flat side to the circle labelled LED. Solder in place.



Familiarize yourself with the 2 Relays. They will go into the PCB one way. There is a NOTCH at the COIL end. Insert them into the board with the NOTCH/COIL end towards the 510R resistor and solder them in place.

Familiarize yourself with the 2 – 3000uf Power Supply Filter Capacitors. They have a positive (+) lead and must be installed correctly. The PCB is marked with the correct orientation. Insert them into the board and solder them in place.

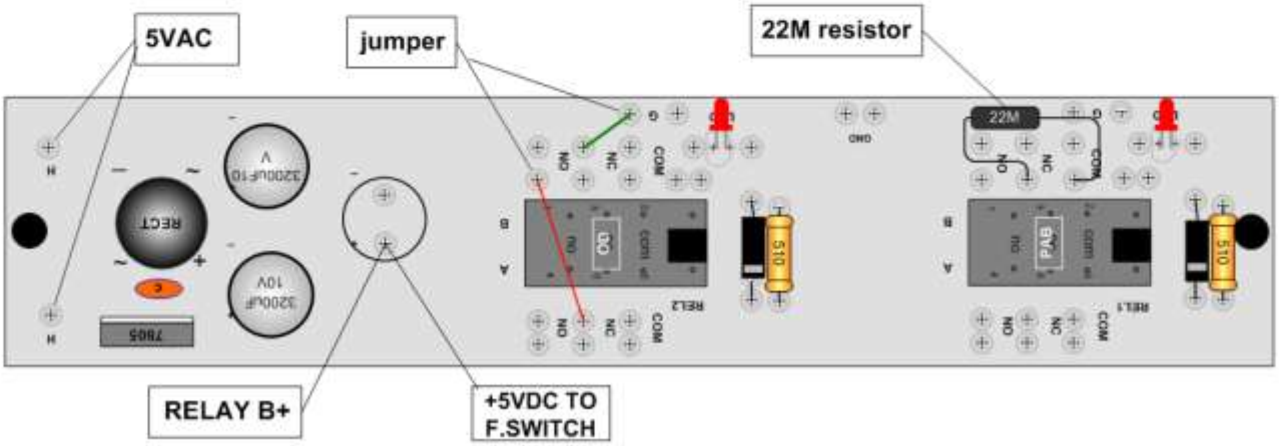
Finally, familiarize yourself with the LM7805, 5V Linear Voltage Reg 1A. It is a good idea to 'ground' your body to make sure static does not destroy the semiconductor.

Note that it has a metal tab on one side. This faces "inwards" towards the Bridge Rectifier. The PCB is marked with the correct orientation. Insert it into the board and solder it in place.

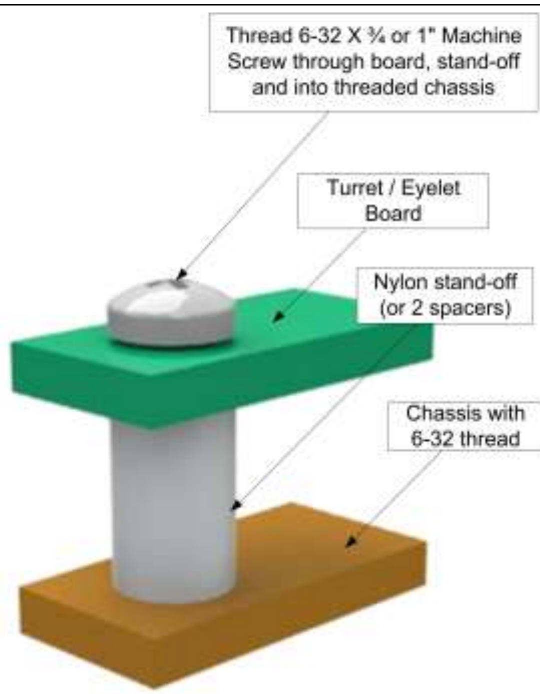
RELAY BOARD – POPULATED

There are some additional Overdrive components to add to the board.

Add two RED 24 Gauge solid wire jumpers and a 22M resistor.



Once completed, you can install the PCB in the chassis. Use two ½" #6 stand-offs and two #6 screws to hold it in place.



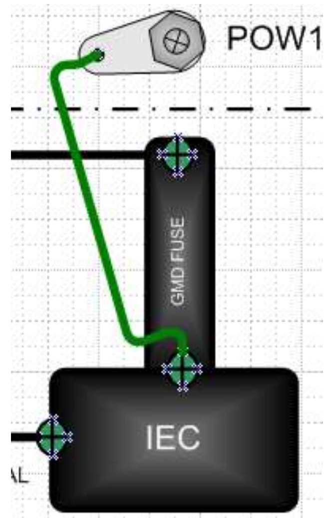
The OSD chassis is tapped to receive 6-32 machine screws.

To mount the board, align the board mounting hole, 1/2" 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.

NOTE: In the next step, once the power transformer is installed, you can connect the 2 - 5VAC leads to the RELAY board and test it.

8 Install the Power Transformer and Output Transformer

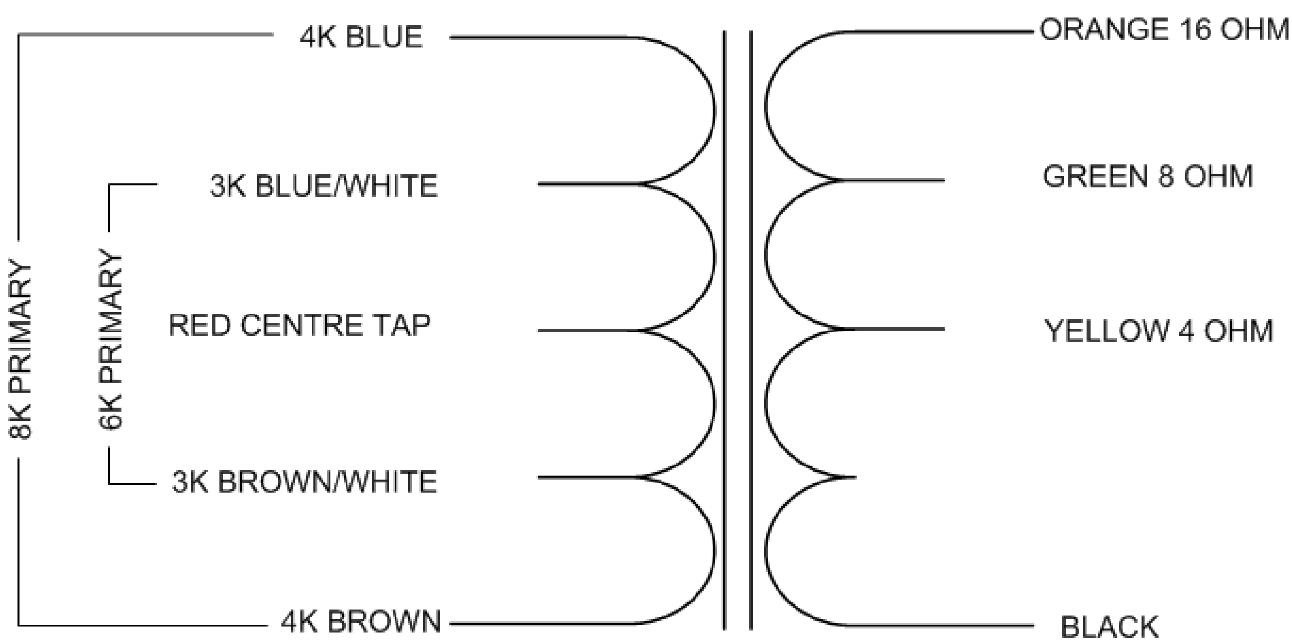


Align all the POWER TRANSFORMER AC mains leads (primary and secondary leads) so they face towards the outside of the chassis. Twist the bundle together and feed them all through the 7/8" grommet installed in the chassis. Align the Transformer bell mounting holes and bolt the transformer in place with the supplied 4 X 8-32 bolts and Keps nuts.

The OUTPUT TRANSFORMER lies down along it's 'long axis'. Braid the five primary leads together (Brown – RED – BLUE – Brown/White – BLUE/White) and also braid the secondary winding leads (YELLOW (4 ohm), GREEN (8), Orange (16) BLACK (Common).

Align the braided 5 primary leads so they are pointing <u>towards the Power transformer</u>. Feed them through the ½" grommet installed in the chassis. Do the same with the braided 4 Secondary leads going through the other ½" grommet. Bolt the transformer in place with the supplied 8-32 bolts & Keps nuts. The secondary leads should be approximately in-line with the impedance switch in the rear of the chassis.

Wire the Output Transformer



Trinity Amps OSD OUTPUT TRANSFORMER HTS-8815-2

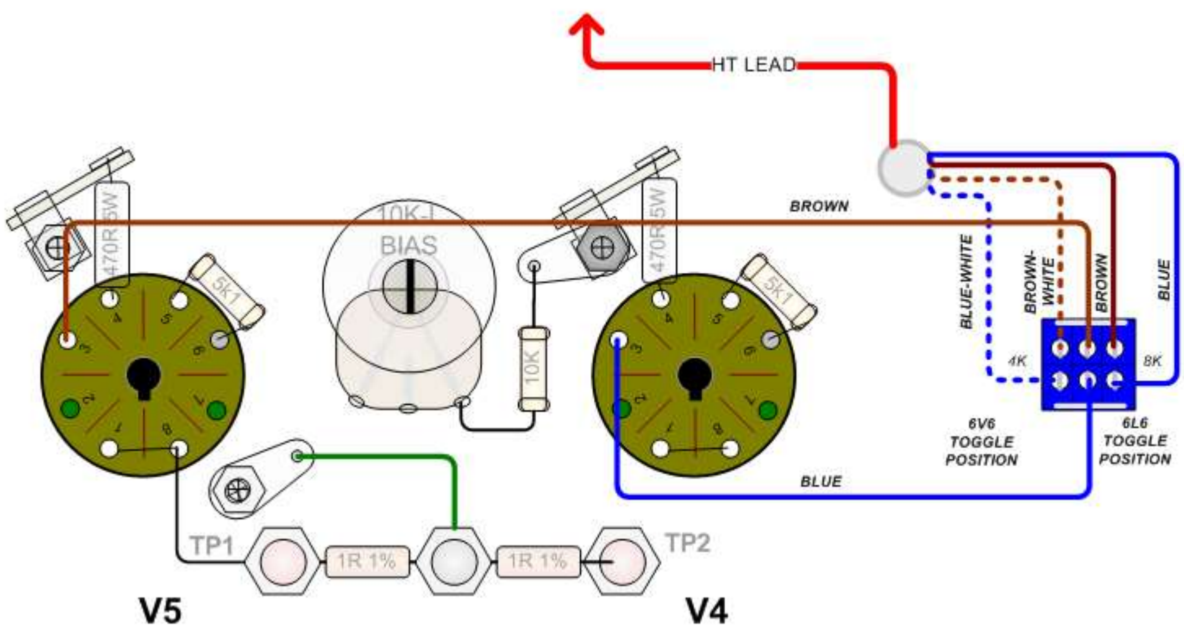
Refer to the Output Transformer schematic above and the below. The OSD is set up to switch impedances to match 6V6 and 6L6 power tubes and as such, has a dual primary consisting of together (Brown – RED – BLUE – Brown/White – BLUE/White leads. 6V6 - 8K primaries are Brown and BLUE while 6L - 6K primaries are Brown-White and BLUE-White.

Follow the diagram closely.

Put ½"of 1/8"shrink tubing over each lead before you solder When the connections are complete, shrink the tubing around each DPDT terminal. This is done to prevent any arcing of HT voltages!

1. Route, Connect and Solder the Brown primary lead from the transformer to right side of the Primary Impedance Toggle DPDT switch, top terminal.
2. Route, Connect and Solder the Brown/White primary lead from the transformer to left side of the Primary Impedance Toggle DPDT switch, left side, top terminal.
3. Route, Connect and Solder the BLUE primary lead from the transformer to right side of the Primary Impedance Toggle DPDT switch, bottom terminal.
4. Route, Connect and Solder the BLUE/White primary lead from the transformer to left side of the Primary Impedance Toggle DPDT switch, left side, bottom terminal.
5. Connect a BLUE transformer cut-off lead from Pin 3 of V4 socket to the bottom, centre terminal of the DPDT.
6. Connect a BROWN transformer cut-off lead from Pin 3 of V5 socket to the top, centre terminal of the DPDT. Solder in place.

NOTE: Leave enough length of leads from the centre tap of the DPDT switch to reverse the leads from one socket to the other if necessary to eliminate amplifier squealing.

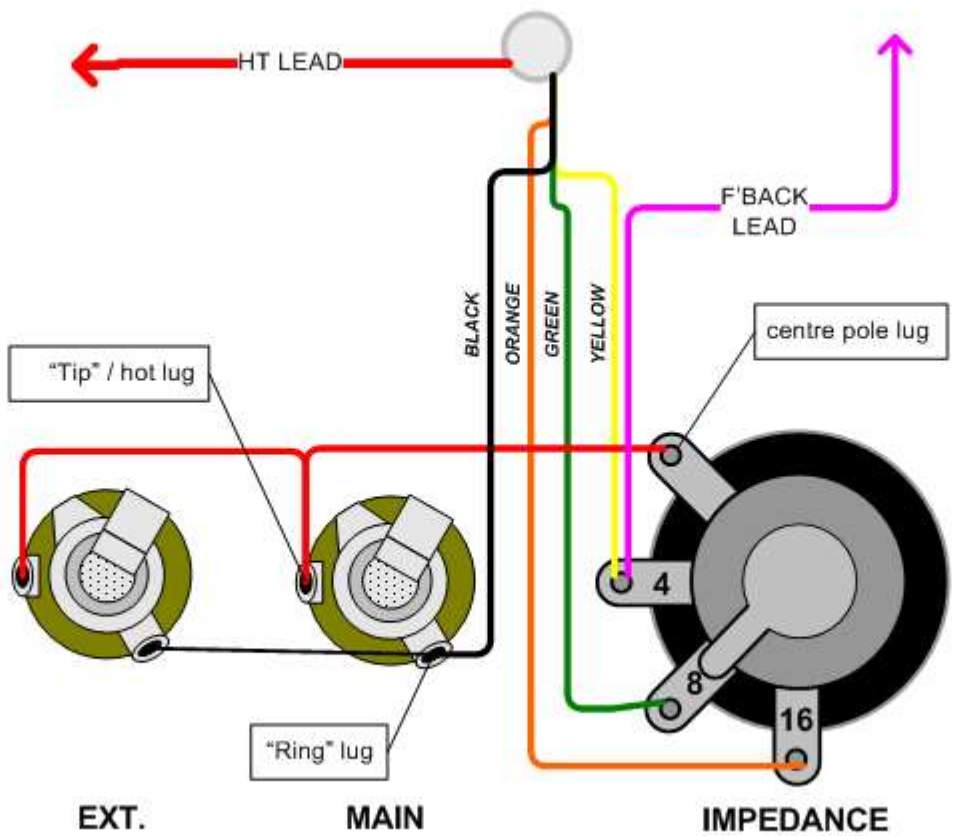


Wire the Impedance Selector and Output Jacks

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 diagrams below for the connections.

In sequence Route, Connect and Solder the braided Orange, GREEN and YELLOW leads from the Output transformer to the Impedance selector.

NOTE: Add a 6" long piece of wire to the 4 ohm lug that is reserved for NEGATIVE FEEDBACK (NFB) loop connection.



Route, Connect and Solder a RED wire from the center pole lug of the IMPEDANCE switch to the TIP/HOT 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/ COMMON lug of the pair of output jacks. Strip enough wire to bridge between both jacks.

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

9 Wiring the Power Transformer Primary Leads

Now is the time to wire up much of the mains for the power transformer.

Note: Managing Power Transformer extra leads.

When you go to wire up your amp transformer you are going to have some leftover leads which need to be insulated and tucked out of the way – i.e. Tied Off:

First, separate all of the primary leads from the secondary leads and put them into their respective bundles. To determine what's what, reference the wiring diagram that came with your kit. The primary leads will all be notated on the left side of the wiring diagram, and the secondary leads will be notated on the right. If you have already wired up all of the secondary leads, they would be permanently trimmed to length and out of the way.

Once you've determined the length of wire you need for all your primaries, trim off the excess. Using a set of wire cutters, trim the excess wire not only from the primary leads you'll be using, but from ALL primary leads.

Why not just trim the full excess of the unused leads all the way down to the transformer itself? There is plenty of room to store the excess leads in the chassis without messing anything up, and what if you move to a place where the power isn't 120V? It's best to leave yourself the option to rewire the primary leads for that country's power.

When the leads are trimmed to length, insulate the exposed ends of the unused wires. Insulate with shrink tubing, but this can also be done by wrapping electrical tape around the wires and over the top exposed side of them. Prevent those conductors from touching each other or anything else inside the chassis.

Finally, twist all of the wires together and tuck them down into the chassis next to the transformer. This little loom of wires is secure and will easily stay put on its own forever; you won't have to worry about them getting loose and messing things up or rattling around and making noise

Start with the IEC socket. Run a GREEN wire from the bolt/lug on the chassis immediately beside the socket to the GROUND LUG on the IEC socket. Solder both ends on place. Make sure to <u>tighten the ground bolt / lug very tightly</u>.

120V Mains

Tightly twist the 2 AC NEUTRAL mains leads (BLACK and WHITE) together. Route them along the inside chassis corners and solder them to the NEUTRAL lug of the IEC socket.

Run an 18 gauge, stranded BLACK wire from the internally fused, 'LINE' or 'Hot' side of the IEC connector to one of the POWER SWITCH lugs. Solder both ends in place.

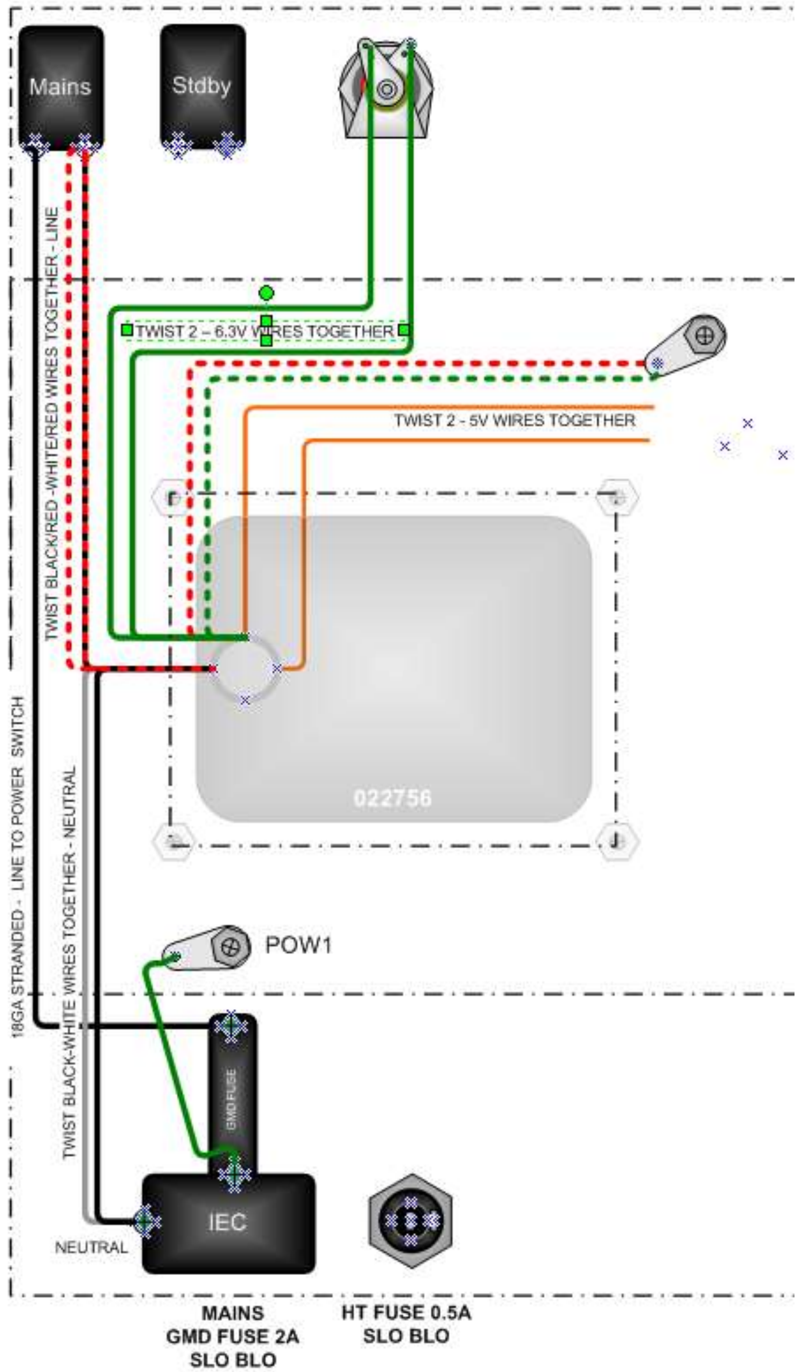
Note - make sure the switch was installed with the desired 'ON' position when the connection is 'made'. i.e. with lugs facing you.

Tightly twist the BLACK/RED and WHITE/RED wires together and connect one end to the other lug of the POWER SWITCH. Solder in place.

Tightly twist the two GREEN wires together and connect one to each lug of the INDICATOR HOLDER.. Leaving one of the lug holes open, solder them both in place.

Neatly run the GREEN/YELLOW and RED/YELLOW transformer centre taps lead to the closest grund lug. Leaving one of the lug holes open for the eyelet board ground wire, solder them both in place.

The 5V YELLOW, 325V HV and RED/BLUE 45V BIAS tap are now all that are left unconnected.



240V Mains

Route the AC NEUTRAL mains leads (BLACK) along the inside chassis corners and solder them to the NEUTRAL lug of the IEC socket.

Run an 18 gauge, stranded BLACK wire from the internally fused, 'LINE' or 'Hot' side of the IEC connector to one of the POWER SWITCH lugs. Solder both ends in place.

Note - make sure the switch was installed with the desired 'ON' position when the connection is 'made'. i.e. with lugs facing you.

Solder the WHITE/RED to the other lug of the POWER SWITCH.

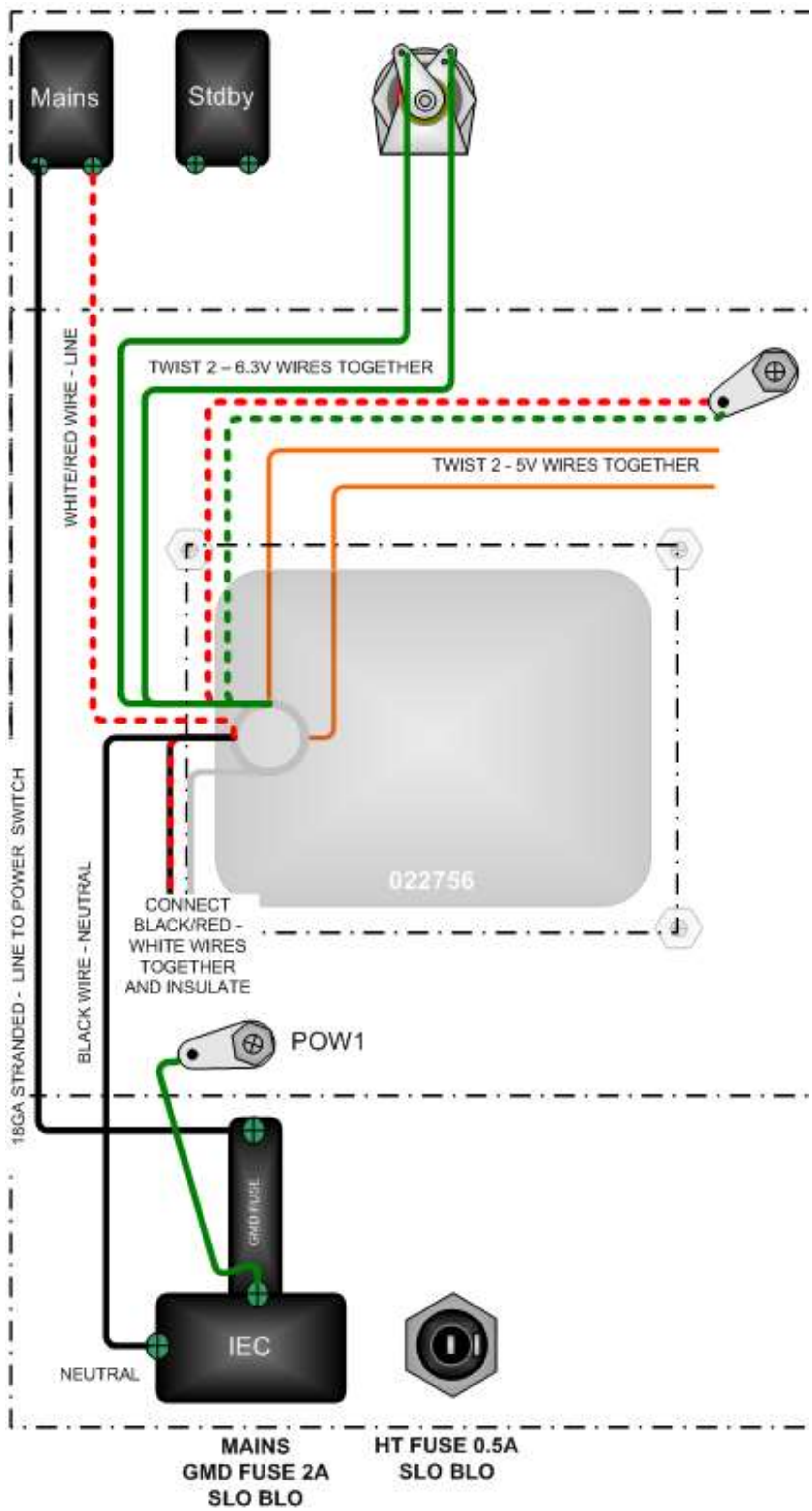
Twist together the WHITE and BLACK/RED leads together and solder in place. Put a piece of heat-shrink tubing over the connection, heat with a hair dryer to shrink and insulate.

Run an 18 gauge, stranded BLACK wire from the internally fused, 'LINE' or 'Hot' side of the IEC connector to one of the POWER SWITCH lugs. Solder both ends in place.

Tightly twist the two GREEN wires together and connect one to each lug of the INDICATOR HOLDER.. Leaving one of the lug holes open, solder them both in place.

Neatly run the GREEN/YELLOW and RED/YELLOW transformer centre taps lead to the closest grund lug. Leaving one of the lug holes open for the eyelet board ground wire, solder them both in place.

The 5V YELLOW, 325V HV and RED/BLUE 45V BIAS tap are now all that are left unconnected



Note: The 100V Black/White and White / Black are not use in 120 or 240V implementations. These are reserved for 100, 200, 220 & 230V mains. So tie them off safely and put some heat shrink tubing over the ends.

Wiring of Mains circuits: 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.	

Test the Power Transformer

BE EXTREMELY CAREFUL WHEN MEASURING HIGH VOLTAGES. THEY CAN KILL YOU.

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**, transformer **HV LEADS NOT** soldered to the board, get out an ohmmeter. Remove the pilot lamp from the 6.3 V assembly. Use an ohmmeter to verify that the connection points for the Power Transformer (PT) secondaries are not shorted to ground. With no tubes and no pilot lamp, each half of 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, ensure the YELLOW and RED leads are taped and insulated.

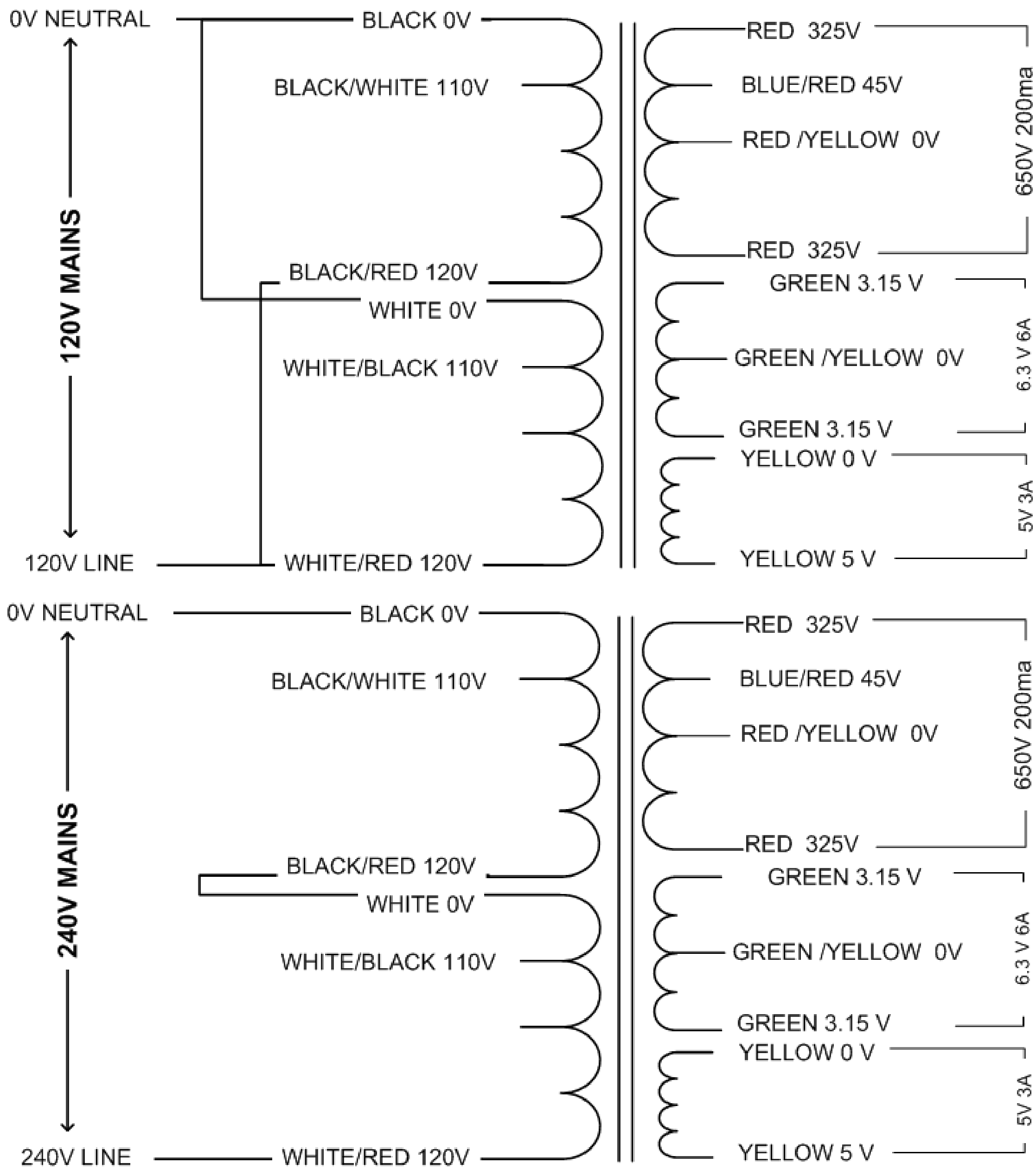
Install your pilot lamp and a GMD 2A fuse in the IEC socket.. Switch to power on for 1 second just to see the pilot come on nice and bright. This checks that the 6.3VAC supply line is not shorted and is properly connected to the lamp. If the lamp did not come on, check to see if the fuse blew. If not, try another lamp and do the 1-second power thing again. If the fuse blows, there is a short on the PT or mains. If the fuse survives, then it's likely that the 6.3VAC is not properly connected to the pilot lamp. Use your AC voltmeter to check for 6.3VAC (actually more like 7VAC with no tubes installed) at the lamp and all the tube sockets.

In the following steps, be extremely careful.

Assuming you had a bright pilot light. Turn the power off and carefully remove the tape from the 5V YELLOW leads, and making sure they do not touch each other, turn the power on and measure the voltage with an AC voltmeter. You should measure 5VAC or more between the 2 leads. If so, turn the power off and tape the YELLOW leads up.

Now remove the tape from the 650VAC RED HV leads, and making sure they do not touch each other, turn the power back on and measure the voltage with an AC voltmeter. You should get a value higher (670VAC) than the rated output voltage of 650 VAC between the 2 leads because there is NO LOAD on them.

If you get a value less than the rating, shut down the amp and check the fuse. If you get a proper value from the HV secondary, record the Mains and AC secondary voltages to ensure they are within spec of the transformer schematics and specs. The voltages below are under LOAD.



Trinity Amps OSD Power Transformer PT650 EX HTS-8816EX

Test the Overdrive RELAY Board

If the voltage measurements were correct in the previous step, then turn the power off and remove the tape from the 5VAC YELLOW leads. Twist the leads tightly, using some tie-wraps or heat shrink tubing to keep them twisted.

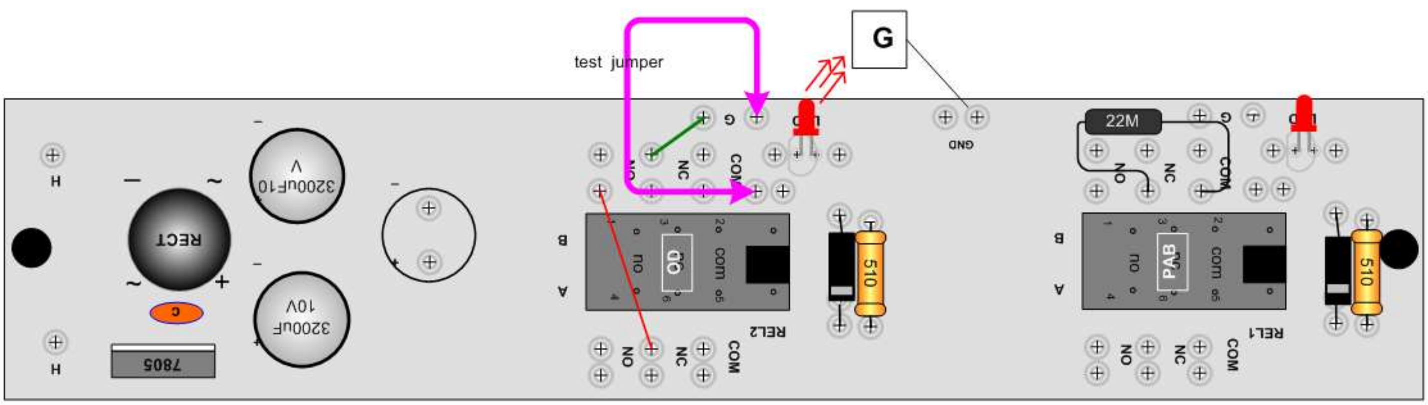
Run the wire alongside where the eyelet board will be installed and very carefully solder them into place on the 2 RELAY board locations marked "H" . These were noted in the diagram in the "Building the RELAY Board" section, 7. Use the supplied Aluminum Tape to shield and hold the yellow leads onto the chassis.

Connect a GREEN wire from the G (ground) terminal on the PAB1 end of the RELAY board to the PRE1 ground lug.

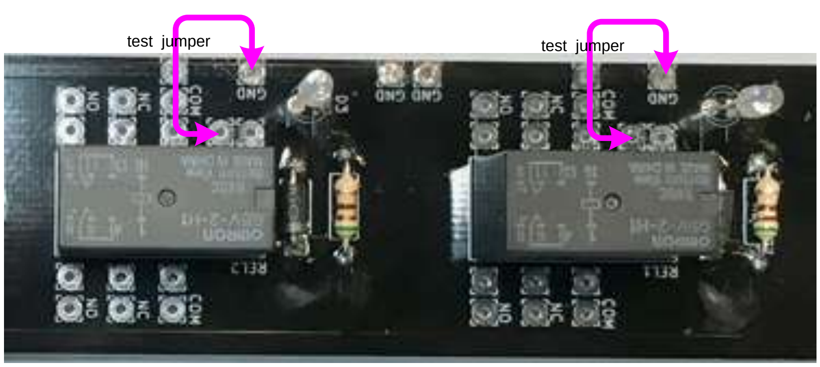
To test the RELAY board, you need to confirm that the PCB power supply is developing 5VDC. Turn the power on and measure the DC voltage between the PCB pad identified as Relay B+ (this is not amp B+!)on the board and the pad labelled G (ground) .

Once you know you have measured 5VDC between the RELAY board B+ and G (ground) , you need to apply it to each RELAY coil by means of small jumper or test leads. Run the jumper from the LED Cathode to the ground bus to test. When applied, the LED should illuminate as you energize each coil.

TIP: If you build the Footswitch now, you can also test the RELAY board using the footswitch.



Testing OD REL2 on the RELAY Board



10 Build the Eyelet Board. Install it in the Chassis

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

Some builders like to install jumpers under the board and some on top of the boards. Installing them on top facilitates servicing and testing while installing them on the bottom looks neater but servicing is harder to do.

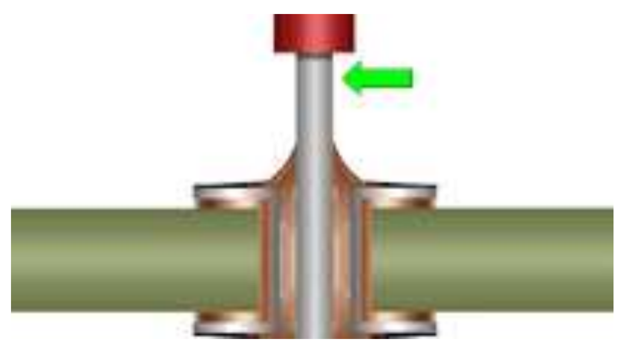
We tend to install jumpers underneath using the following process but you can do it however you prefer.

- ***Fully solder jumpers in place (fill in the eyelet with solder), when all the remaining parts are installed. Tack solder leads in place if necessary to hold them in position***.
- ***Read ahead in the manual and study the layout to determine where multiple connections are made.***

Soldering Leads onto Eyelet Boards

Several sections require the termination of jumpers or leads directly to the eyelet board, rather than to terminal posts or through a connector. Terminations are typically through-hole, but lap terminations are also possible.

1. The jumper should enter the eyelet, perpendicular to the board surface, with proper insulation clearance and lead protrusion. The wire end may be clinched to aid assembly.
2. The termination should exhibit proper insulation clearance and lead protrusion. The termination is fully wetted, with complete fillet formation on both sides of the board.
3. The insulation gap (referenced from the first point of contact of the conductor to the terminal) should be less than two (2) wire diameters and not be imbedded in the solder joint. The wire contour should be visible at the end of the insulation.
4. Discrete wires are treated as components - with the same bending, soldering and stress relief requirements seen for other discrete axial/radial devices.



Procedure to install jumpers

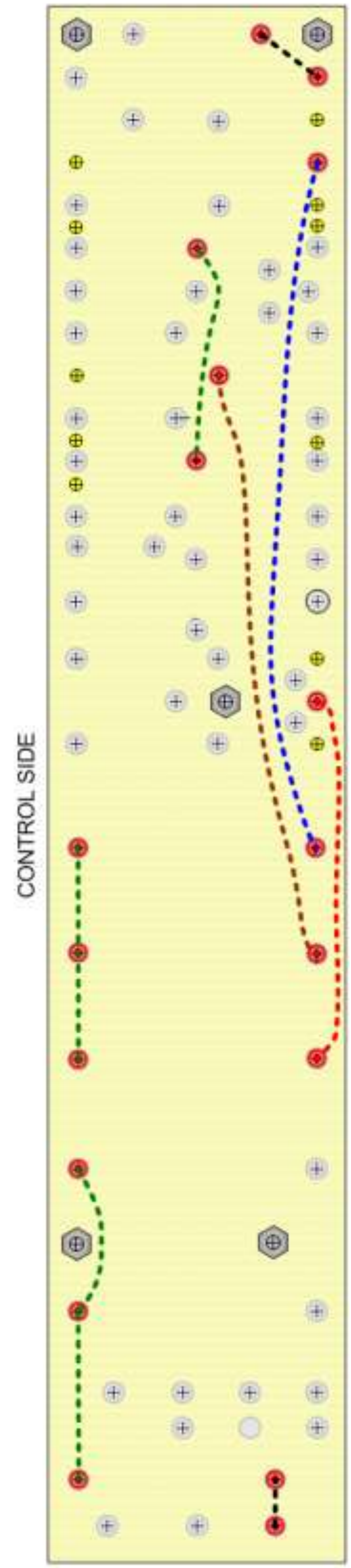
1. Measure and cut to length a piece of 22 gauge solid wire that will reach each between eyelet plus ½" at each end.
2. Bare ½" solid wire at each end.
3. Push the bare wire through the eyelet and bend it over on the other side so that it "hooks' the eyelet. This is done so any unsoldering will not let the jumper disconnect from the eyelet.
4. Solder it in place or tack solder it in place until the remaining parts are installed then fully solder it and fill in the eyelet with solder. See "Soldering Leads onto Eyelet Boards"

   Read ahead in the manual and study the layout to determine where multiple connections are made

5. Use some hot glue to hold the jumper to the eyelet board again so any unsoldering will not let the jumper disconnect from the eyelet.

Using the above procedure, install 10 jumper wires on the underside of the board between the dark dots on the picture. The colour of the wire does not matter.

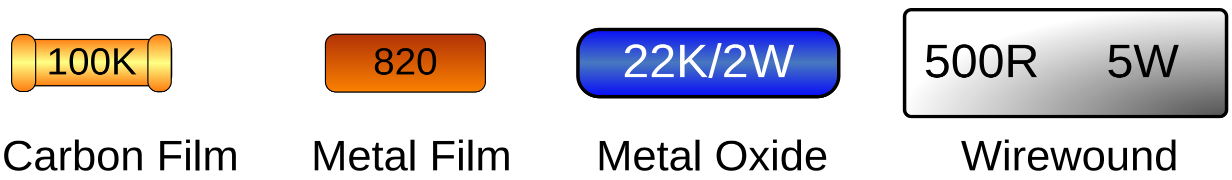
Make sure the jumper does not cover up another eyelet, hole or mounting hole.



Eyelet Board General Assembly Notes

Locate and carefully identify the board components and their values. **<u>Measure the resistor values to confirm they are correct</u>**. **<u>If possible, check the capacitor values as well</u>**.

There are Carbon Film, Metal Film (precision) Metal Oxide, Wirewound (power), See the section on how to read Resistor and wire wound (power) resistors in the kit. The carbon film have coloured bands, the others have values printed on them. Generally, they look like the layout diagram.



Capacitor codes. 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.

Non-Polarized Capacitor Orientation: Generally, it does not matter which way these parts are installed. However, 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.

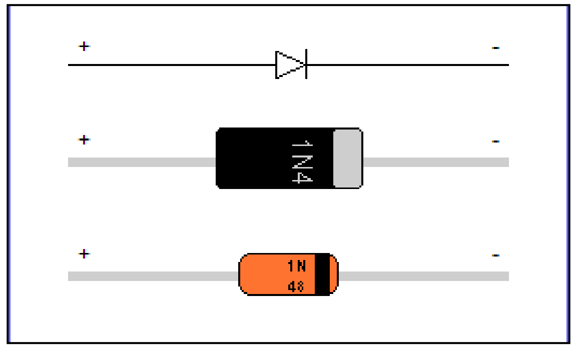
Some manufacturers such as SOZO have this polarity marked. Others do not. In this case, if you have access to an oscilloscope, you can quickly determine which lead is the outer foil.

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 layout.

NOTE: For multiple component leads that must fit into one eyelet, insert them first and solder once when they are all in place. If you can, solder each eyelet once all component leads that connect to it are in place.

Diode Orientation: Pay particular attention to the orientation diodes when they are installed. 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, and circuit diagrams may be labeled 'a' or '+' for anode and 'k' or '-' for cathode (yes, it really is 'k', not 'c', for cathode!). 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! The diagram below shows the orientation of the 1N4007 diode.



Testing Diodes: If you ever need to test a diode, you can test with an ohm meter, using a setting that shows a picture of a diode on it. Put it to that setting and just put the RED (+ve) lead on one leg of the diode and the BLACK lead on the other leg. If you get a resistance reading the cathode is on the side where the BLACK lead is. If you get no reading the cathode is where the RED lead is. If there is a dead short you will get a buzz tone out of the meter. Same as if you touched the leads together.

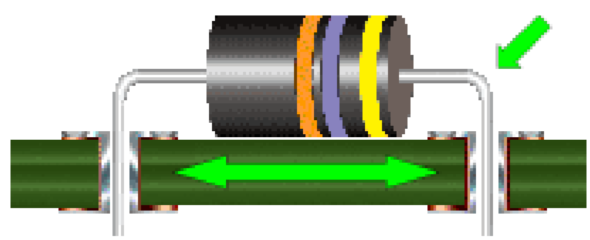
General Eyelet Board Build Requirements

Components should be installed per documentation, parallel to, and in contact with, the board surface. Component and any board markings should remain clear and legible. Component leads exhibit proper bend radii and stress relief. Solder fillets are smooth and shiny with concave profiles.

Horizontal mounting axial components

Parts should be parallel to, and in full contact with the mounting surface and approximately centered between the termination holes. Leads exhibit proper stress relief bends and spacing.

Populated eyelets should exhibit a vertical solder fill of 100%, with a fully formed fillet on the solder side, and evidence of 100% wetting on the component side lead, barrel and pad.



Preparation of conductors The quality of solder terminations can be correlated to the preparation of the conductors prior to soldering.

Solderability can be significantly improved by the pre-tinning and thorough cleaning of all surfaces designated to be part of the completed solder termination. Pre-forming of component leads and other conductors reduces stresses in the solder joint and component body

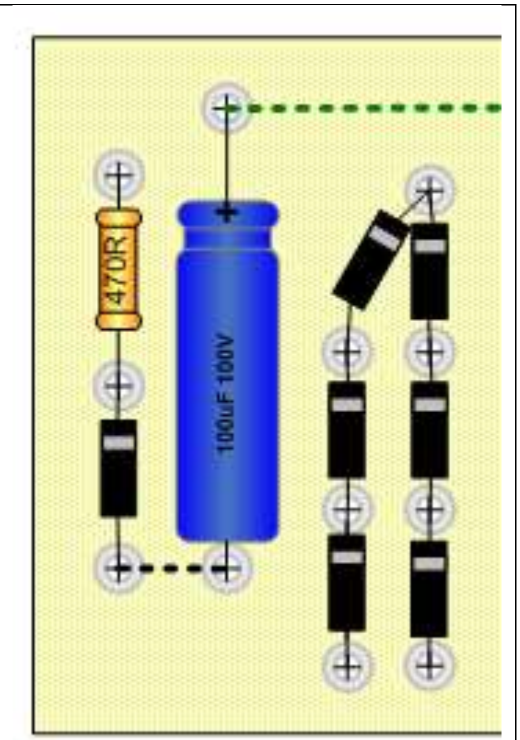
Component Installation Process

- Form the component as shown above to fit the eyelet spacing for it's location.
- Bend the leads outwards (or inwards) so that you can flip the board upside down and the components stay put.
- Repeat for all the components that are intended to fit into each eyelet.
- Solder in place and fill the eyelet with solder, as above.
- Inspect the connection

Eyelet Board Assembly

Arrange the board according to the layout diagram and follow the diagram closely and build it in logical component sections. E.g. Rectifier and bias Supply, Power Supply Filer capacitors, Power tube and Phase Inverter, Preamp

Install the components on the board by following the layout pictures.

Bias and Rectifier Components Locate and test the following components: 1 – 470R resistor 6 – IN4007 Diode 1 – 100uF, 100V electrolytic capacitor Familiarize yourself with the axial capacitor and note the POSITIVE end. Using the Component Installation Process, install the: 470R and 1N4007 diode 100uF capacitor (positive end to ground!!); and 5 - 1N4007 diodes Inspect the connections	

Power Supply Components

Locate and test the following components:

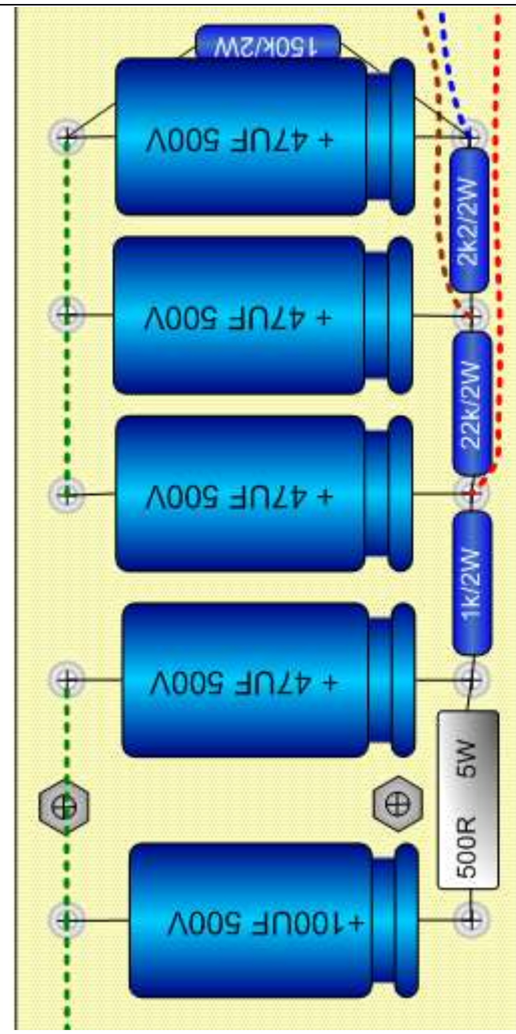
1 – 100uF, 500V axial capacitor
4 – 47uF, 500V axial capacitor
1 – 1K / 2W metal oxide resistor
1 – 22K / 2W metal oxide resistor
1 – 2K2 / 2W metal oxide resistor
1 – 150K / 2W metal oxide resistor
1 – 500R / 5W cement power resistor
Familiarize yourself with the axial capacitor and note the POSITIVE end.

Using the Component Installation Process, install the:

5 axial capacitors adding the appropriate resistor on the positive ends as you work along the board. (i.e. 500R, 1K, 22K, 2K2 / 2W)

Finish with the 150K / 2W bleeder resistor

Tip: Sometimes it is a good idea to first solder at the eyelet that has no other part inserted in it. This is in order to keep the component located correctly on the eyelet board while the required components are installed.



Phase Inverter Components

Locate and test the following components:

2- 220K resistor
1- 110K resistor
1- 100K resistor
1- 24K resistor
2- 1M resistor
1-820R Metal Film 1% resistor
1 - 4K7 / 2W metal oxide f 'back resistor
1 – 5K Trim Potentiometer
3 - .1uF 600V orange drop capacitor
1 - .022uF 600V (.02uF alt.) orange drop capacitor

Using the Component Installation Process, install the:

5K Trim Potentiometer Making sure it is spaced above the board slightly and does not touch the board eyelets.

Install the 110K, .1uF cap, 2 - 220K, , .1uF cap and 100K resistor.

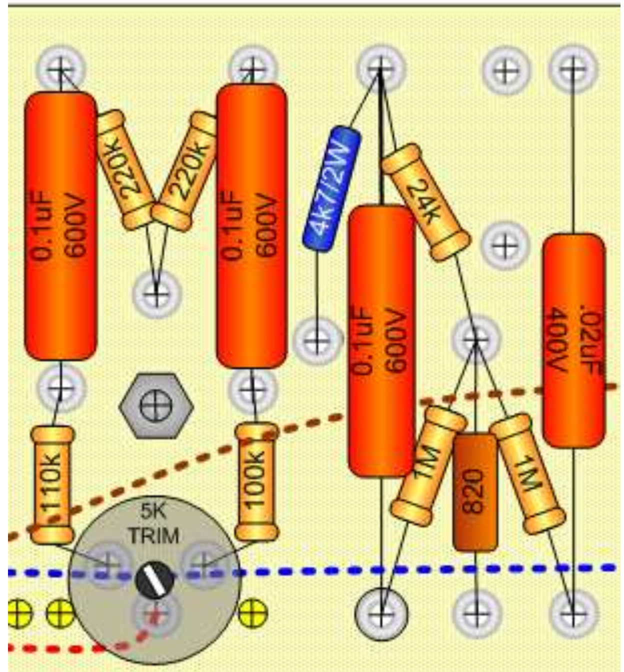
Set the 5K TRIM to the middle position.

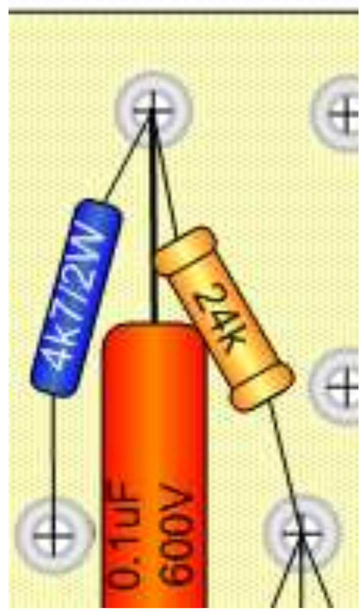
Next install the remaining parts: 4K7 / 3W metal oxide NFB resistor, .1uF 600V orange drop capacitor, 24K

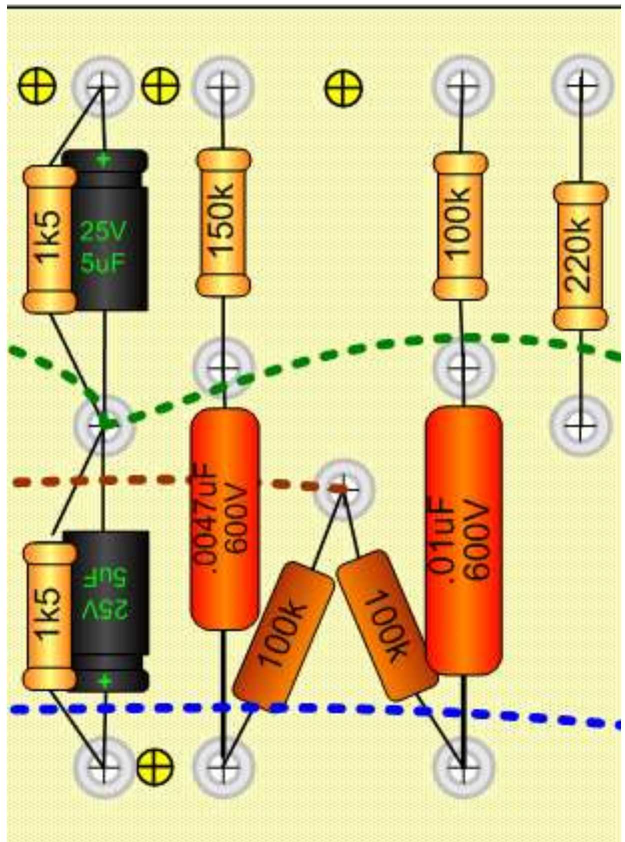
Install the 2- 1M resistor with 820R 1% resistor and - .02uF 600V orange drop capacitor.

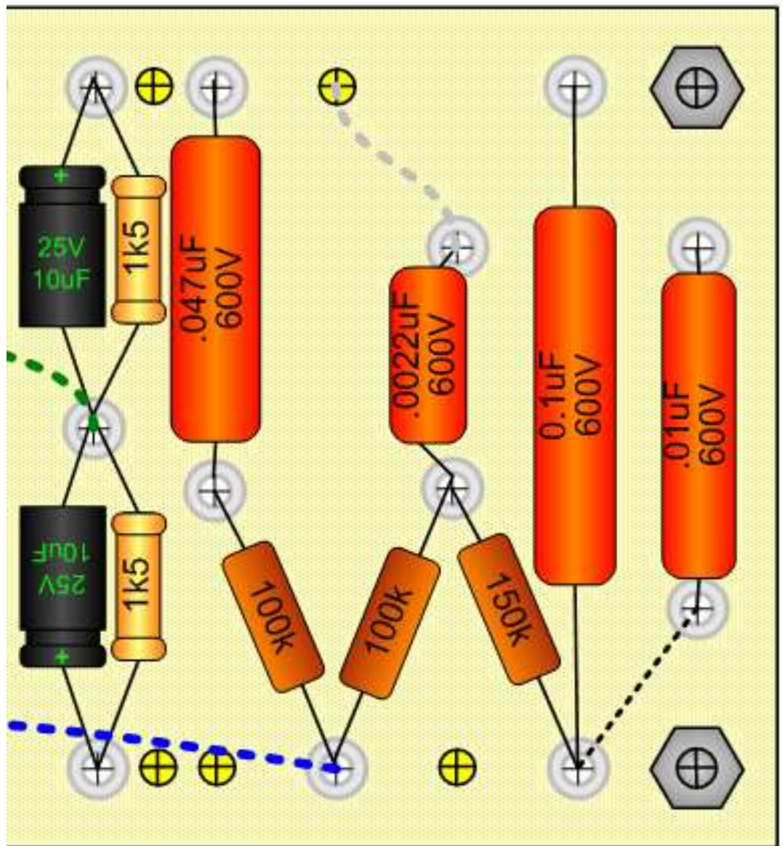
Inspect the connections

Tip: Sometimes it is a good idea to first 'tack' solder at an eyelet that will have other part inserted in it. This is in order to keep the component located correctly on the eyelet board

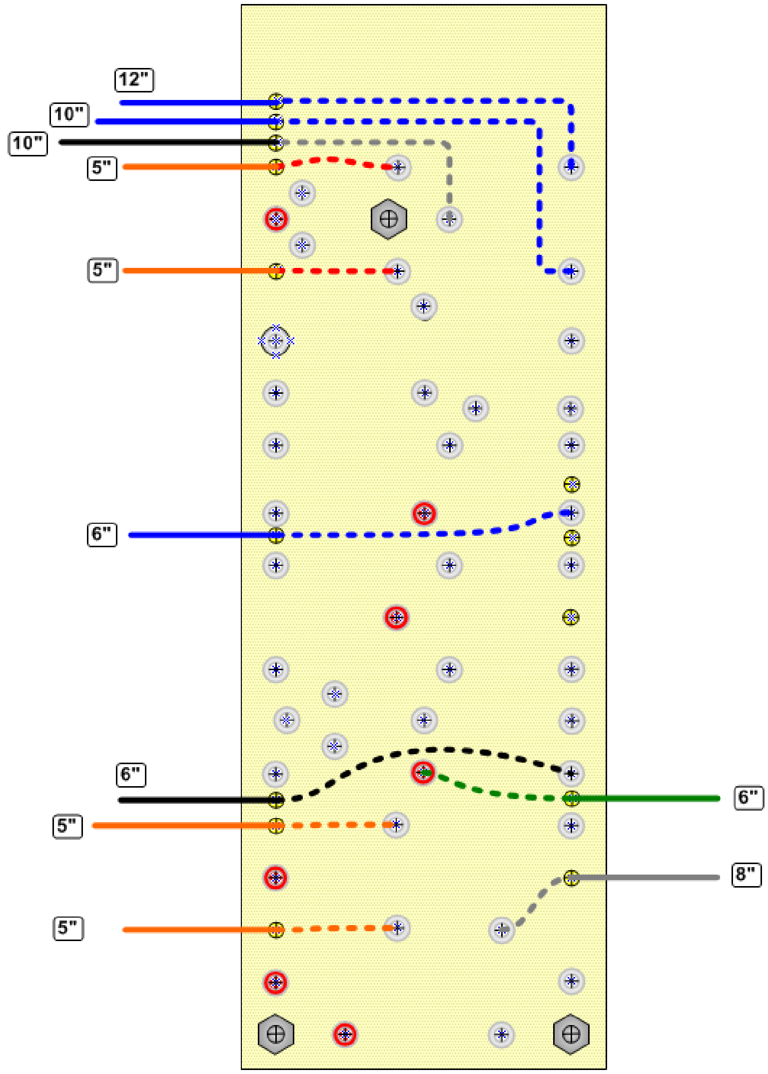




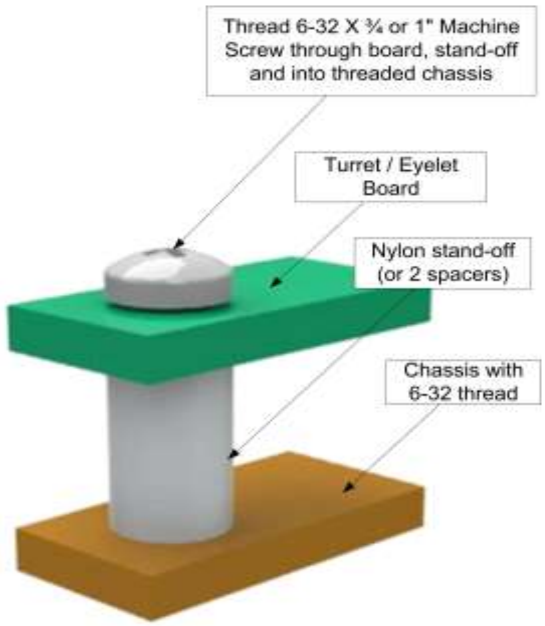
until the required components are installed.	
Preamp Components (1) Locate and test the following components: 2 – 1K5 resistor 1 – 150K resistor 1 – 100K resistor 2 – 100K Metal Film 1% resistor 1 – 220K resistor 2 – 4.7uF / 25V electrolytic capacitor (or 5uF) 1 - .0047uF orange drop capacitor 1 - .01uF orange drop capacitor Familiarize yourself with the axial capacitor and note the POSITIVE end. Using the Component Installation Process, install the: 2 – 1K5 resistor / 4.7uF capacitor pairs Next install the 2 – 100K 1% resistors, .0047uF and, .01uF capacitors and the 100K and150K resistors. Finally install the 220K resistor Inspect the connections	

Preamp Components (2) Locate and test the following components: 2 – 1K5 resistor 2 – 100K 1% resistor 1 – 150K 1% resistor 2 – 10uF / 25V electrolytic capacitor 1 - .002uF orange drop capacitor 1 - .01uF orange drop capacitor 1 - .047uF orange drop capacitor 1 - 0.1uF orange drop capacitor Familiarize yourself with the axial capacitor and note the POSITIVE end. Using the Component Installation Process, install the: 2 – 1K5 resistor / 4.7uF capacitor pairs Next install the .047uF, 2 – 100K and 150K 1% resistors, .002uF, 0.1uF and .01uF orange drop capacitors. Inspect the connections	

With the board now fully populated, inspect it again for accuracy and proper connections.

Several sections require the termination of leads directly to the eyelet board. Refer to the previous Soldering Leads onto Eyelet Boards section. The eyelet board has several leads that go underneath the board and out through holes in the board and onwards to another part. These are identified on the diagram as dotted and solid lines. Using 22 gauge solid wire cut 8 wires in correct colors according to the layout diagram to 5" to 12" long. We suggest you confirm the approximate lengths before cutting. Following the layout solder the leads onto the eyelet board to the bottom of the board and then feed them out the correct holes to the top.	

When the board is built, double check all components, jumpers and leads against the layout. If all is correct, carefully install the board into the amp. Locate 5 - #6 X 3/4" screws, ½" nylon spacers and lock washers. At one end of the board, put two screws through the lock washer, board, and spacers. Align the screw with the #6 tapped holes in the chassis and install the board. Loosely tighten the screws. Repeat at other end and middle and then tighten nuts firmly.

	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.

11 Connect Eyelet Board Ground Points

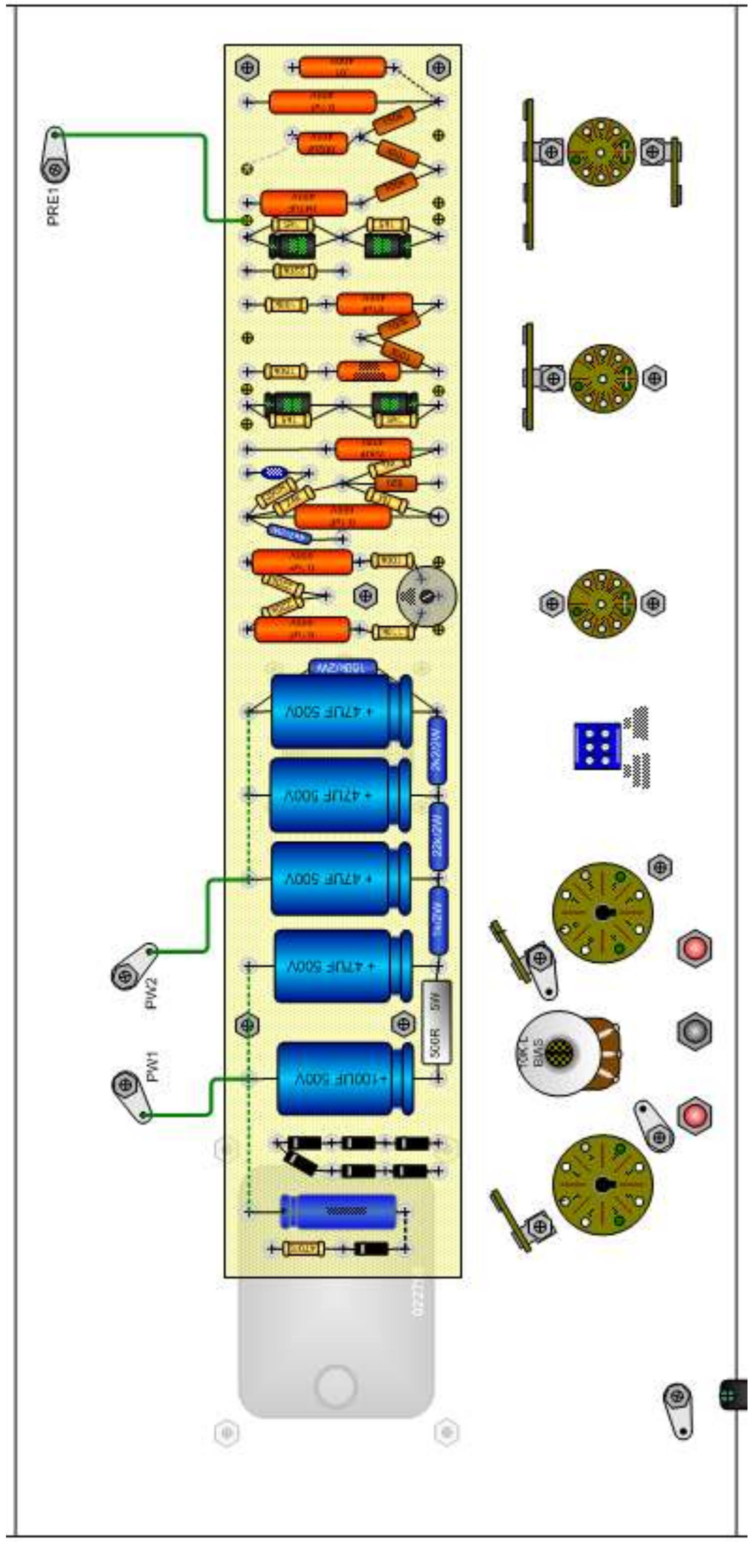
The proper installation and soldering of wires and component leads to lugs terminals is important to the overall electrical and mechanical reliability of the termination.

The insulation gap (referenced from the first point of contact of the conductor to the terminal) should be less than two (2) wire diameters, but shall not be imbedded in the solder joint. Wire/harness terminations should exhibit an even distribution of conductor dress and tension throughout the cable and harness, to prevent stress to the terminations.

For pierced or perforated terminal lugs, socket pins,switch lugs and terminals, the wire passes through the eye of the terminal, is wrapped in contact with both sides of the terminal, and does not overhang the terminal edge. Insulation clearance is less than 1 wire diameter.

The lead profile is discernable, with wire and terminal interface completely wetted. The solder is smooth and shiny, and fillets the entire wire/lead and terminal interface.

Using GREEN Solid wire, route and connect three board ground points to



the chassis ground lugs labelled PRE1, PW1 and PW2.	

12 Connecting the Eyelet Board to Tube Sockets

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

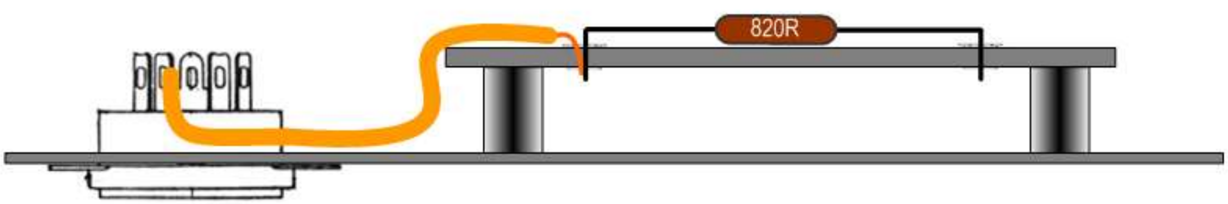
Tip: On a photo-copy of the layout, highlight the connections as you complete them to make sure they are done correctly.

Some tube sockets require components or jumpers to be installed on them. Some builders prefer to do this work out of the chassis. 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 especially the jumper on V3. 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 V5 doing the point-to-point wiring. Board to tube pin; board to tube pin etc. Start at V1, pin 1 and move to the far end of the board to V6.

Identify the first eyelet and its destination socket pin.

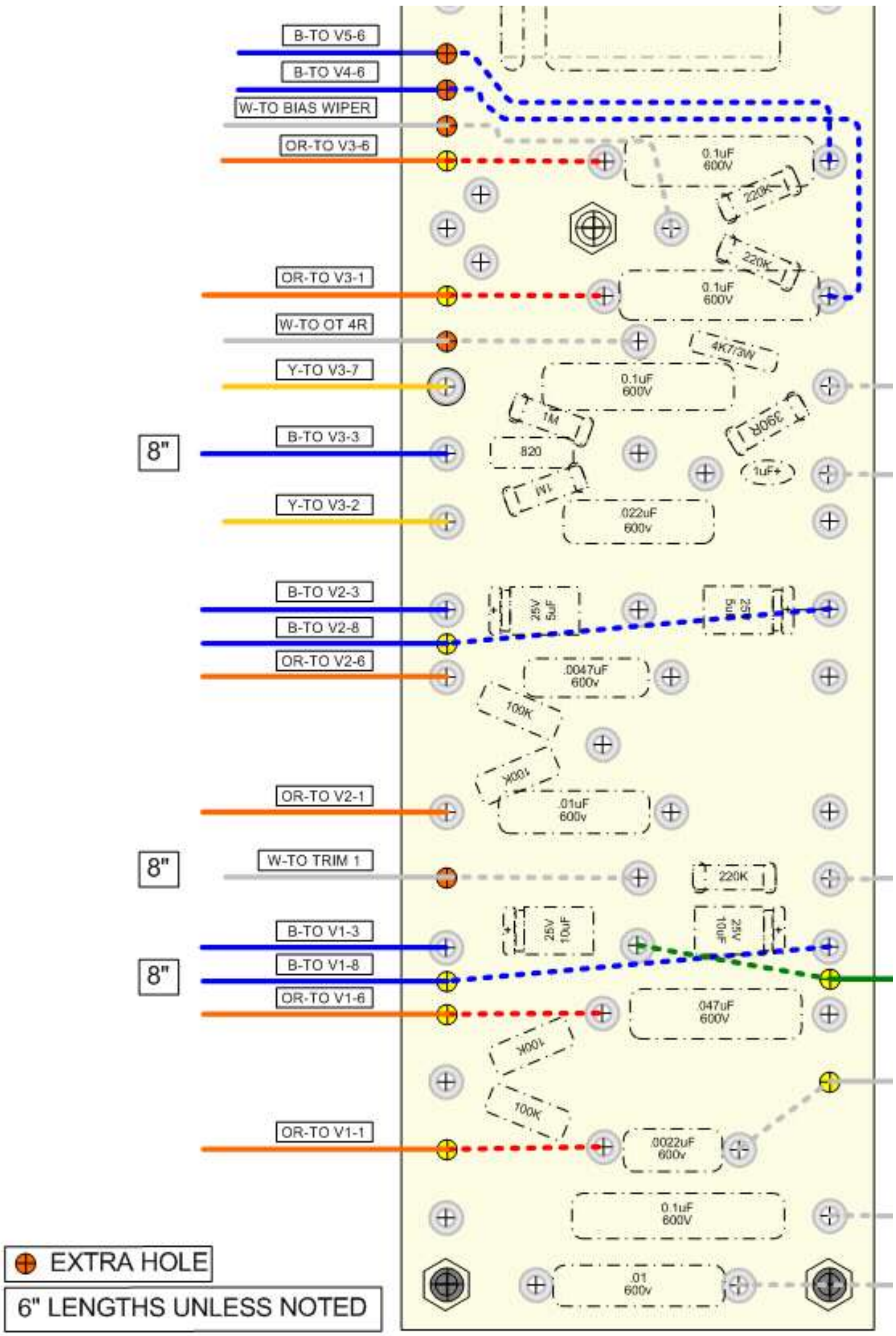
Follow the colour code on the layout. Cut a length of the supplied 22 Guage solid core wire so it will easily reach (with some extra) from the destination eyelet to the correct tube socket pin while laying flat to the eyelet board and against the chassis.



Once the connection is cool, press the wire so that it lies flat on the board and chassis with any excess tucked underneath the board.

Repeat for each eyelet that has a connection to another part.

Use the following layout to get an idea of the lengths of the connecting wires



B-TO V5-6
B-TO V4-6
W-TO BIAS WIPER
OR-TO V3-6
0.1uF 600V
220K
220K
OR-TO V3-1
0.1uF 600V
W-TO OT 4R
4K7/3W
Y-TO V3-7
0.1uF 600V
1M
390R
8"
B-TO V3-3
820
1uF+
1M
Y-TO V3-2
.022uF 600v
B-TO V2-3
25V 5uF
25V 5uF
B-TO V2-8
OR-TO V2-6
.0047uF 600v
100K
100K
OR-TO V2-1
.01uF 600v
8"
W-TO TRIM 1
220K
B-TO V1-3
25V 10uF
25V 10uF
8"
B-TO V1-8
OR-TO V1-6
.047uF 600V
100K
100K
OR-TO V1-1
.0022uF 600v
0.1uF 600V
EXTRA HOLE
6" LENGTHS UNLESS NOTED
.01 600v

Connecting to V1 Socket 1

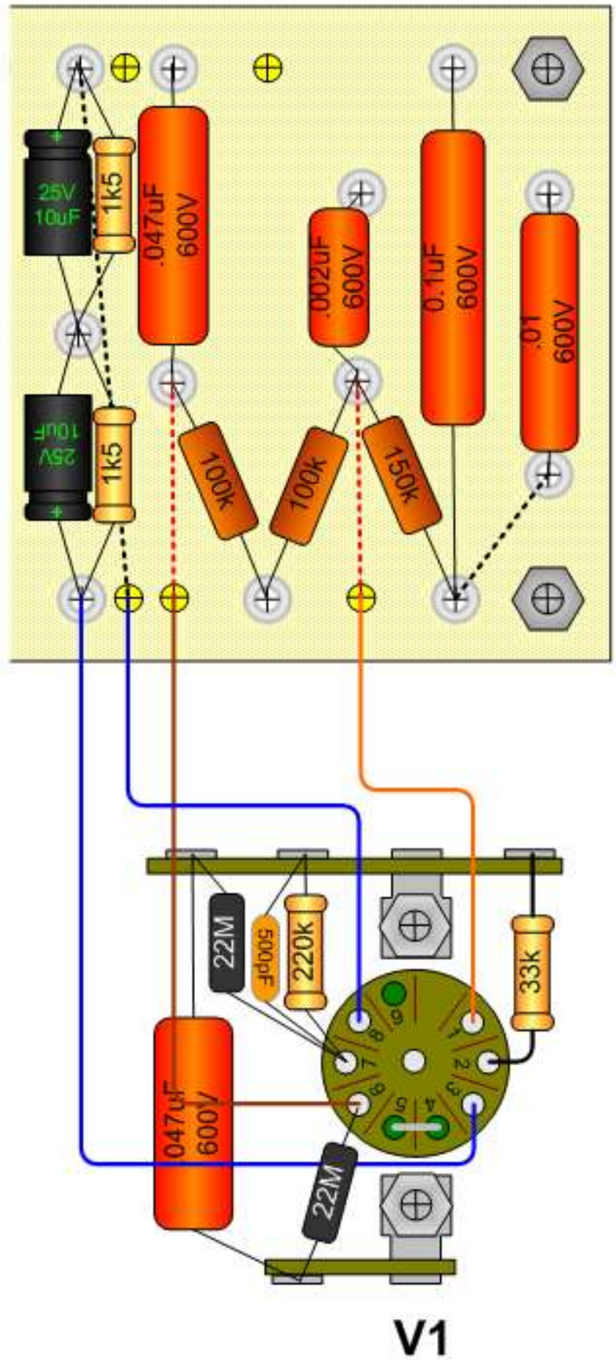
PREAMP TUBE

Connect the previously wired orange under-board lead from the .002uF capacitor to pin 1, socket 1.

Connect the closest 25uF / 1K5 pair with a BLUE lead to pin 3, socket 1.

Connect the previously wired orange under-board lead from the .047uF capacitor to pin 6, socket 1.

Connect the other 25uF / 1K5 pair with the previously wired BLUE under-board lead to pin 8 socket 1.



Connecting to V2, Socket 2

OD TUBE

Connect the .01uF capacitor with an orange lead to pin 1, socket 2.

Connect the closest 25uF / 1K5 pair with a BLUE lead to pin 3, socket 1.

Connect the .0047uF capacitor with an orange lead to pin 6, socket 2.

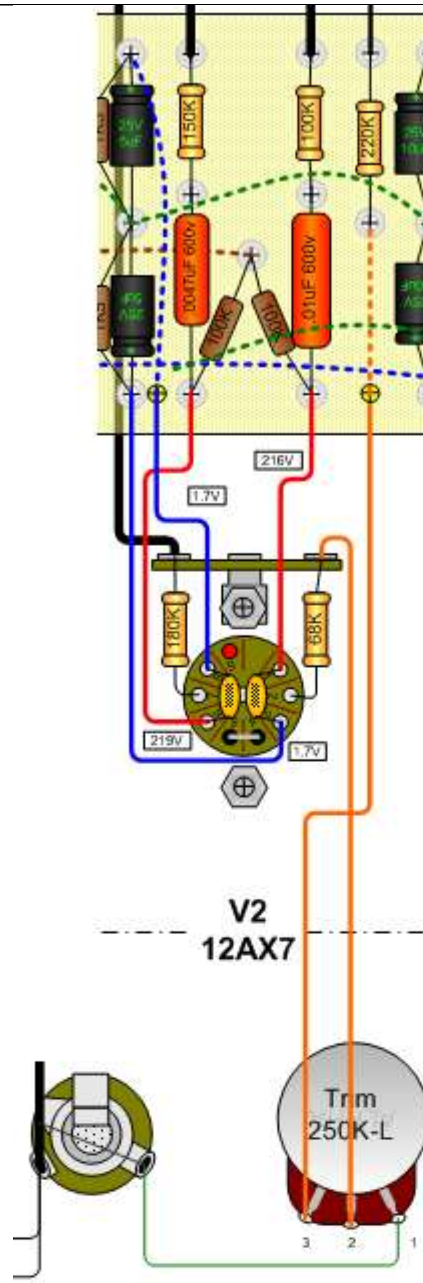
.

Connect the other 25uF / 1K5 pair with the previously wired BLUE under-board lead to pin 8 socket 2. Run wire through hole in board then under board

Connect the 220K resistor with a YELLOW lead to terminal 2 of the 250K Trim control. Run wire through hole in board then under board

Connect a YELLOW lead from terminal 1 of the Trim control to the terminal strip of the 68K grid resistor that connects to pin 2 socket 2.

Connect lug 1 of the trim pot with a GREEN wire to the ground lug of the RETURN jack.



Connecting to V3, Socket 3

PI TUBE

Connect the previously wired orange under-board lead from the 0.1uF capacitor/100K resistor to pin 1 socket 3.

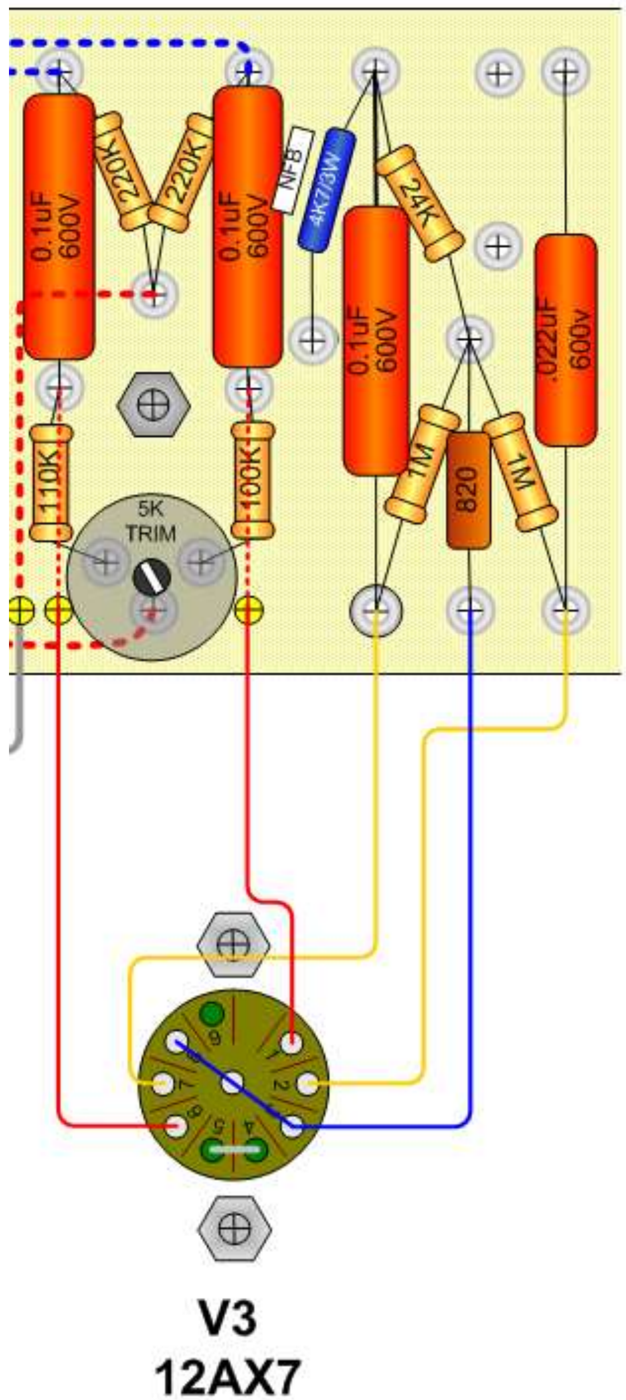
Connect the .02uF capacitor with an YELLOW lead to pin 2 socket 3.

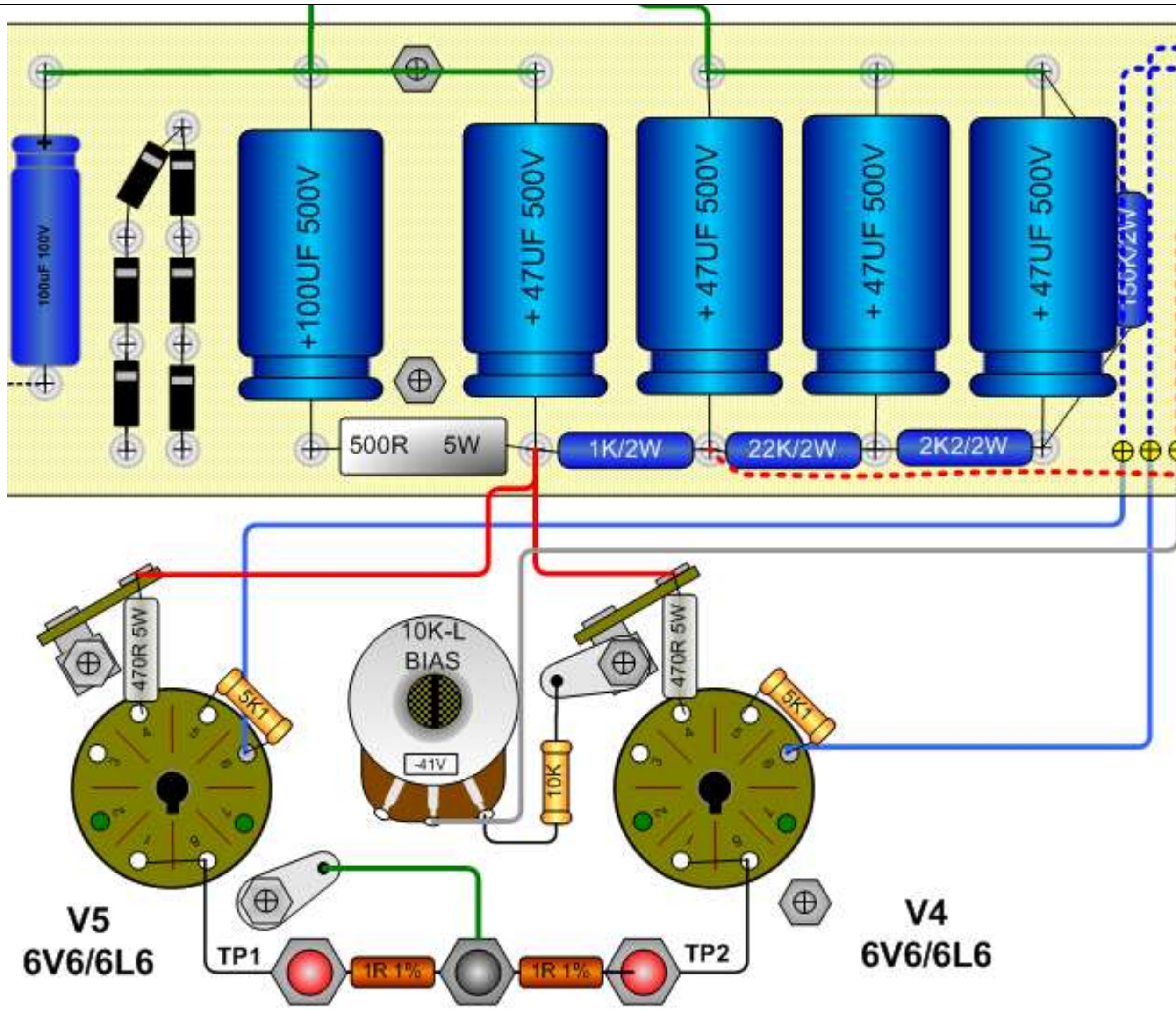
Connect the 820R cathode resistor to pin 3, socket 3 with a BLUE lead.

Strip enough lead to reach from pin 3 across to pin 8. Put some heat shrink over the lead as you feed it between the two terminals and then solder it in place.

Connect the previously wired orange under-board lead from the 0.1uF capacitor/110K resistor to pin 6 socket 3.

Connect the 0.1uF capacitor /1M resistor eyelet with an YELLOW lead to pin 7, socket 3.





Connect Power Tubes

Measure and cut a long BLUE lead to reach from the 2 - 0.1uF /220K eyelets to V4, V5, pins 6.

Connect them to each board eyelet.

Make sure you take note of which lead goes to which eyelet. A BLACK permanent mark on the end of one of them will help. Twist the leads together.

Route neatly, over/under board, trim to length and solder the lead of the 0.1uf/220K pair to V4, pin 6.

Route neatly, over/under board, trim to length and solder the lead of the 0.1uf/220K pair to V5, pin 6.

Measure and cut a long white lead to reach from the 220k/220K junction eyelet to the wiper of the 10K BIAS pot. Route neatly, over/under board, trim to length and connect to the board eyelet.

Route neatly, trim to length and solder the lead of the wiper of the 10K BIAS pot.

Measure and cut 2 leads to reach from the board junction of 500R 5W and 1K 2W power supply node, **B+ 2** to each of 470R 5W resistor on the terminal strips.

Connect them to the board eyelet.

Route neatly, trim to length and solder the leads to each 470R 5W resistor on the terminal strips.

13 Connecting the Eyelet Board to the Controls

Now is the time to make the connections from the controls to eyelet board, RELAY board, jacks and tubes.

TIP: Use the thinner RED wire to connect to the RELAY BOARD if you find that helpful.

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

Some parts may still require components or jumpers to be installed on them. Some builders prefer to do this work out of the chassis. 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.

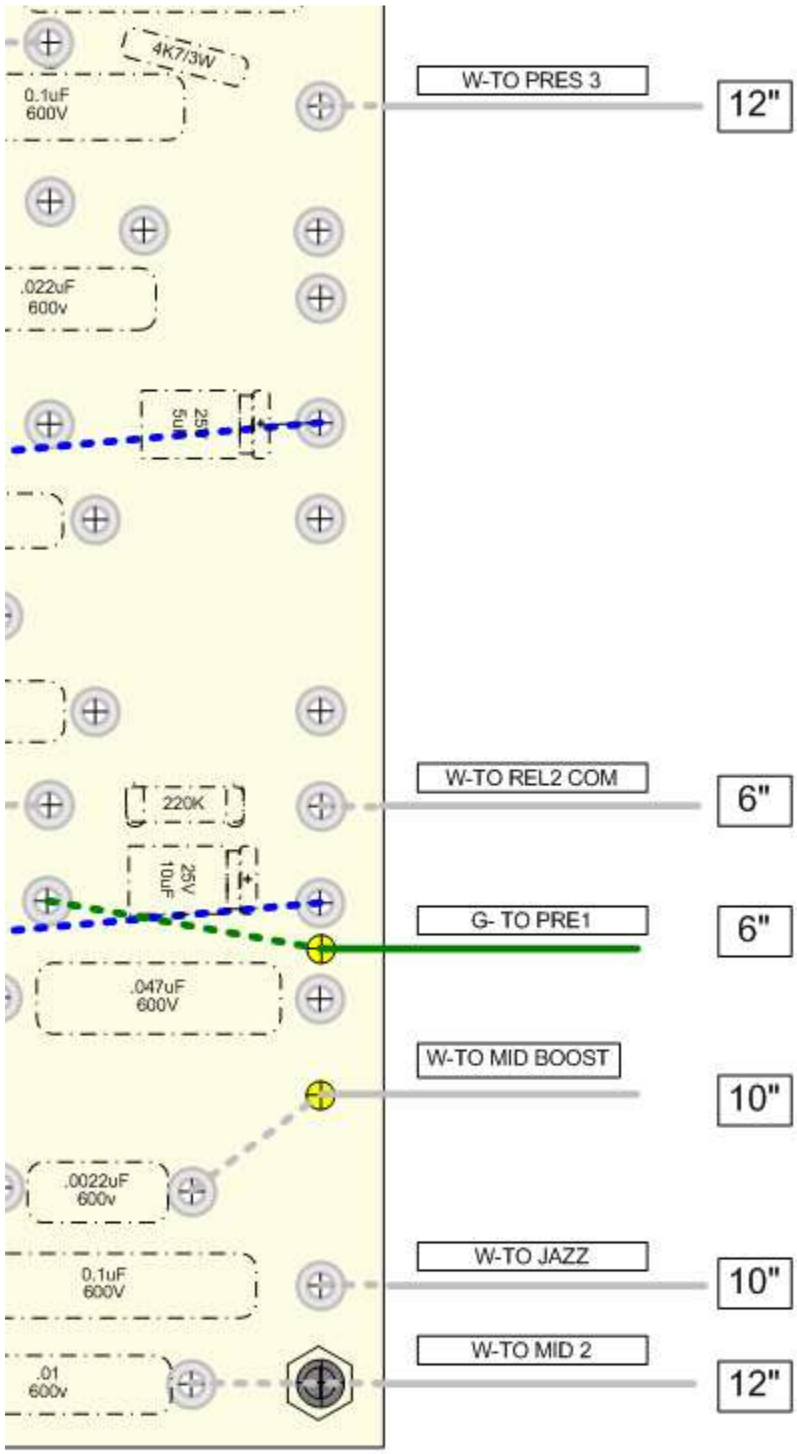
Shielded Cable

Shielded Cable will be required for this part of the build. Here is how to prepare it.

1. Cut back the outside plastic covering at both ends by about 5/8" to reveal the braided shield.
2. At one end of the cable, pull back the shield and cut it off entirely 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”. Pull the “core” (inside conductor) through this hole and pull it through.
4. Twist the braid together.
5. Finally, cut back the outside plastic covering on the “core” on the inside conductor at both ends by about 1/4"
6. Lightly tin the 2 core wire ends and the shield. **NOTE:** Do not overheat and melt the inner core



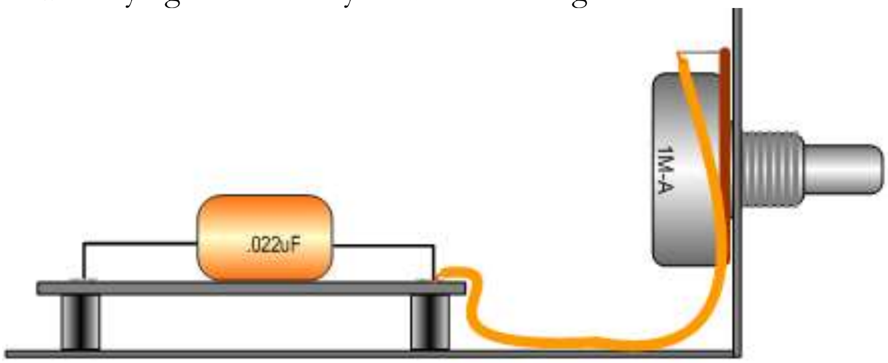
Use the following layout to get an idea of the lengths of the connecting wires.



Start at the PRESENCE control end of the amp and work your way sequentially to the VOLUME Control Doing the point-to-point wiring. Control lug/terminal to board; board to control lug/terminal to board etc.

Identify the first eyelet and its destination point.

Follow the colour code on the layout. Most control leads are white. Cut a length of the supplied 22-gauge solid core wire so it will easily reach (with some extra) from the destination eyelet to the correct terminal while lying flat to the eyelet board and against the chassis and into the corners.

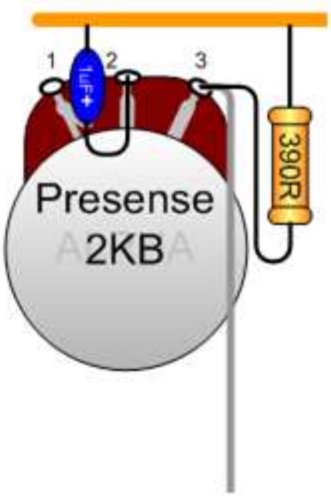
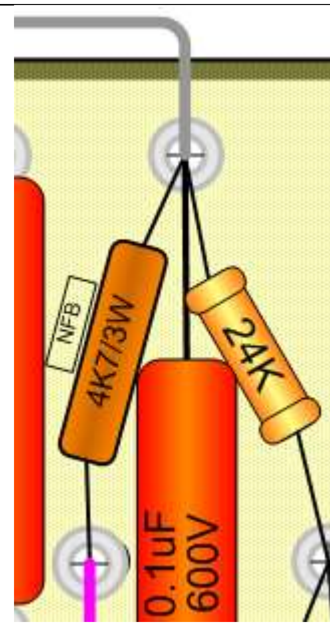


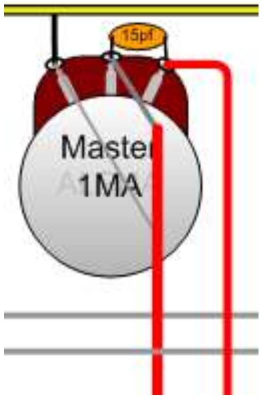
Once the connection is cool, press the wire so that it lies flat on the board and chassis with any excess tucked underneath the board.

Repeat for each eyelet that has a connection to another part.

The pictorial guide below is in addition to the layout in order to make the task as clear as possible.

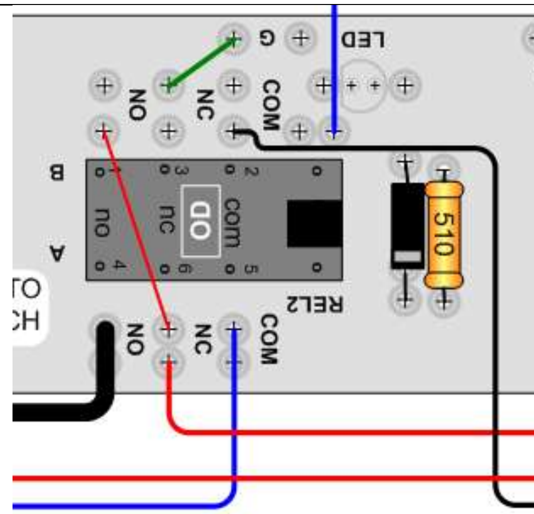
NOTE: Keep the control leads away frm the 5V twisted pair that feeds the RELAYboard.

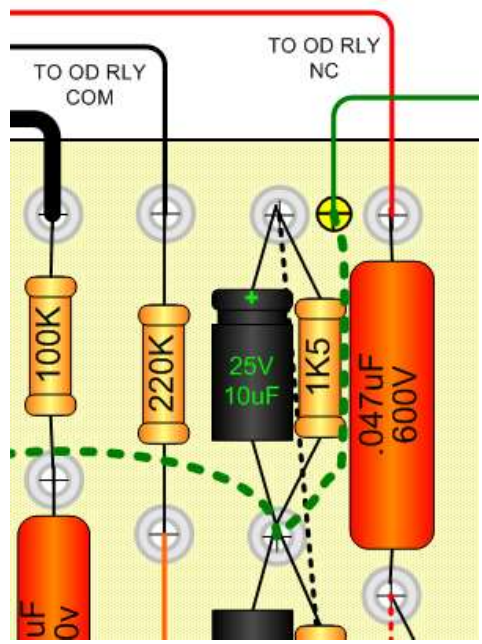
CONNECT FROM HERE PROCEDURE		**TO HERE**
	Measure and cut a long white lead to reach from PRESENCE CONTROL terminal 3 to the EYELET board 4K /24K eyelet. Route the PRESENCE CONTROL lead along the chassis, inbetween the RELAY board and eyelet board and solder in place at the 4K /24K eyelet eyelet and control.	



Measure and cut a long white lead to reach from MASTER CONTROL pin 3 to the RELAYBOARD, OD relay, COM terminal.

Route the lead from the MASTER CONTROL terminal 3 along the chassis, inbetween the RELAY board and eyelet board and solder in place on the RELAYBOARD and control.



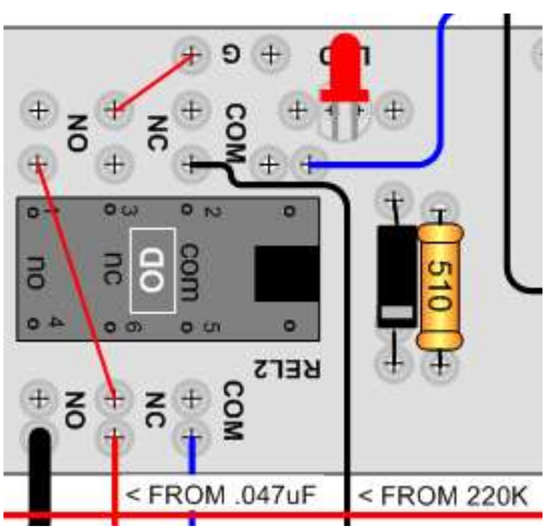


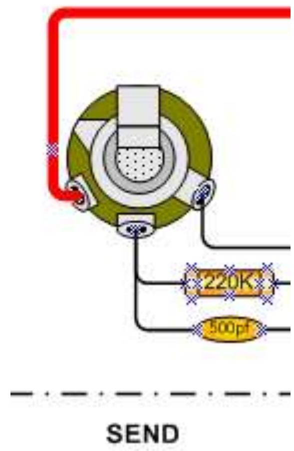
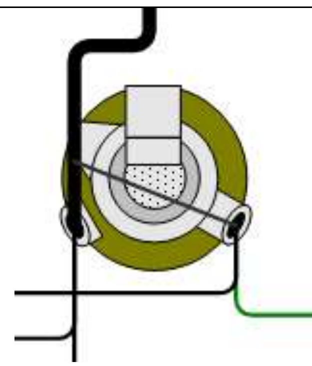
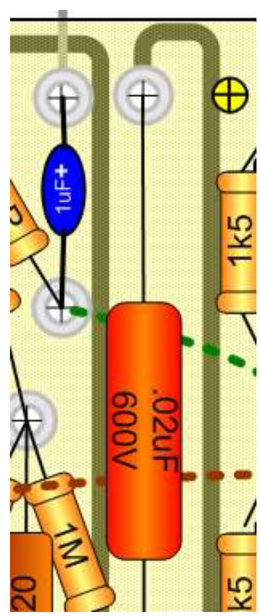
Measure and cut a lead to go neatly from the .047uF capacitor eyelet on the board to the OD RELAY NC terminal on the RELAY board.

Solder in place on the RELAY and EYLET BOARD.

Measure and cut a lead to go neatly from the 220K resistor eyelet on the board to the OD RELAY COM terminal on the RELAY board.

Solder in place on the RELAY and EYLET BOARD.



Measure and cut a long RG-174U co-axial cable to reach from MASTER CONTROL terminal 2 to the SEND JACK TIP lug. Prepare the cable following the above procedure. Route a COAX CABLE from the MASTER CONTROL terminal 2 along the chassis, inbetween the RELAY board and eyelet board, then underneath the eyelet board durectly to the SEND JACK TIP lug and solder in place on the control and jack.. Solder the COAXIAL cable ground braid to terminal 1 of the MASTER CONTROL	 SEND JACK
Measure and cut a long RG-174U co-axial cable to reach from the 0.02uF cap eyelet close to the RELAY BOARD to the RETURN JACK TIP lug. Prepare the cable following the above procedure. Route the COAX CABLE from the .02uF cap, underneath the eyelet board to the RETURN JACK TIP lug. Solder at the eyelet and at the RETURN JACK TIP.. Solder the COAXIAL cable ground braid to the other lug of the JACK. NOTE: By default the R-C network is inserted itno the signal path with no Fx plugged in and removed when the Fx is plugged in. If you want it to be connected when the Fx is inserted, connect the return cable to the switch lug (middle) of the SEND jack.	 RETURN JACK 

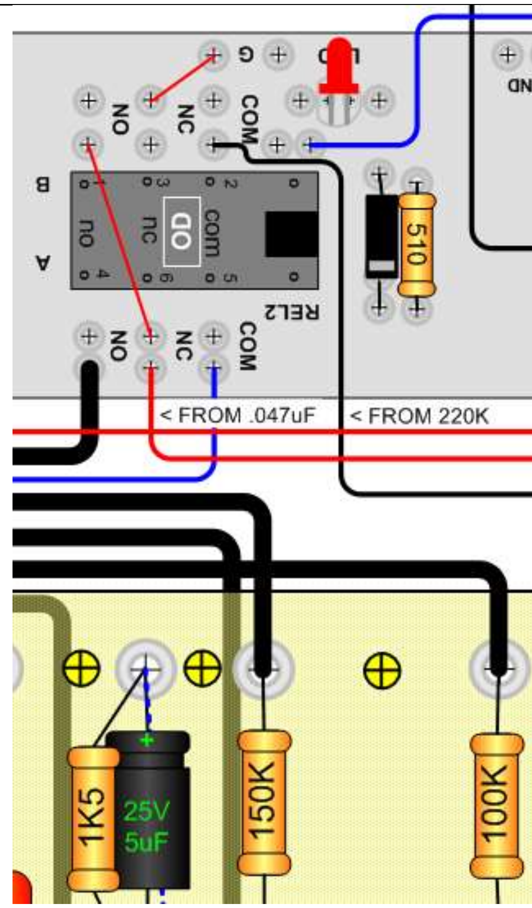
Measure and cut two long RG-174U co-axial cable to

reach from RATIO CONTROL terminal 2 and 3 to the RELAY board OD, NO position and EYELET board 150K eyelet.

Prepare the cable following the above procedure.

Route one COAX CABLE from the RATIO CONTROL pin 2 along the chassis, inbetween the RELAY board and eyelet board, and solder the core lead to the RELAY board, OD, NO position and the RATIO control. Solder the COAXIAL cable ground braid to terminal 1 of the RATIO CONTROL.

Route the second COAX CABLE from the RATIO CONTROL pin 3 along the chassis, inbetween the RELAY board and eyelet board, and solder the core lead to the 150K eyelet and the RATIO control. Solder the COAXIAL cable ground braid to terminal 1 of the RATIO CONTROL.

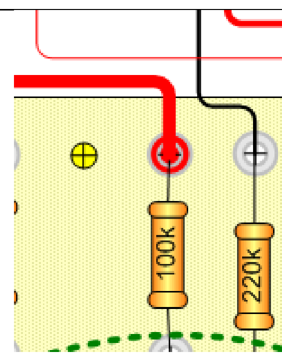


Measure and cut two long RG-174U co-axial cable to reach from LEVEL CONTROL terminal 3 to the EYELET board 100K eyelet and terminal 2 to the terminal strip holding the 180K grid grid resistor.

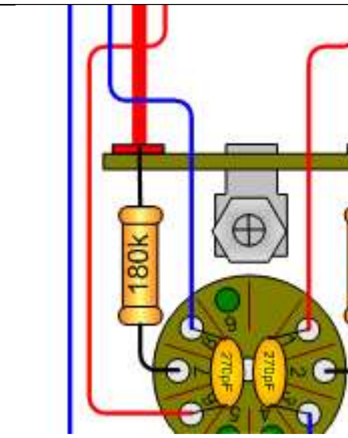
Prepare the cable following the above procedure.

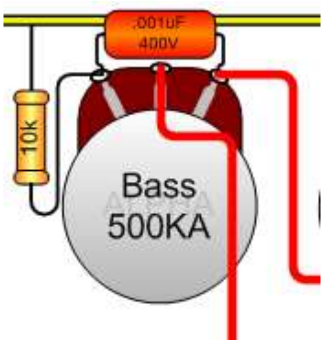
Route one COAX CABLE from the LEVEL CONTROL pin 3 along the chassis, inbetween the RELAY board and eyelet board, and solder the core lead to the 100K eyelet..

Route a COAX CABLE from the LEVEL CONTROL terminal 2 along the chassis, inbetween the RELAY board and eyelet board, then underneath the eyelet board durectly to the the terminal strip



holding the 180K grid grid resistor. Solder the core to the terminal . Solder the COAXIAL cable ground braid to terminal 1 of the LEVEL CONTROL.

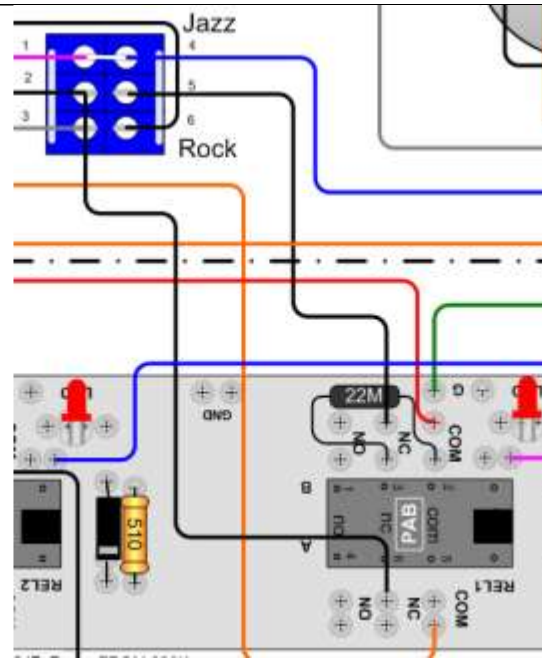




Measure and cut a long white lead to reach from BASS control pin 2 to the RELAY board, PAB relay, COM terminal and from BASS control terminal 3 to the JAZZ/ROCK switch, terminal 1.

Route the lead from the BASS control terminal 3 along the chassis, inbetween the RELAY board and front panel and solder in place on the JAZZ/ROCK switch and control.

Route the lead from the BASS control terminal 2 along the chassis, inbetween the RELAY board and front panel and solder in place on the RELAY board, PAB relay, COM terminal and control.

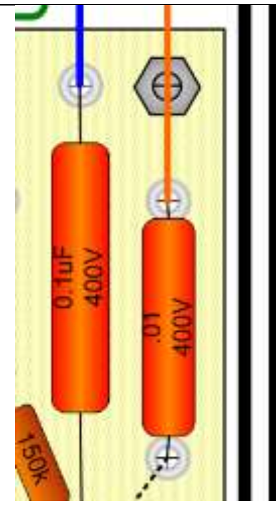


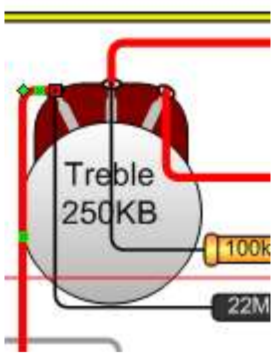
RELAY BOARD (PAB)

Measure and cut a white lead to reach from MID control terminal 2 to the .01uf eyelet.

Route the lead from the MID control terminal 2 along the chassis, inbetween the RELAY board and front and then directly to the .01uF eyelet on the board.

Solder both ends in place.





Measure and cut a white lead to reach from TREBLE control pin 1 RELAY board, PAB RELAY 2, COM terminal.

Measure and cut a white lead to reach from TREBLE control pin 2 to terminal 3 of the VOLUME control.

Measure and cut a white lead to reach from TREBLE control pin 3 to terminal 2 of the MID-BOOST DPDT switch..

Route the lead from the TREBLE control terminal 1 along the chassis, inbetween the RELAY board and front panel and then turn to under the RELAY BOARD and up to connect to PAB RELAY 2, COM terminal.

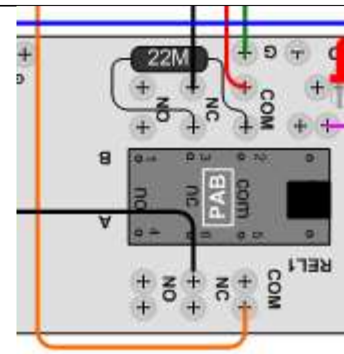
Solder in place at both ends.

Route the lead from the TREBLE control terminal 2 neatly and tightly along the chassis edge to the VOLUME control terminal 3.

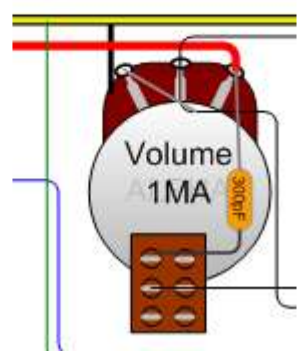
Solder in place at both ends.

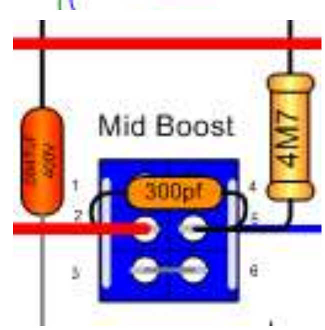
Route the lead from the TREBLE control terminal 3 neatly and tightly along the chassis edge to the MID-BOOST Switch terminal 2.

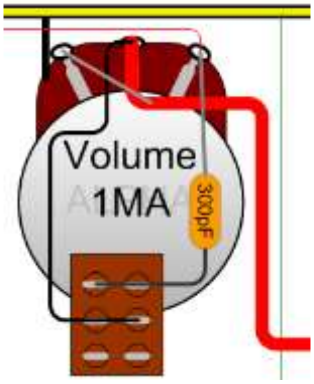
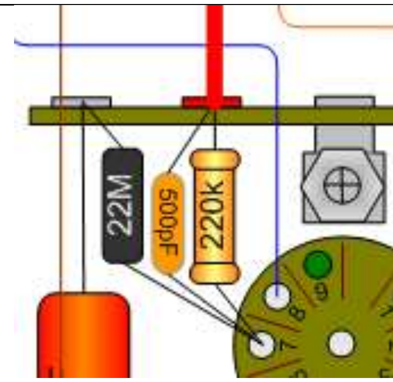
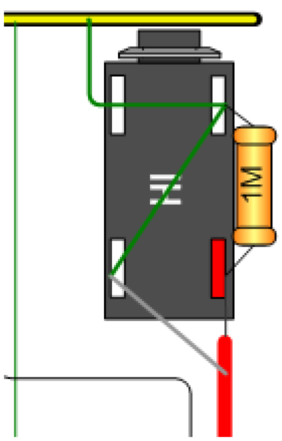
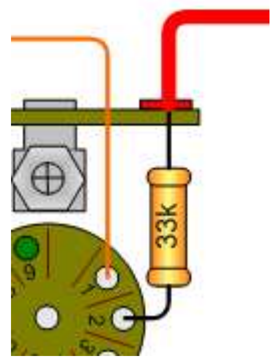
Solder in place at both ends.



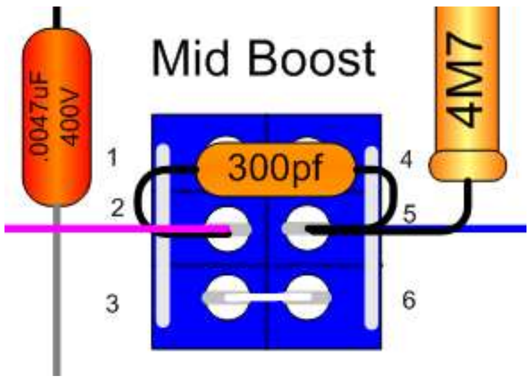
RELAY BOARD (PAB)





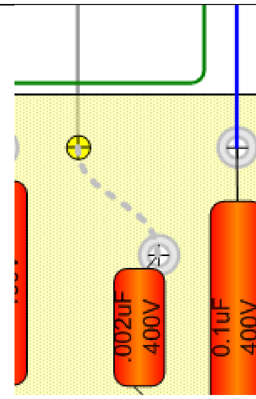
 Measure and cut one long RG-174U co-axial cable to reach from VOLUME control terminal 2 to the terminal stip with the 220K/550pf. Prepare the cable following the above procedure. Route the COAX CABLE from the VOLUME control pin 2 under the eyelet boardand directly to the terminal lug Solder the core lead to the VOLUME control terminal 2. Solder the COAXIAL cable ground braid to terminal 1 of the VOLUME control.	
 Measure and cut one long RG-174U co-axial cable to reach from INPUT jack to the terminal strip with the 33K lug. Prepare the cable following the above procedure. Route the COAX CABLE from the INPUT jack, under the eyelet board to the terminal strip with the 33K lug. Solder the core lead to the INPUT jack at the 1M resistor and solder the COAXIAL cable ground braid to the grounded lug of the INPUT jack beside it. Solder the other core lead to the terminal strip with the 33K lug. CLIFF jacks have 2 normally closed contacts and 4 terminals. The contacts open when a ¼" plug is inserted into the jack. The Tip connection is at the very end of the plug and is normally 'positive' polarity. This is sometimes referred to as the 'Hot' side. The other part of the plug is typically ground or 'common'	

Connect the previously wired under-board lead from the

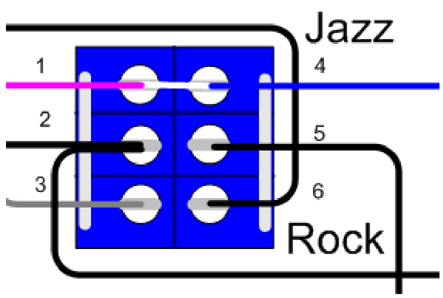


.002uF capacitor to terminal 5 of the DPDT MID-BOOST switch.

Solder in place at both ends.



Measure and cut a white lead to reach from DPDT JAZZ/ROCKswitch terminal 4 to the .1uF eyelet on the board.



Route the lead from the JAZZ/ROCKswitch along the chassis, inbetween the RELAY board and front panel and then turn towards the eyelet.

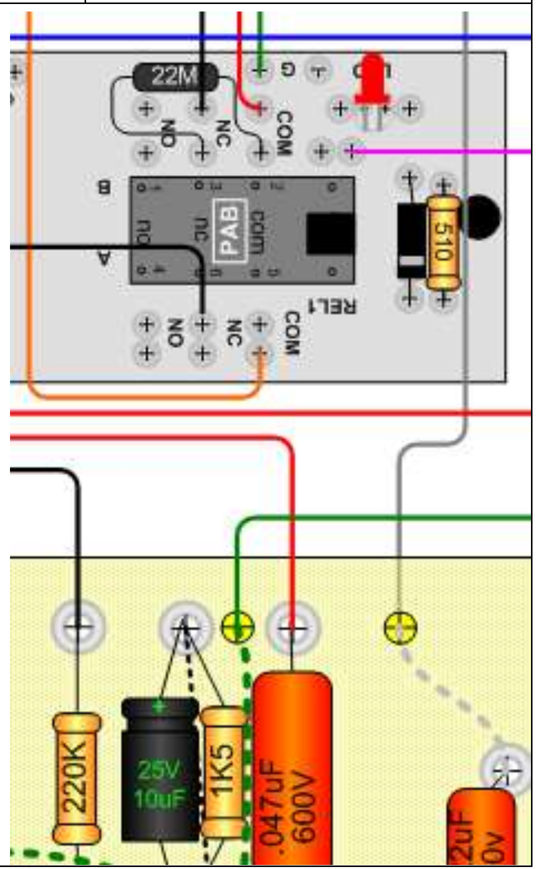
Measure and cut a white lead to reach from DPDT JAZZ/ROCKswitch terminal 5 to PAB RELAY 2, 22M terminal.

Neatly route the lead and solder in place.

Measure and cut a white lead to reach from DPDT JAZZ/ROCK switch terminal 2 to PAB RELAY 2, NC terminal.

Neatly route the lead and solder in place.

Solder a jumper between terminal 1-4



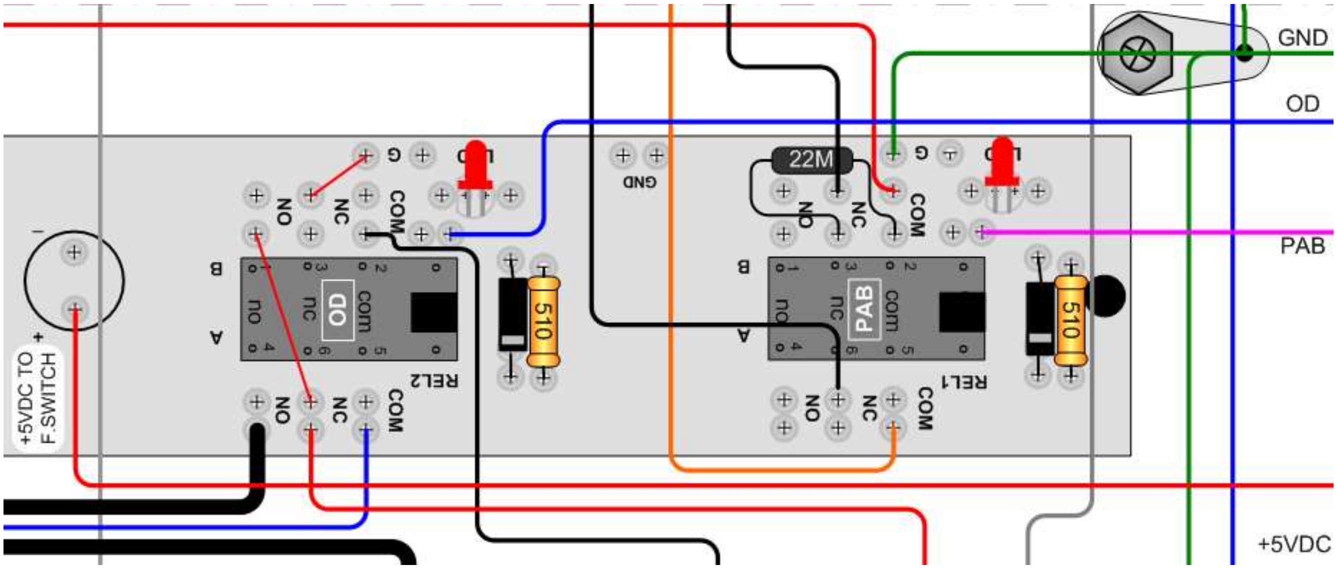
14 Wire the RELAY Board to the Foot Switch Chassis Socket.

Using 26 gauge wire, measure and cut 4 wires from the RELAY board to the FOOTSWITCH SOCKET by running the wire in the chassis corner.

SOLDER 4 leads to the RELAY board for +5V, Ground (GND), OD and PAB.

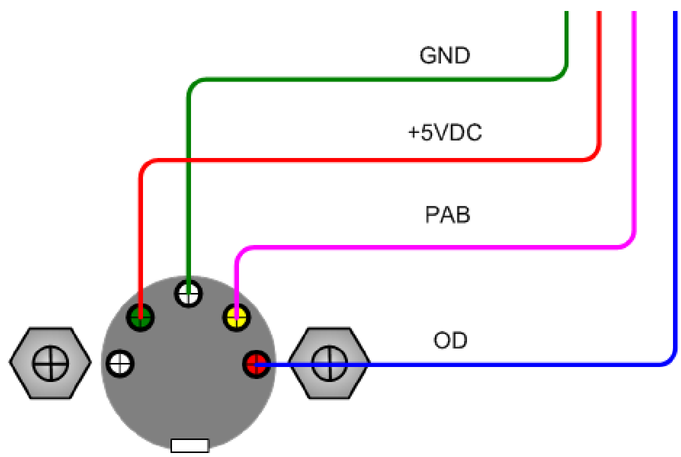
You may decide it is neater to run the +5VDC lead between the RELAY and EYELET boards rather than the other side of the board.

IMPORTANT: Make a careful note which lead is which.



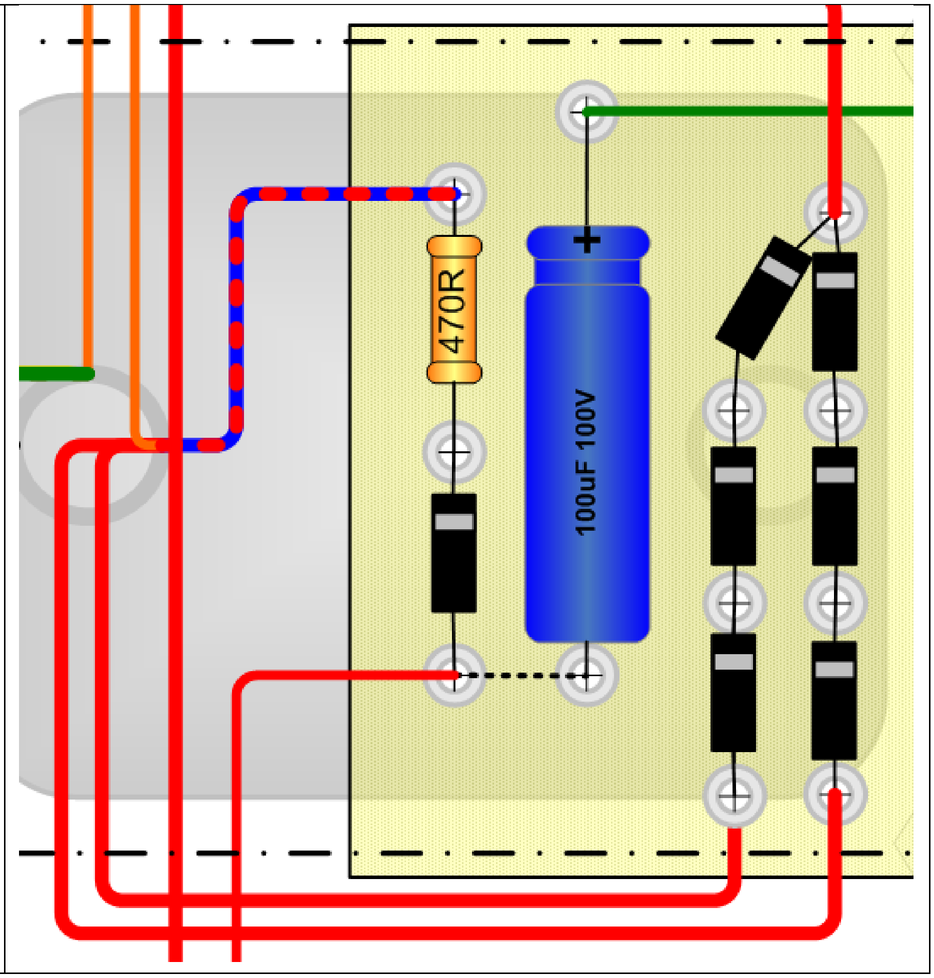
Twist the bundle of wires together and then confirming you have the correct lead, connect and solder the appropriate lead to the FOOTSWITCH SOCKET as shown in the layout.

IMPORTANT: Make a careful note which lead is which



15 Complete the Power Transformer Secondary Wiring.

When we wired and tested the Power Transformer, all that was left to connect were the High Voltage (HV) RED leads, the 5V (YELLOW) leads and the RED/BLUE(45V BIAS tap) leads.

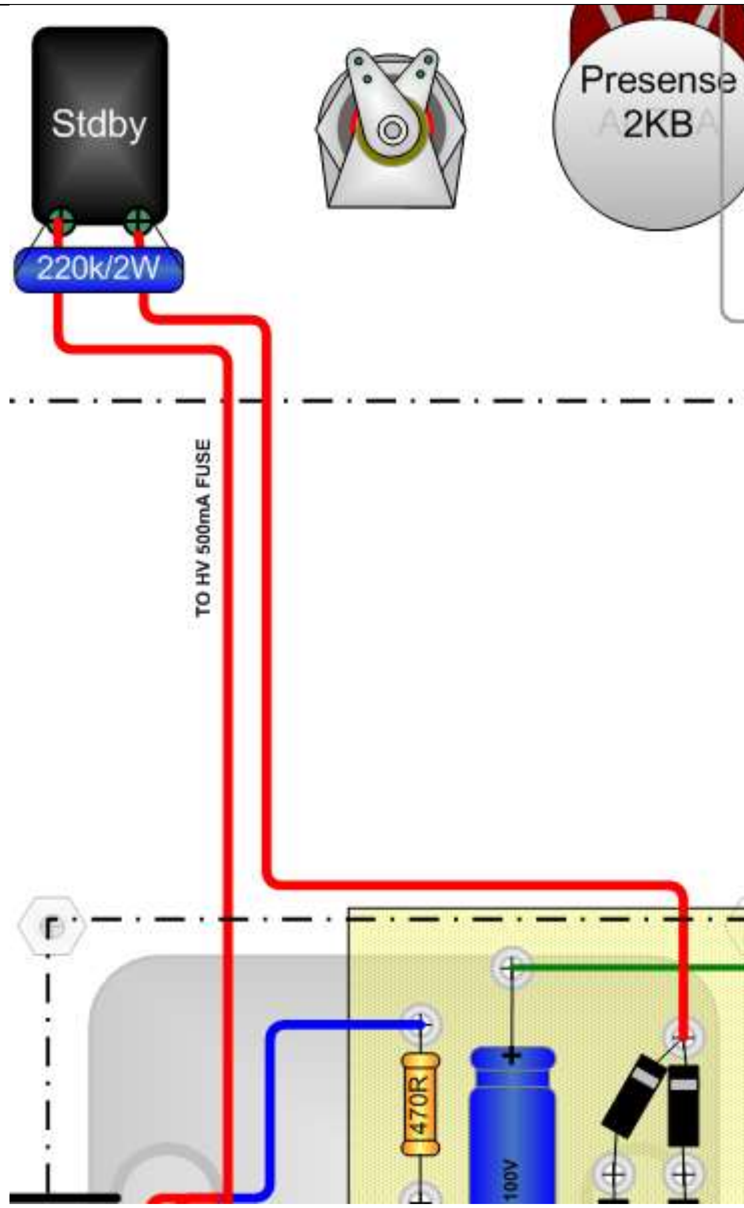
Twist and route the two RED HV 650VAC leads to the two RECTIFIER DIODE eyelets and solder them in place. Twist and route the BLUE/ RED 45VAC BIAS tap leads to the 470R voltage dropping resistor eyelet. and solder it in place.	

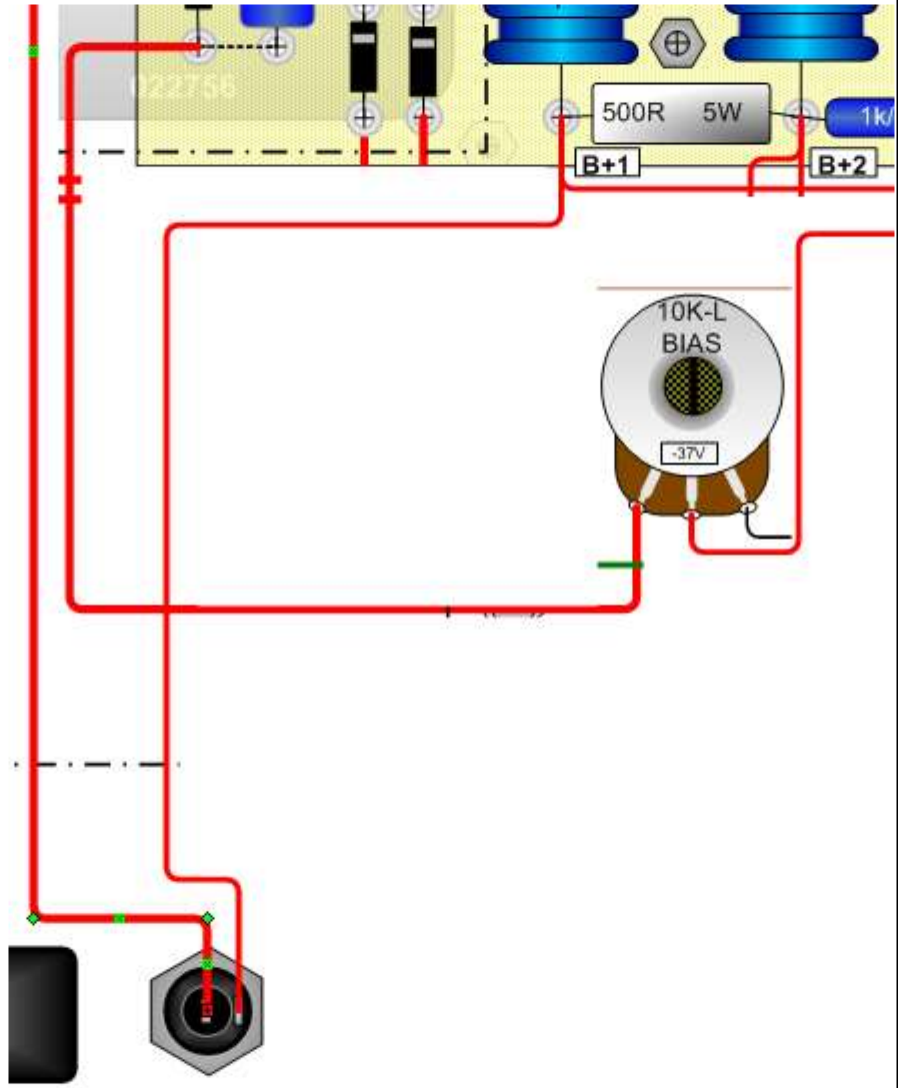
<table>
<tr>
<td>Locate the 220K/2W power resistor.

Install it between the two stand-by switch lugs.

Form and route a RED 600V HV lead from the last DIODE pair eyelet and one of the stand-by switch lugs.

Solder in place at the eyelet and switch.

Measure and cut a RED 600V HV lead from the other STANDBY switch lug to the HV 500mA fuse holder, end lug.</td>
<td>
</td>
</tr>
</table>

Route and install the RED 600V HV lead from the other STANDBY switch lug to the HV 500mA fuse holder, end lug. Measure and cut a RED 600V HV lead from the 500mA fuse holder, side lug to the 500R/100uF filter cap eyelet. Solder at the FUSE holder but wait until the final wiring of the OUTUT TRANSFORMER before soldering at the eyelet board. The OUTUT TRANSFOEMR HV lead needs to be iinstalled in the same eyelet. Route and install a wire from the eyelet that is connected to the NEGATIVE BIAS DIODE and/100uF filter cap to the 10K BIAS control, terminal 3. Solder in place at both ends. There should already be a wire from the BIAS control to the 220K/220K eyelet on the board.	

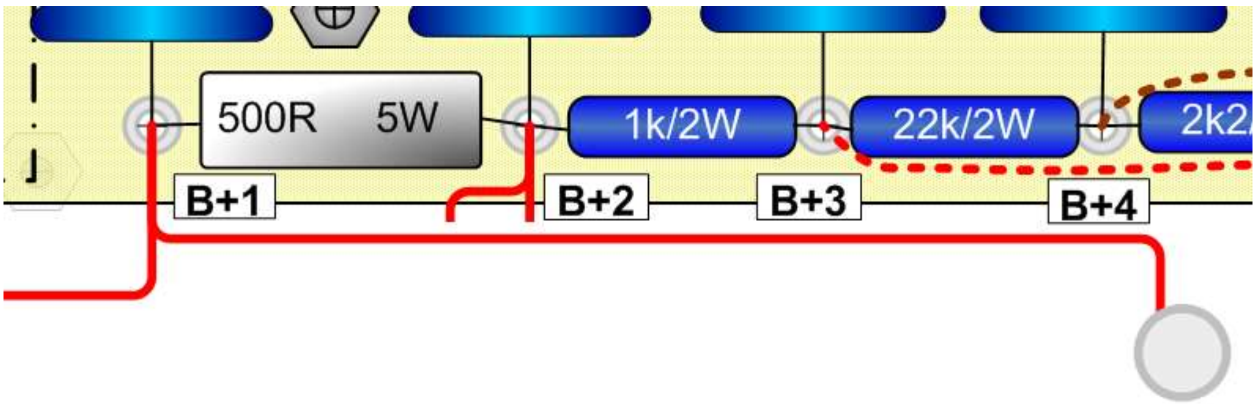
This completes the power transformer secondary wiring.

NOW <u>DOUBLE CHECK</u> YOUR WORK.

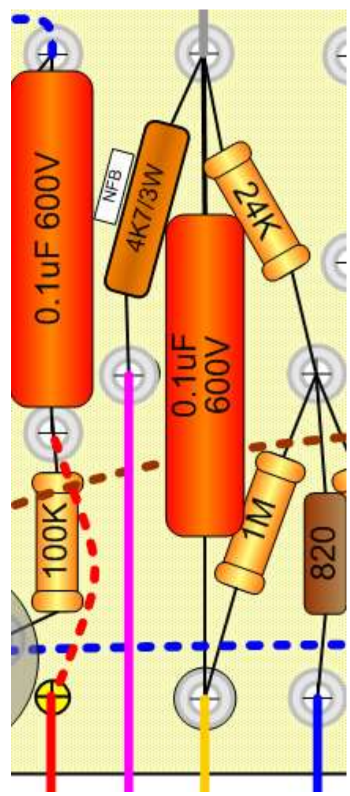
16 Complete Output Transformer Wiring

To complete the wiring of the output transformer all that needs to be done is to connect the RED HV Centre Tap lead to the B+1 node on the eyelet board and connect the NEGATIVE FEEDBACK (NFB) resistor to the impedance switch.

Route the RED HV lead to the 500R/100uF filter cap eyelet. And solder it on the board.



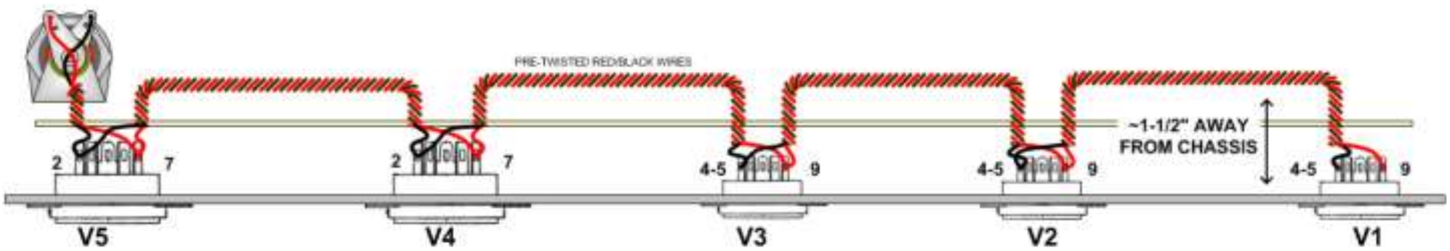
Run a wire from the 4 OHM tap for the NEGATIVE FEEDBACK (NFB) to the eyelet board 4K7 2W



17 Wire the Heaters

Heater leads "fly" above the tube sockets making neat right angle bends to connect directly to the socket pins. Finish off by connecting a twisted pair back to the two indicator light terminals.

For the heater wires, the pre- twisted 20 gauge wires connect to the pilot lamp socket and then to the terminals of the first Power Tube then the second Power Tube. From there, the wires daisy chain across the preamp tubes, keeping the colours of wires connected to the tube sockets consistent. . This phasing or 'polarity' on the preamp heaters needs to be maintained. The two power tube sockets also should have their heaters wired in the same phase (using the same colours) to reduce hum.



Use the pre-twisted 20 gauge wire to minimize any hum.

Solder a RED and BLACK wire to each lug of the pilot light assembly.

Route the twisted pair wire directly across the chassis to socket V5. Locate the centre of the socket and bend the wires at 90 degrees and cut them off at 2" long. Strip ½" of each wire and hook the BLACK lead onto V5, pin 2 and the RED lead onto pin 7.

Make a "U" shaped lead of pre-twisted wire that goes between V5 and V4 centres. Bend the ends 90 degrees and cut them off 2" long. Strip ½" of each wire and hook one end BLACK lead onto V5, pin 2 and the RED lead onto pin 7. Solder V5 pins. Hook the other end BLACK lead onto V4, pin 2 and the RED lead onto pin 7.

Make a "U" shaped lead of pre-twisted wire that goes between V4 and V3 centres. Bend the ends 90 degrees and cut them off 2" long. Strip ½" of each wire and hook one end BLACK lead onto V4, pin 2 and the RED lead onto pin 7. Solder V4 pins. Hook the other end RED lead onto V3, pin 9 and the BLACK lead onto pins 4 AND 5 together.

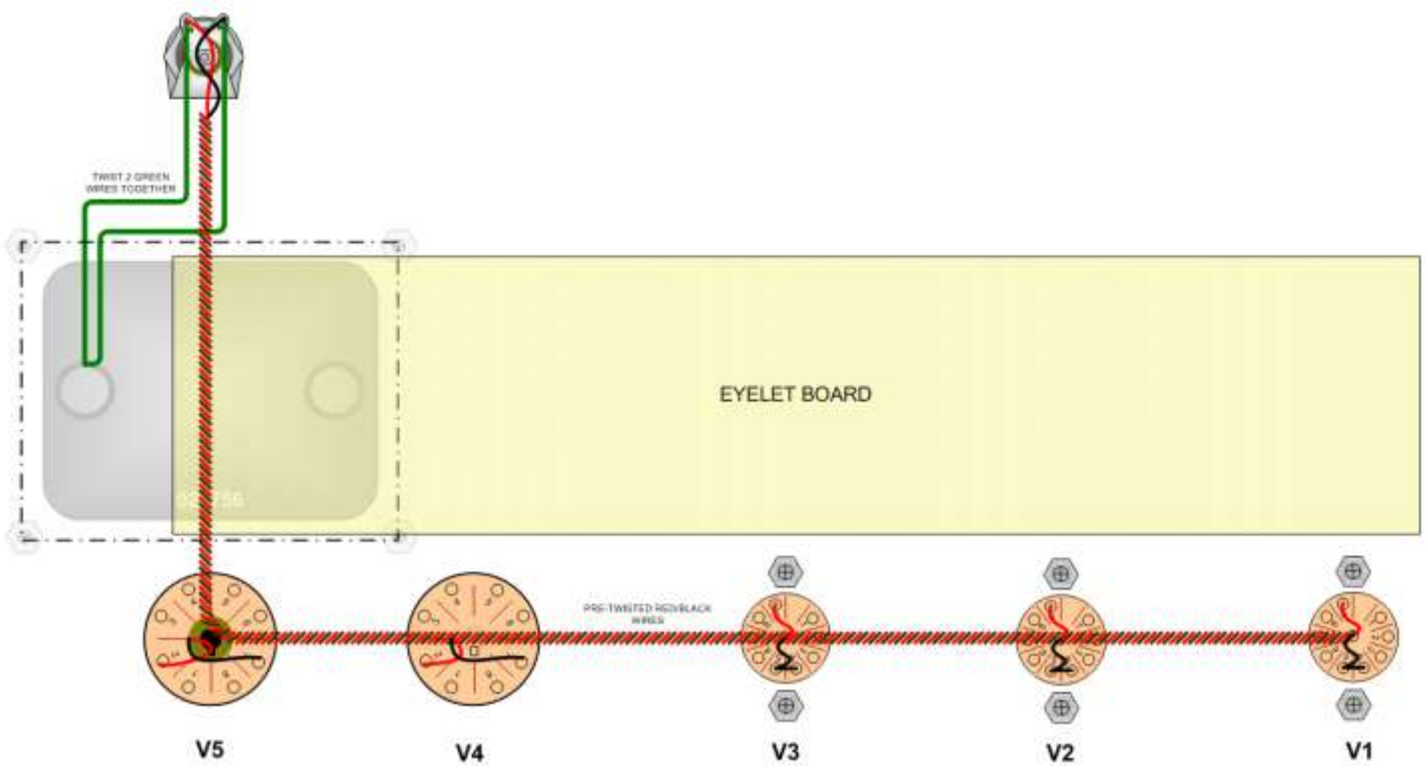
Make a "U" shaped lead of pre-twisted wire that goes between V3 and V2 centres. Bend the ends 90 degrees and cut them off 2" long. Strip ½" of each wire and Hook the other end RED lead onto V3, pin 9 and the BLACK lead onto pins 4 AND 5 together.. Solder V3 pins. Hook the other end RED lead onto V2, pin 9 and the BLACK lead onto pins 4 AND 5 together..

Make a "U" shaped lead of pre-twisted wire that goes between V2 and V1 centres. Bend the ends 90 degrees and cut them off 2" long. Strip ½" of each wire and Hook the other end RED lead onto V2, pin 9 and the BLACK lead onto pins 4 AND 5 together.. Solder V2 pins. Hook the other end RED lead onto V1, pin 9 and the BLACK lead onto pins 4 AND 5 together..

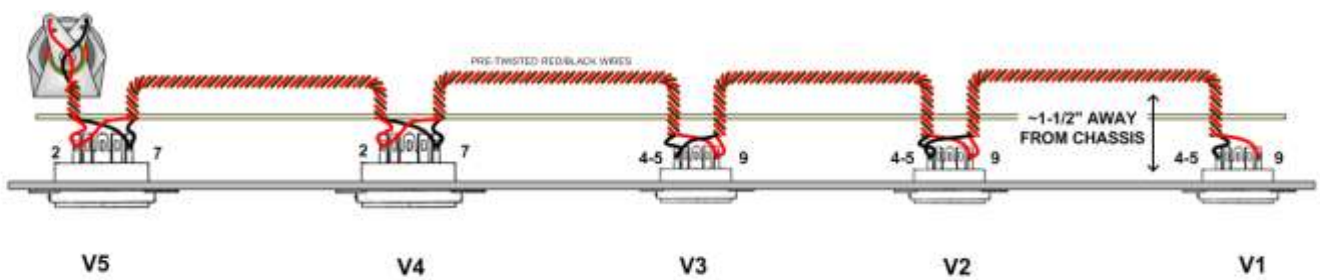
Neatly align all the heater wires.

When the heater wiring is complete it should look like the diagrams below with the fly-over connections.

NOTE. If you are installing the Buffered Effects loop, the Heater connections between V2 andV3 will need to be wired to lie down tight to the chassis to provide clearance for the FX PCB.



TOP VIEW



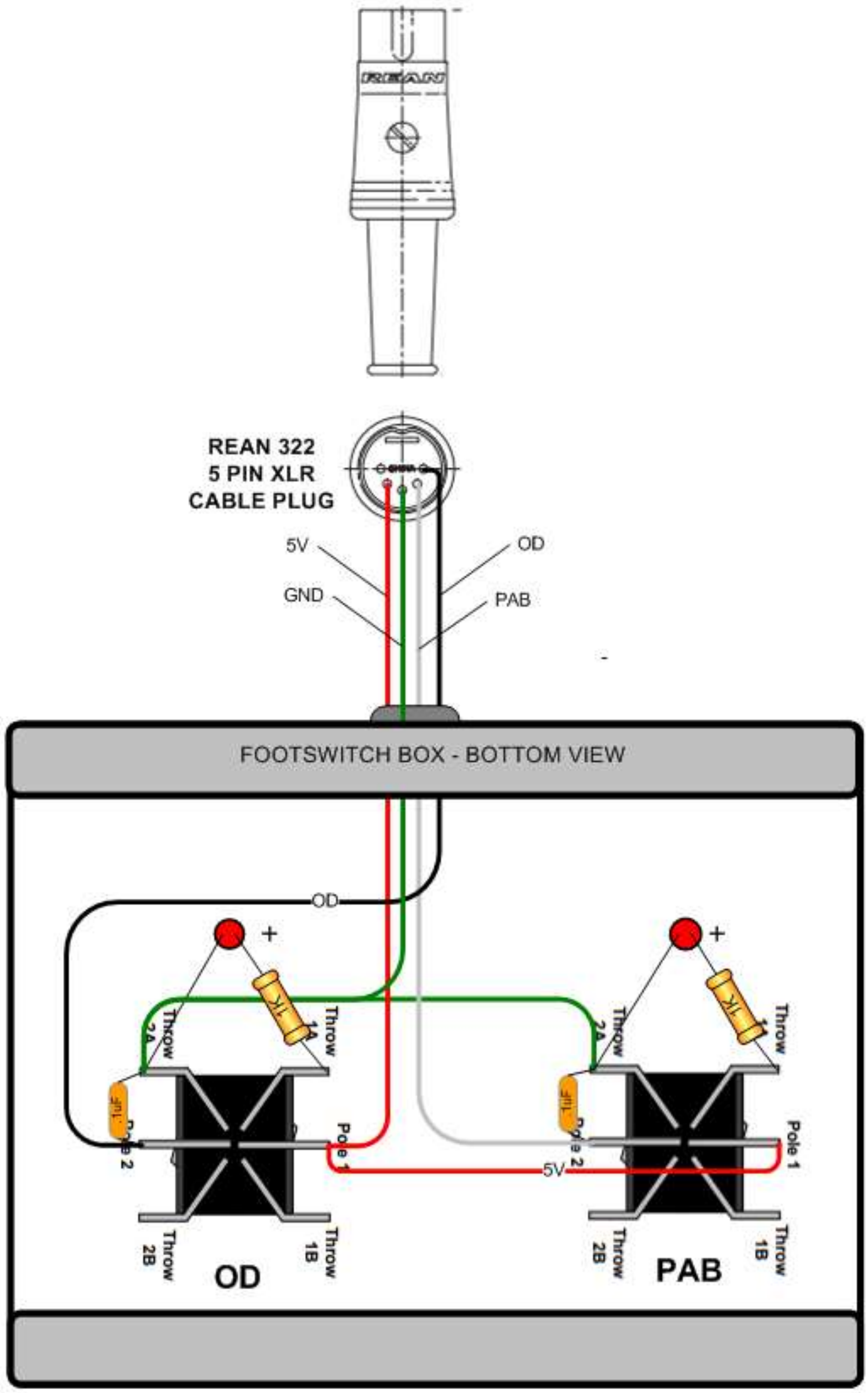
SIDE VIEW

18 Double Check.

Double check that all the connections are made according to the layout and the layout is neat, tidy and organized.

1. When you finish assembling the amp, double-check the wiring and the components against the check-print layout and schematic. Look for any 'missed' connections. i.e. those that weren't highlighted during your build.
2. Check the wiring and the components against the layout and schematic and any on-line pictures of "official" builds.
3. Test continuity for all the connections. 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! To test, touch each component's lead and touch the lead at the other connection.
4. Measure the resistances to confirm they are correct.
5. 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.
6. Make sure the Mains ground at the chassis is **very** tight.

19 Build the Footswitch Box, Cable and DIN connector.



Build the footswitch box, cable and DIN connector referring to the layout.

Remove 4 screws and disassemble the provided Footswitch Box.

Strip the inside of the box EXCEPT only disconnect the LEDs for reuse.

NOTE: BE CAREFUL WHEN HEATING THE FOOT SWITCHES AS TOO MUCH HEAT WILL DAMAGE THEM!!

Strip the 5-conductor cable 6" at one end, 1"a t the other end and bare the internal conductor.

Feed the new cable through the box and connect the leads as shown. There are 5 conductors and you need to use 4. So wrap the unused brown conductor around the core at each end.

Disassemble the REAN 322 PLUG so you can solder the terminals inside.

Feed the 5-conductor cable through the jack body. Cut off the brown conductor.

Connect the PINs as shown in the layout.

Connect the 0.1uF capacitor across the lugs as shown in the layout.

Test for correctness against the layout

Reassemble the plug. *You may use some heat shrink on the cable at the jacks/plugs for robustness, prior to installing the plug.*

Reassemble the box with the 4 screws.

Test using amp without tubes. When pressing the OD switch, the OD LED on the RELAY board should illuminate. Same for PAB and for BOTH when pressed.

If this does not work as expected, then review and correct the installation errors.

20 Start-Up Procedure

Working Inside A Tube Amplifier Safely

Working inside a tube amplifier can be dangerous if you don't know the basic safety practices. If you aren't prepared to take the time to learn and apply the right precautions to keep yourself safe, don't work on your own amp. You can seriously injure yourself or get yourself killed.

Unplug Pretty self explanatory. Do not, ever, ever, leave the equipment plugged in and start work on it. Leaving it plugged in guarantees that you will have hazardous voltages inside the chassis where you are about to work.

Sit If the amp has been turned on recently, the caps will still have some high voltage left in them after the switch is turned off. Let it sit for five minutes after you turn it off.

Drain When you open up an amp, you need to find a way to drain off any residual high voltage. A handy way to do this is to connect a shorting jumper <u>between the plate of a preamp tube and chassis ground</u>. This jumper will drain any high voltage to ground through the 50k to 100K 2W plate resistor on the tube. To do this successfully, you will need to know which pins are the plate pins. Look it up for the amp you're going to be working on. You'll need to know this for the work anyway. Leave the jumper in place while you do your work. Remember to remove it when you finish your work. You can also permanently install a 220K 2W resistor on the B+ line to chassis ground to do this.

Test Take your multimeter and ground the negative, black lead to the chassis. With the positive, red lead, probe the high voltage cap terminals or leads and be sure the voltage across them is low. Preferably to less than 10V.

Close First take the shorting jumper out. Put the chassis back in the cabinet, making sure all of your tools, stray bits of solder, wire, etc. are out of it. You don't have to actually put all the screws and so forth back in if you believe more work might be needed, but make sure that the chassis is sitting stably in the cabinet and won't fall out.

First note that most meters have three input jacks (some have four) one is marked COM, the BLACK lead goes there. Another jack is marked V, ohm, mA, the RED lead goes there for most measurements. The third jack is a high current jack usually marked 10ADC (sometimes it is 20 or some other number). This jack is used only for high current measurements. The four jack models use separate jacks for current measurements, this makes accidentally setting the meter to a current mode harder, but it still can be set to resistance. For vacuum tube electronics we can usually ignore the high current mode. Put your test leads into the COM and V(ohm)mA jacks and leave them there.

Making a Voltage Measurement

Before attempting to make a voltage measurement, think about the anticipated result.

- Is this a DC or AC voltage?
- How much voltage will be present?
- If things are not working correctly what is the highest voltage that I might find?

A voltage is ALWAYS measured between TWO points. Is one of those points CHASSIS GROUND? This is the most common case. If not, can you make a different measurement such that one of the measurement points IS GROUND? If your measurements are all referenced to CHASSIS GROUND, you can then connect the black lead (Negative or Common) to the CHASSIS with a clip and probe the other test point with the RED (Positive) lead.

1. Set the selector switch on the meter to the range that is higher than the maximum anticipated voltage of the appropriate type (DC or AC). If the maximum anticipated voltage is not known, set the meter to the highest range available.
2. Wherever possible connect the meter into the circuit when the circuit is OFF, then power up the circuit without touching anything.
3. Read the meter. If the reading is lower than the next available lower range on the meter you may set the meter to a lower range while the circuit is on. When doing this touch ONLY the meter with ONE hand, and be careful to only lower the meter one range, allow the readings to stabilize (2 or 3 seconds) before proceeding further.

Note: Accidentally setting the meter to a current or resistance range can damage the meter, and the circuit it is connected to. If the circuit has sufficient power the meter can explode or burst into flames. I know from experience that this will happen if you try to measure the resistance of the wall outlet. Most modern meters are "fuse and diode protected" this is to prevent fireworks, but will not usually save the meter from an overload of this magnitude.

Discharging the Power Supply

If you need to service the amp after having it on, you must "discharge" the power supply capacitors. This is done by unplugging the amp, turning the power to the on position and letting it sit for 60 seconds or so. The 150K 2W resistor will drain the supply in about 60 seconds but always use a multi-meter to check the residual B+ voltage in the large filter capacitors to make sure it is fully discharged.

REMEMBER: DO NOT OPERATE YOUR AMP WITHOUT A LOAD

NOTE: On first power-up, we recommend you make and use a bulb limiter (or variac if you have one). It will keep you from destroying some very expensive parts if there is any problem with your amp. Typically use a 40W to start with.

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.

1. Complete all the basic circuit checks already mentioned before soldering the transformers into the rest of the circuit. **If you haven't performed the Power transformer test, go back and do it now.** If you've already soldered in your trannies, take a minute to desolder the secondaries from the rest of the amp and go back and test them.
2. Install a 2 AMP SLO BLO GMD fuse and 500maA SLO BLO HV fuse.
3. Plug in the foot switch.

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

4 **THIS IS IMPORTANT**: Before powering up **INSPECT DIODES & 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!

5 With the Bulb limiter in circuit, and **NO TUBES INSTALLED**, power up the amp and watch the following things as quickly as possible and roughly in this order:
   a. pilot lamp comes on brightly; and
   b. Test the 6.3 AC filament voltages and ensure they are on the correct pins for all tubes. Remember this is AC voltage, not DC so set your meter accordingly

6 Power down. If any of these tests did not happen find the problem by looping back to the beginning of this checklist.

NOTE: B+ MUST be discharged to safely continue messing with the amp guts. The included bleeder resistor will take at least a minute to bring B+ down to safe levels.

7 Without any tubes installed, hook your DC voltmeter between B+1 and ground. Power up 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, 650VAC across the full secondary in the above steps, then each half is delivering 325VAC. B+ will be ~40% above this, which is ~450VDC.
   a. Check for high voltage DC at all the filter caps.
   b. Check for high voltage DC at all plate resistors including the preamp.
   c. Check for negative DC voltage on the bias pot wiper. In the negative 40VDC range.

8 If all is well, check that B+ is at the OT on all 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. 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. Make sure the negative voltage is being generated and check that it gets to the power tube grids and is adjustable with the bias pot.

9 If everything checks out, turn the amp off and wait for the caps to drain. (Since there are no tubes installed, the caps take a little longer than usual to bleed down.

KEEP IN MIND that every time you power up from now on that B+ will be high. In all the following, allowing B+ to bleed at each power down is implied.

10 Final Power-Up INSTALL THE TUBES 3 – 12AX7 AND 2 – 6V6

a. Set the tube selector toggle switch to select your type of power tubes - 6V6.
b. Adjust all controls as follows:

Vol – 7:00 (off)
Treble, Mid, Bass – 12:00
OD Drive and OD Level – 9:00
Master – 7:00 (off)
Presence – 12:00
10K bias control pot all the way down (fully anti-clockwise)
5K on-board PI trim in centre position

11 Connect a speaker (or speaker load) to the speaker jack.
12 Turn on the amp and wait a minute for the tubes to warm up.
13 Switch the amp from Standby to ON.

Using a DMM, insert the BLACK (negative) test probe into the BLACK bias test point jack. Put the other into the RED bias test point jack. check and slowly move the pot with a small screwdriver until bias current is 18-22mA. (The bias taps convert mA to mV so you'll be reading on the millivolt scale. The readings are as follows:

6V6 Bias	15 ma min	23 ma max
6L6 Bias	30 ma min	40 ma max

With the bias set correctly, you can 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.

14 Check plate and screen voltages at the power tubes. You should see about 440VDC on the plates and 435VDC on the screens.
15 Check plate voltages at the phase inverter. You should see about 305VDC. (This will vary depending on the tube and may range between 300 and 315VDC on either plate.)
16 Check plate voltages at V1 and V2. V1a will be about 212VDC, V1b will be about 209VDC, V2a about 216VDC, and V2b about 219VDC. Cathode voltages will be in the 1.7VDC range.

You should be able to hear a little hiss or hum from the speaker. Hopefully this is at a low level, requiring your ear up next to the speaker to tell (make sure the Overdrive control is pushed in –i.e. Off). If hiss and hum is loud at this point, there are problems. If there is dead silence, something is likely wrong, too.

17 Plug in your guitar and turn the Vol control to 12:00. Listen for any unusual noises. There should be no volume from the speaker since the Master is still turned off.
18 Gradually turn up the Master while strumming the guitar. At 9:00 the volume should be reasonably loud. .
19 Check various switches for correct operation…Bright, OD, PAB footswitch. .
20 With the amp in the OD position, turn up the OD Drive control to achieve desired level of OD. Note that the Vol control has a lot of effect on the OD level

If all has gone according to plan, you should be grinning from ear to ear by now! Congrats!!!

If you have any problems, get on the forum and get some help. Don't get frustrated. Most start-up problems are relatively simple mistakes. Go back to the Double-Check part of the build.

Quick OSD Setup

1. Plug your guitar using a 1/4" instrument cable into the INPUT on the far left of the front panel
2. Plug a suitable power cable from the OSD's rear panel MAINS cable inlet to your wall power receptacle
3. Plug the OSD into your speaker cabinet using 1/4" speaker cable
4. Set the IMPEDENCE selector to the match the impedance of your speaker cabinet
5. Plug the OD Switch cable into the FOOT PEDAL jack on the rear panel of the amplifier
6. Set the OD TRIM control on the rear panel to 1/4
7. Set all rotary controls on the front panel to middle position
8. Turn MASTER control to 1/4
9. Set front panel MID BOOST switch in the UP position (ON)
10. Set front panel ROCK / JAZZ switch in the DOWN position (ROCK)

11. Set front panel POWER switch in the upward ON position (with adjacent switch to STANDBY) for 30 seconds to allow tube filaments to warm up
12. Set front panel STANDBY switch upward to the ON position
13. Play!

Using the OSD Controls

PRESENCE adjusts the high frequency response of the power amplifier using negative feedback. Use this control to add sparkle and clarity to your tone.

MASTER sets the overall volume of your amplifier.

RATIO serves a sort of volume control for the overdrive channel. However, just like this version of the original amplifier, there are not individual master volume controls for the clean and overdrive channels. Instead, the RATIO control serves to balance out the volume of the overdrive channel with the clean channel.

LEVEL adjusts the amount of gain, and in turn distortion in the overdrive mode.

BASS adjusts low frequencies in your amplifier for both clean and overdrive modes.

MIDRANGE adjusts the mid frequency response for both clean and overdrive modes.

TREBLE adjusts the high frequency response for both clean and overdrive modes. At near-maximum settings, you may also notice an increase in gain.

ROCK / JAZZ adjusts the overall frequency response and voicing of the amplifier. ROCK has a fatter midrange and a deeper, spongier bottom end. You might find ROCK more familiar territory. JAZZ tightens up the bottom end and adjusts the contour of the midrange, giving the amplifier more of a hi-fi response. Experiment with both, as great sounds rest in each. With the toggle switch in the UP position, JAZZ is on. In the DOWN position, ROCK is on.

MID BOOST is a midrange-frequency boost. You can use this to add fatness to your clean or overdrive tones, or even make single coil guitars sound thicker and less scooped. We particularly like **MID BOOST** with the overdrive mode. With the toggle switch in the DOWN position, MID BOOST is on. In the UP position, MID BOOST is on.

VOLUME adjusts the signal strength coming out of the tonestack, and going into the second tube stage. Think of this as a gain control primarily for your clean channel, but note it will impact the overdrive mode as well.

BRIGHT is a high-frequency boost that can be used to add sparkle to your tone in both clean and overdrive modes. This high frequency boost is more prominent as VOLUME is turned down. To engage this feature, pull out the VOLUME control. To turn BRIGHT off, push the VOLUME control inward.

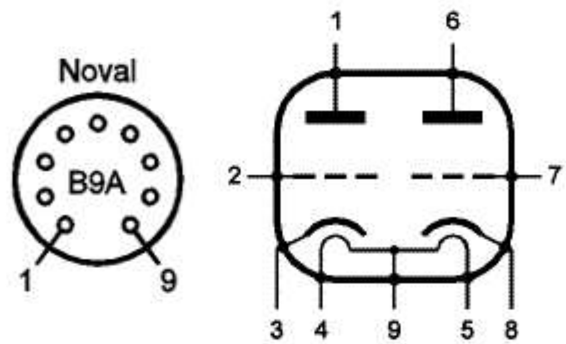
OD TRIM. This control adjusts the signal strength sent to the first tube in the **OVERDRIVE** channel. Lower settings yield more touch-sensitive, lower gain sounds. Higher settings are more compressed, higher gain, and more harmonically complex. Start with the control between 10:00 and 12:00 but experiment for your own tone.

FOOT SWITCH 5-pin DIN female jack is used to connect the foot switch to the amplifier. Use the foot pedal to control the OVERDRIVE and (PAB) PREAMP BOOST modes.

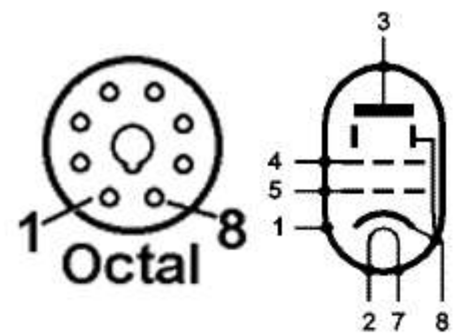
Trinity Amps OSD OSD 6V6 Voltage Chart

AC Mains Voltage 120VAC;B+ 460 VDC no tubes; With Tubes:
B+1 441 VDC; B+2 440 VDC; B+3 434 VDC: B+4 333 VDC: B+5 320 VDC

6V6 Bias	22 ma @ -41VDC Bias Voltage	



12AX7



6V6 / 6L6

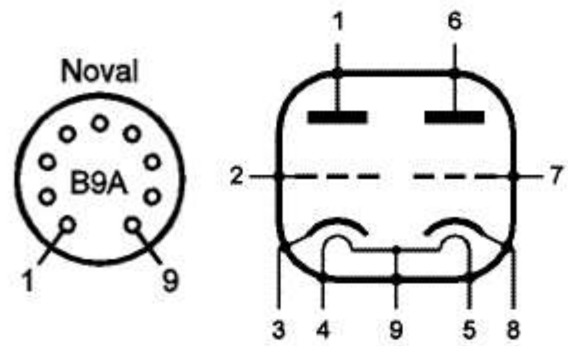
TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1 - PRE (12AX7/ECC83)	212	--	1.7	--	--	209	--	1.8	--
V2 - OD (12AX7/ECC83)	216	--	1.7	--	--	219	--	1.7	--
V3- PI (12AX7/ECC83)	301	41	67	--	--	308	43	67	--
V4 6V6	--		441	440	--	--		--	
V5 6V6	--	--	440	440	--	--	--	--	

* Varies with bias pot setting

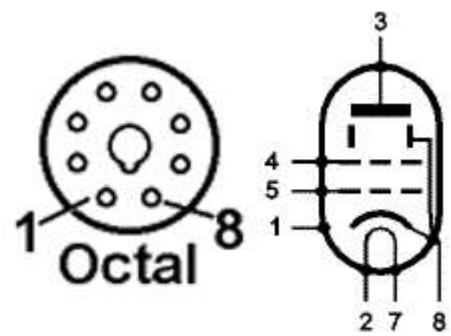
Trinity Amps OSD 6L6 Voltage Chart

AC Mains Voltage 120VAC;B+ 460 VDC no tubes; With Tubes:
B+1 440 VDC; B+2 436 VDC; B+3 427 VDC: B+4 328 VDC: B+5 323 VDC

6L6 Bias	35 ma @ -47VDC Bias Voltage	



12AX7



6V6 / 6L6

TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1 - PRE (12AX7/ECC83)	210		1.7	--	--	208		1.7	--
V2 - OD (12AX7/ECC83)	214		1.7	--	--	217		1.7	--
V3- PI (12AX7/ECC83)	298	40	66	--	--	305	43	66	--
V4 6L6	--		437	435	--	--			
V5 6L6	--	--	436	435	--	--	--		

* Varies with bias pot setting

WARNING

Read This Information Carefully

There Are Voltages Inside This Amplifier In Excess Of 450 VDC.

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

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Builders Guide General Troubleshooting

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

Tone T weaking

Adjust the PI TRIM POT to get maximum "bloom' when played.

Method:

NOTE: This may be difficult to achieve if the PI is not a matched triode tube. The objective is to get a slight imbalance on the PI plates.

1. Set the trimmer for a 6.5 volt difference (I like the input side as the higher plate). Set the amp clean (no boost, no mid boost, no overdrive, no bright) with all the appropriate controls at noon. Use a neutral sounding guitar on both pickups with it's volume(s) and tone(s) on 10.
2. Play these single notes on the 3rd,4th,5th frets of the B string - a D, E flat E. Let each ring out before playing the next one (no finger vibrato please). In an ideal world they should all bloom equally.
3. If the E blooms but not the D move the trimmer to make the input side lower by a half a volt. Fine tune to taste by ear.
4. Most of the time the 6.5V is near perfect, have seen some amps do this better at a 3 volt difference but it's less common in my experience.

By default the R-C network is inserted itno the signal path with no Fx plugged in and removed when the Fx is plugged in.

If you want it to be connected when the Fx is inserted, connect the return cable to the switch lug (middle) of the SEND jack.

GENERAL DUMBLE TWEAKING

Once you get you amp working, there are plenty of things to experiment with:

The value of the small cap in the tonestack (300pF on the standard layout) is very critical. 250pF is the Fender value - sounds somewhat thin in the Dumble. 500pF is a significant boost in the mids - amazing sustain, but VERY middy tone.

Play around with the feedback. The NFB loop on the second preamp stage is really what gives the amp its character. The negative feedback loop in V1b is crucial to the sound. 0.047uF/44M works well there. 0.047uF/22M tightens up the sound and feel even further, but it's overkill for my ears. Removing this feedback loop gives the overdrive a more compressed, Boogie-ish character. Something you might want to make switcheable, but be sure to put the switch on the grid side of the capacitor or you might end up with high voltage on the switch.

Early Dumble amps used Fender values for the preamp plate and cathode resistors (i.e. 100k and 1k5). Raising these values to those used in the 90's era Skyliner amps helps to add smoothness, although you might get even better results by experimenting with variations, like 2k7 or 2k2 instead of 3k3 for the cathode resistor, and 120k, 150k, 180k or 220k for the plate resistors. You might also try determining the bias current for each preamp stage by measuring the voltage drop across the plate resistor and dividing it by the value of the resistor; many people like the sound and response of a tube stage biased at roughly 0.75mA.

The earlier amps used 5uF cathode resistor bypass caps instead of the typical 25uF caps used in many Fender designs. The OSD uses 10uF on V1 and 5uF on V2. By using the smaller caps, there is less of a chance of getting a "farty" bass response. A further improvement can be achieved by adding a small 1.0uF poly cap in parallel with the 10/5uF electrolytic cap (or use a 4uF e-cap if you can get them). Using 5uF cathode bypass caps for all four preamp stages can make the sound a bit bass heavy, so it is suggested that you replace one of the 5uF caps with a 1uF poly cap to keep the bass response under control. You can try using the 1uF poly cap by itself on the second Clean stage or the second OD stage.

Changing the coupling caps after the various stages can also fine-tune the sound to your tastes. Using a 0.047uF coupling cap instead of 0.01uF after V1b will improve the bass response of both the Clean and the OD channels.

Using a 0.005uF coupling cap after V2b (as in OSD) seems to improve the blues tones from the amp, while the 0.01uF cap is good for a thicker rock sound.

There are many possibilities for the coupling cap after V2a as seen in different D-ODS amps and clones. The 0.01uF value used in the OSD could be increased to 0.022uF for a fuller OD signal, although the Skyliner amps decrease the value to 0.0022uF.

The tone stack

Increasing the 100k slope resistor to 150k (as in OSD) makes the tone stack work more effectively, and you can also try replacing the audio taper 250k treble pot with a linear taper 250k treble pot (as in OSD).

The 0.01uF Middle cap (as in OSD) is replaced with a 0.05uF cap in the Skyliner, which improves the midrange response. The 100k linear taper Middle control was replaced with a 250k audio taper pot (as in OSD) in the Skyliners, which allows for more mids at the higher settings.

Increasing the 250k audio taper Bass control to a 500k audio taper pot (as in OSD) is recommended, along with replacing the 1k8 resistor to ground from the ccw terminal with a 10k resistor (as in OSD). The later designs also add a cap between the two outer terminals on the 500kA bass pot; 0.001uF seems to work quite well. All of these changes seem to improve the sound of the amp and the response of the tone stack..

The midrange boost was added by selecting between two values for the treble capacitance. The OSD adds a second cap wired in series, with the second one optionally bypassed with a switch. With the switch open the two capacitances are summed together using the same basic formula as two resistors wired in parallel (i.e., CTOTAL = C1*C2/C1+C2). So with a .0022uF cap followed by a 390pF (300pF in OSD) cap, the net capacitance in the unboosted mode is approximately 330pF; with the switch closed, the full value of the first cap becomes the boosted value. While the later D-ODS amps use a .0022uF cap followed by a 390pF cap, many people think that the midboost is too extreme, in which case you might want to try two 500pF caps wired in series or a 500pF cap followed by a 1000pF cap. With the first alternative, the unboosted value would be 250pF and the boosted value would be 500pF (for a more subtle tonal shift effective for both Clean and OD modes). With the second alternative, the unboosted value would be 333pF, closer to the stock value used in many of the D-ODS amps. As for the composition of the treble caps, ceramic seems to work better than dipped silver mica for those values of 1000pF or less; if you use the 0.0022uF treble cap, you should use poly rather than ceramic.

The footswitchable preamp boost used in the later amps is an effective addition. This preamp boost is achieved by essentially bypassing the tone stack; the connection from the CCW treble pot terminal to the bass pot is interrupted to remove the bass and middle pots from the signal going to the first volume control. Unlike a full bypass switch, some of the signal is bled to ground through the bass and mid caps, which makes the boosted sound much more usable

It should also be noted that the Rock/Jazz switch are very effective for both the Clean and the OD modes; in the Jazz mode the bass and mid frequencies are cut a bit, for a sound more like the jazzy C&W guitarists than the traditional jazz guitarists like Wes Montgomery or Kenny Burrell. For a more traditional jazz sound, the Deep switch used only in the 70's amps will cut the high frequencies a bit, along with a very noticeable reduction in overall signal level. If you have a spare switch available, you might try hooking up the Deep switch to see if you like the effect. While the stock 70's design shows a 500pF Bright cap across the ungrounded terminals of the initial volume control, many people think that value is way too high and you might try something like 220pF or 270pF.

Two revisions that will brighten up the sound a bit. The 220k series resistor after the initial volume control and going to the grid of V1b can be bypassed with a 390pF cap (500pF in OSD) as it is in the Skyliner design to give more definition to the Clean and OD sounds.

Another revision involves the local feedback loop at V1b consisting of 2- 22M resistors and a 0.047uF cap. The 44M resistor can be replaced with a 32M or 22M resistance to thicken and open up the sound. (Add a 10M resistor in series with the 22M to get 32M; add two 22M resistors in series to get 44M.) Wire the cap to the V1b plate to keep the high voltages from the resistors (which are generally available only as 1/4 watters these days). In the Skyliner design the local feedback loop has been eliminated, possibly to maximize the signal level from the two Clean stages.

Much has been hypothesized about adding tone shaping components to smooth out the sound. However, in adding a cap to ground to bleed off some of the high frequency content, the sound can become compressed and muddy. So it is suggested that you keep the tone shaping components as simple as possible.

The 500pF caps from the plates to the cathodes of the two OD stages are there to eliminate oscillations and to mellow out the sound a bit. You can try smaller caps like 350pF or 250pF (as in ODS) to give the OD sound a little more presense. Since some of the oscillations can be higher than the audio frequencies you may need a scope to confirm that they are in fact not there.

The final suggestion for shaping the tone sounds too simple to have much of an effect but it may in fact be the "internal high-frequency taper control". After the coupling caps for V2a and V2b, try wiring in a 500k trim pot as a variable resistor ahead of the 100k ratio and level pots. The 70's drawing shows a 100k series resistor here; replace that resistor with the trim pot. There is no series resistor shown after the V2b coupling cap so insert the 500k trimmer in the circuit ahead of the 100k OD level control.

The series resistance after the V2b coupling cap has a very drastic effect on the overall sound of the OD section. With no resistance at all, the OD section can sound very harsh and brittle. Adding in a 150k resistance for a 0.01uF coupling cap, or a 330k resistance for a 0.005uF coupling cap seems to work really well in shaving off some of the high frequencies while leaving plenty of definition in the sound. But with the 500k trim pot in there (at least temporarily) you can determine the "sweet spot" for your own amp. Once you find the value you prefer you can hard wire in a fixed resistor (or combination of resistors) for that particular resistance.

The series resistance after the V1a coupling cap has a more subtle effect on the sound of the OD section, and the "sweet spot" worked out to around 105k (very close to the 100k resistor used in both the 70's and 90's designs). However, you are encouraged to try the 500k trim pot here since your own amp may be tuned a bit differently. Set the trimmer to 91k and 82k to make the sound a bit brighter, and improve the blues tones. For an "ultra-smooth" sound, try setting the trimmer to roughly 220k.

Try playing with feedback on V1a, in addition to V1a. You can split the cathode resistor and only bypass part of it. Try a 150K plate resistor with a 2K pot with one end connected to the cathode, the other end connected to ground, and a 4.7uF cap between cathode and wiper. That way, you can control the first stage's negative feedback and gain.

~parts extracted from fender forum

General Tips for fine tuning your amp

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.

Appendix 1 - Running 6L6 Tubes in the OSD

The 6L6 power tube can work in the OSD. The VARIABLE IMPEDANCE switch works by connecting second 4K impedance winding to the 6L6 to better match the tubes to the output.

1. Turn the amp off.
2. Replace the 6V6 with 6L6
3. Put the VARIABLE IMPEDANCE switch to the 6L6 setting.
4. Carefully set bias of the 6L6 setting to get around 35 mA/mV max. on the power tubes.

Calculating Power Tube Bias

To calculate bias, there are two pieces of information you need to know: Your amplifier's power tube plate voltage, and the published value for maximum plate dissipation for the power tubes used in your amplifier.

NOTE – ***Plate voltage is measured between pin 3 of the POWER tube and ground***.

Maximum plate dissipation for 6V6s = 14W

The formula for calculating bias is as follows:

$$\frac{maximum\ plate\ dissipation}{amplifier\ plate\ voltage} \times percent\ of\ max.\ dissipation \times 1000 = bias\ current\ (mA)$$

In most cases, amplifiers are biased between 50% and 75% dissipation. We suggest a bias for the OSD to approximately 23mV-25mV reading on a DMM.

As an example: $\frac{14W}{380VDC} \times 70\% \times 1000 = 26mA$

You might wonder why your DMM is set to millivolts and not milliamps – simply, we have a 1 Ohm resistor placed between the probe jacks and ground to convert a current reading to a voltage reading across the resistor. That way, a bias current of 24mA measures as 24mV on your DMM.

NOTE – Only set your DMM to mV for measuring bias on the OSD amplifiers. Not doing so may damage your DMM.

Appendix 2 - Installing the Tube Buffered Effects Loop

Installing this module will require you to work with high voltage. Previous experience with tubes and/or tube amplifiers is mandatory. It's recommended to have the module installed by an amp technician.

See also latest doc on our support page **Tube Fx Builder's Guide**

The install requires you to connect an Input, Output, Ground, High voltage (B+) and Heater Voltage. Use shielded wire for In and Out connections. The Fx board should be inserted between the preamp and phase inverter. Typically, just before a PI input.

Ensure that that the proximity of the Vacuum tube to components is no less than 1/4" . At that distance, the temperature of the component will reach a safe 40 degrees C which is less than half the typical temperature allowed.

1. Input IN Should come from the output of the preamp stage. This may be before or after a Master volume or after the Treble control. Use coaxial cable to connect and connect the shields to the single Fx board ground point.

2. Output OUT Should go to your master volume if available or directly into the phase inverter input. Use coaxial cable to connect and connect the shields to the single Fx board ground point. Only ground one end of the cables.

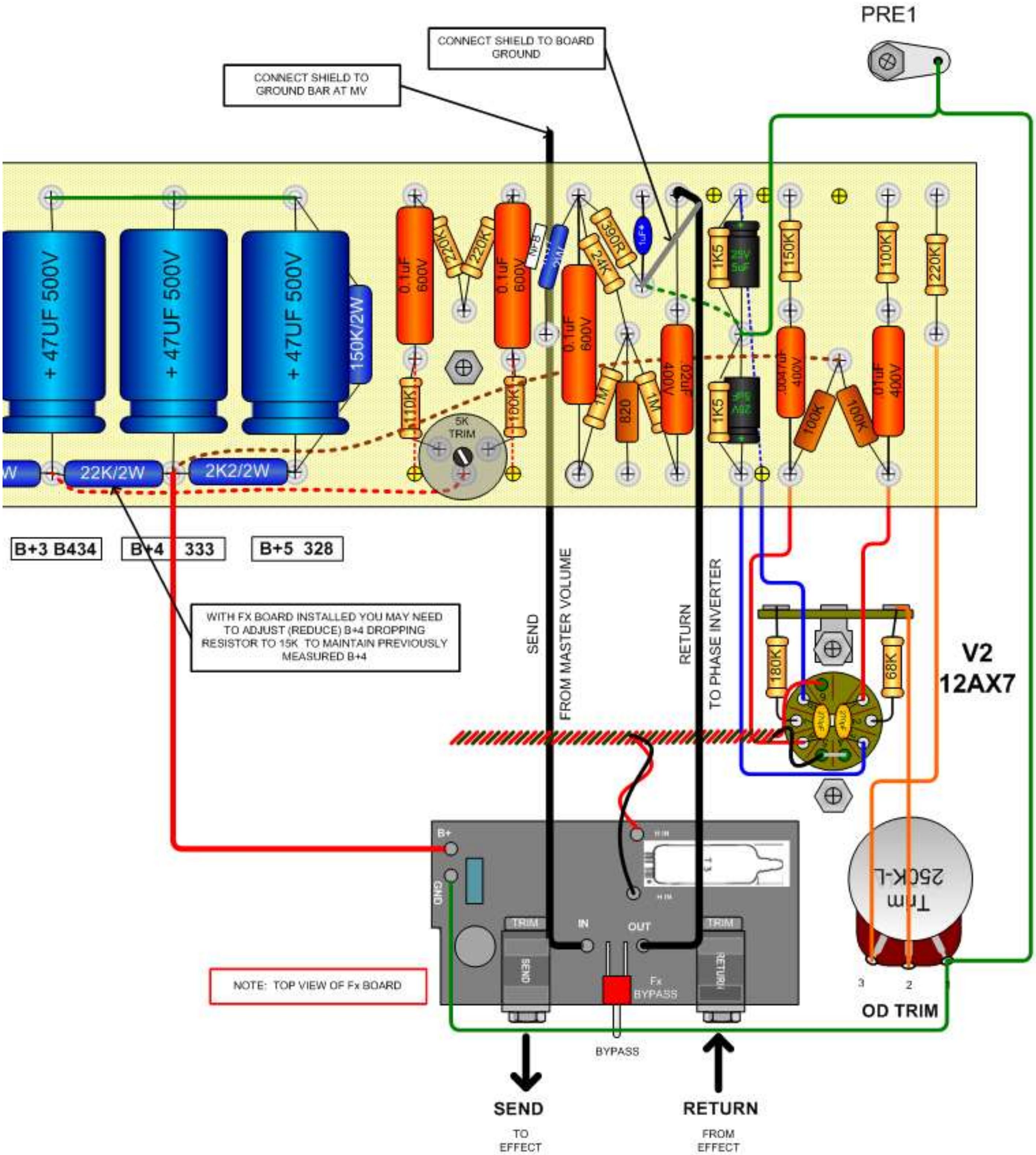
3. Ground GND Should be connected to your phase inverter ground or to the ground point associated to where you took your B+ from. It is also used to ground shielded cable from input and output. Only ground one end of the cables. Ground to same section of circuit you connected your B+ to.

4. High voltage B+ It's recommended to connect to the same section feeding your phase inverter tube or the last preamp tube. Voltage must be at least 200V up to 450V. The Fx design has a built-in voltage regulator that sets the voltage for the tube and plate voltage for longer tube life. However, before connecting the Fx board, measure and record the B+ voltage you will be using for the Fx board.

5. HEATER VOLTAGE This tube only works with 6.3V AC or DC. Do not use 12.6V! Wires for this voltage are connected to holes on sides of tube. If using 6.3VDC, positive can be on either side.

Connect twisted heater leads from a nearby tube socket. Always keep the leads close to the chassis to eliminate induced hum and noise.

Note: Turn the amp on and if equipped with a Standby switch, place in Play mode, ensuring that you have an adequate load connected to the speaker jack. Measure the B+ Fx board voltage again, and compare to the previous measurement. If the B+ has dropped more than 10VDC, it could slightly affect the amplifier's tone and dynamics - the more the difference in the original voltage the more affect it will have on tone. If this is the case, changing the B+ second stage dropping resistor to a lower value will allow the B+ to return to its original value. In many amps the resistor(s) are 10K (1-3W) or in a range of 6.8K-22K. Experiment with replacing the resistor with another that has a value that is 2-10K less.


PRE1
CONNECT SHIELD TO BOARD GROUND
CONNECT SHIELD TO GROUND BAR AT MV
+ 47UF 500V
+ 47UF 500V
+ 47UF 500V
150K/2W
22K/2W
2K2/2W
0.1uF 600V
220K
220K
0.1uF 600V
0.1uF 600V
390R
24K
1K5
25V 5uF
150K
100K
220K
110K
5K TRIM
160K
1M
820
1M
.02uF 400V
1K5
.0047uF 400V
100K
100K
.01uF 400V
B+3 B434
B+4 333
B+5 328
WITH FX BOARD INSTALLED YOU MAY NEED TO ADJUST (REDUCE) B+4 DROPPING RESISTOR TO 15K TO MAINTAIN PREVIOUSLY MEASURED B+4
SEND
FROM MASTER VOLUME
RETURN
TO PHASE INVERTER
180K
68K
V2
12AX7
Trim 250K-L
3
2
OD TRIM
B+
GND
TRIM
IN
OUT
TRIM
SEND
RETURN
Fx BYPASS
BYPASS
NOTE: TOP VIEW OF Fx BOARD
SEND
TO EFFECT
RETURN
FROM EFFECT

Using the Fx Loop

In stock configuration, installing the Fx Loop in active mode will reduce your SEND signal after the buffer (cathode follower) stage of the circuit. On RETURN, the signal is input into a basic triode gain stage that adds gain. Therefore, the Fx Loop can deliver a net signal that is higher. This can be trimmed by using the SEND and RETURN internal trim pots internally or by inserting a small, flat bladed screwdriver through the jack itself. It can also be trimmed via the output potentiometer on your effects rack if you have one, or via the amp's master volume.

Start with both trim pots around 3 o clock (looking at it from the outside) and adjust from there. Adjust the the RETURN to achieve unity gain or no noticeable volume difference between SEND/RETURN when bypassed or unplugged. Keep in mind, the higher the RETURN amplification, the more noise may be injected.   Test it with a effect and adjust SEND up or down to suit.

Tube Fx Set-Up If you have bench instruments, follow this procedure.

- use a signal generator set to about 500mv peak to peak. This is in the mid humbucker range. It could be as much as 1.0 - 1.5V peak to peak (see table below)
- turn on the amp to low playing level with master volume on max. e.g. level 3 of 10
- use the scope to measure the INPUT to the loop.
- attenuate the SEND signal about -20dB = or about 1/10th of the loop INPUT voltage.
- measure this at the tip of the SEND jack. Often around 3 O'Clock on the SEND trimpot.
- adjust the RETURN trimpot so the loop OUTPUT matches the loop INPUT level (unity gain). Often this ends up at 3 o'clock.

USAGE:

- Connect an effect and test it INSERTED / BYPASS mode. Look for close to unity gain. i.e. effect is not amplifying or making it louder when INSERTED
- When inserted, listen for overload or distortion of the effect. This indicates the SEND is too high. Adjust the SEND, reducing as required, but readjusting / increasing the RETURN to get back to unity gain.
- If signal is too weak, you can adjust the SEND and decrease the RETURN to add gain . The RETURN can also be increased but often, increasing the SEND is the quieter option.
- Ideally, to minimize added noise, you want the SEND as high as possible without overdriving the effect, while maintaining close to unity gain by reducing the RETURN.

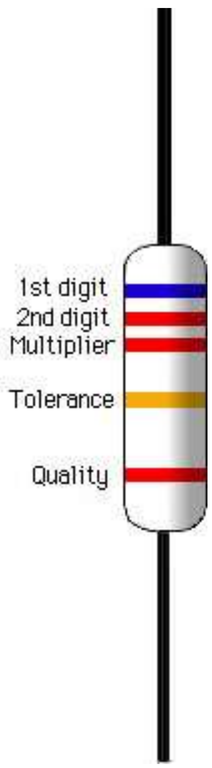
Connect patch cables into the SEND and RETURN jacks. Connect them to your effects unit. Put the amp in Play mode. You should hear the effect added to the signal when engaged. If there is no effect to the signal, ensure all cables are good, plugged in correctly, and the amp controls are adjusted properly.

Appendix 3 - How to read Resistor Color Codes

First the code

BLAC K	Brown	RED	Orange	YELLO W	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 OSD, Lightning Strikes or, 18 Watt forums.

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 an OSD, it is measured between the joined lugs of the 100 and 50 cap and chassis ground. It should be about 440 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 UP is ON (US 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: 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 20/22 Gauge solid for hook up to tubes;

Use 20/22 Gauge, twisted tightly for tube heater wiring;

Use 20/22 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.

Use 18 gauge, stranded, for connection from IEC to POWER SWITCH

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 eyelet board?

A: Use the provided solid 22 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 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.

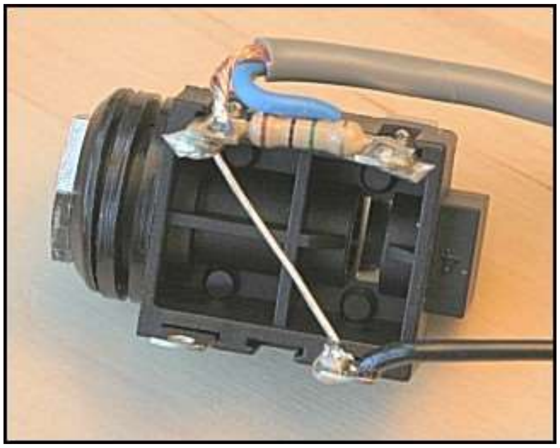
TIP: More, larger format, colour pictures and the schematic & layout that are helpful in the build are posted on the Trinity Forum – Resources Section. Right click on them to download if you want print in large, colour format.

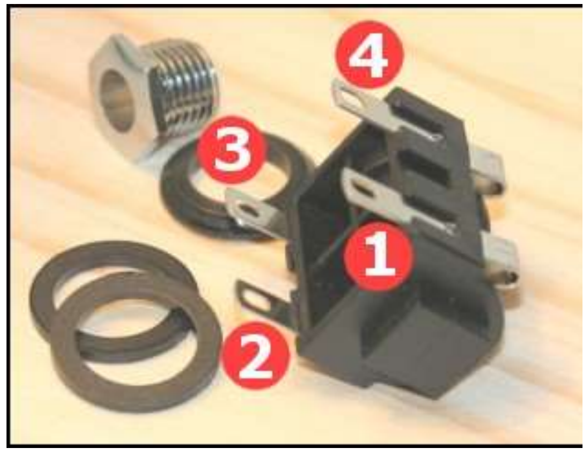
TIP: Sometimes it is hard to decode the resistors colours. It is a good idea to check the resistances of these parts before assembly.

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 20 ga wire.

Appendix 6 - Cliff Jacks Explained

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





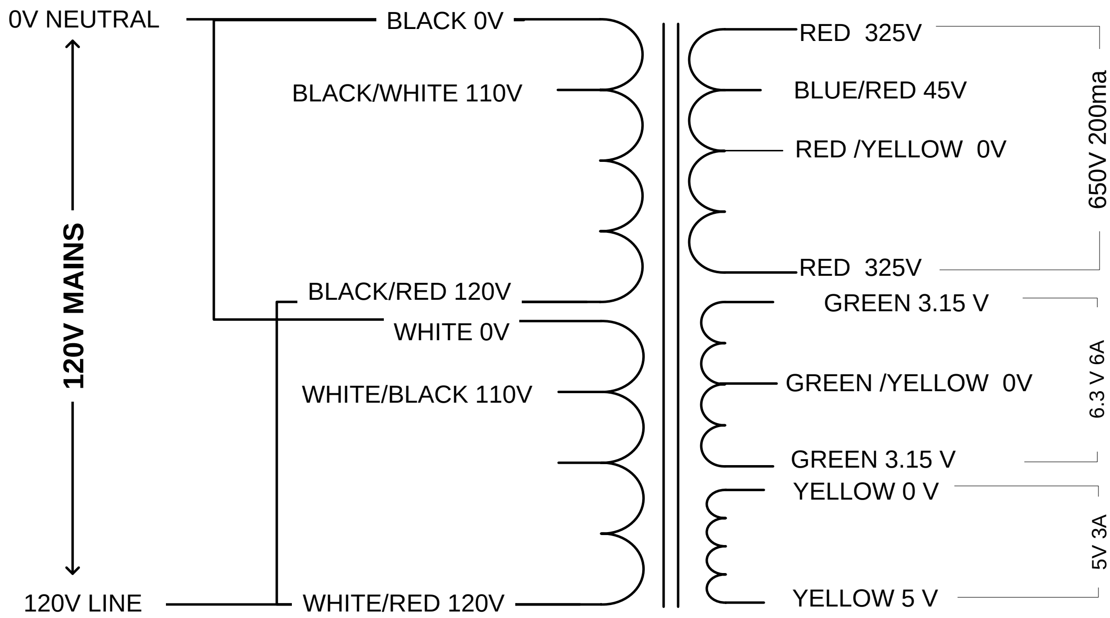
With no guitar plugged in, there's continuity to ground for lugs 2 and 4 (a direct connection) and also for lug 1 (it's not switched and therefore mechanically connected to lug 2 with the crossover wire). With a guitar plugged in, the switching breaks, and now there's only continuity between lugs 2 and 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

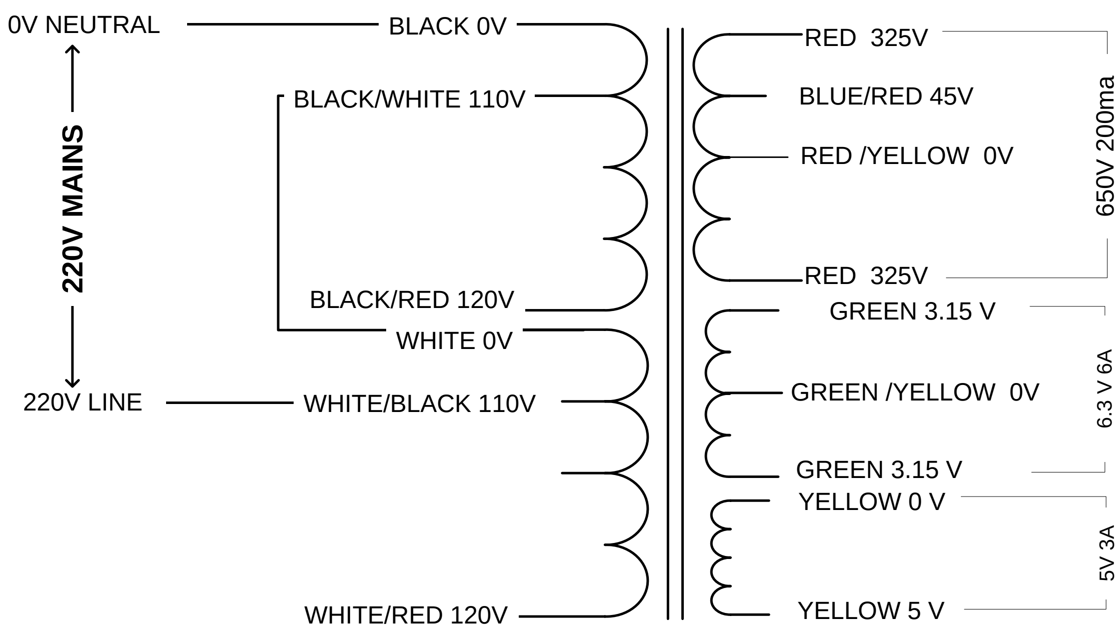
Appendix 7 – Additional Mains Wiring Schematics

Here are the connection schematics for most country voltages.

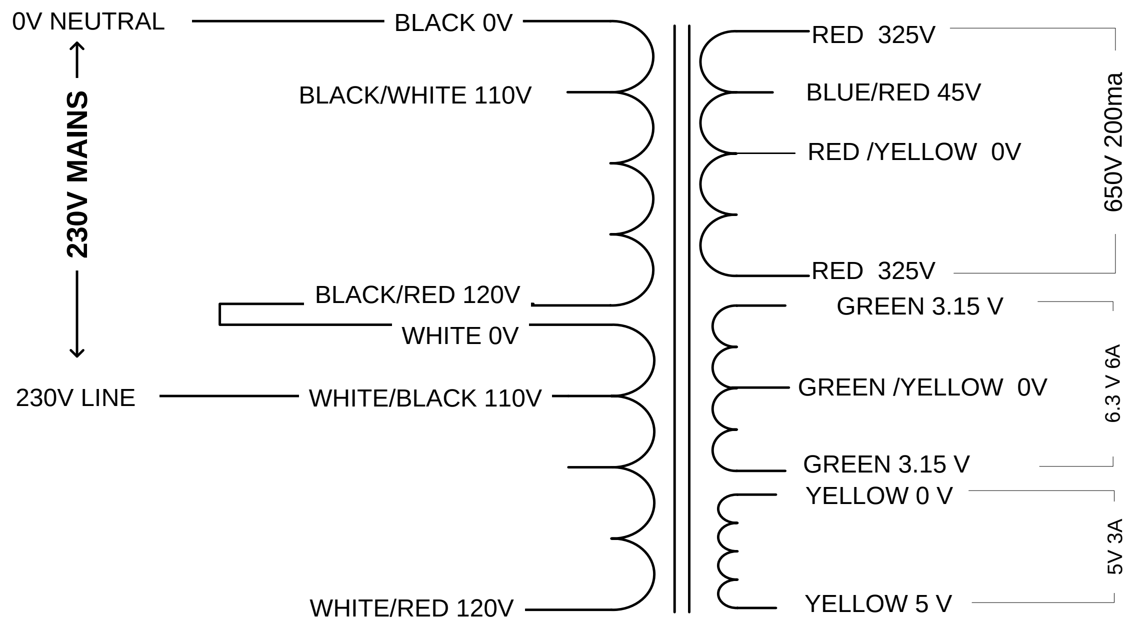
Note: 110V is also supported by hooking the windings in parallel as done for 120V.



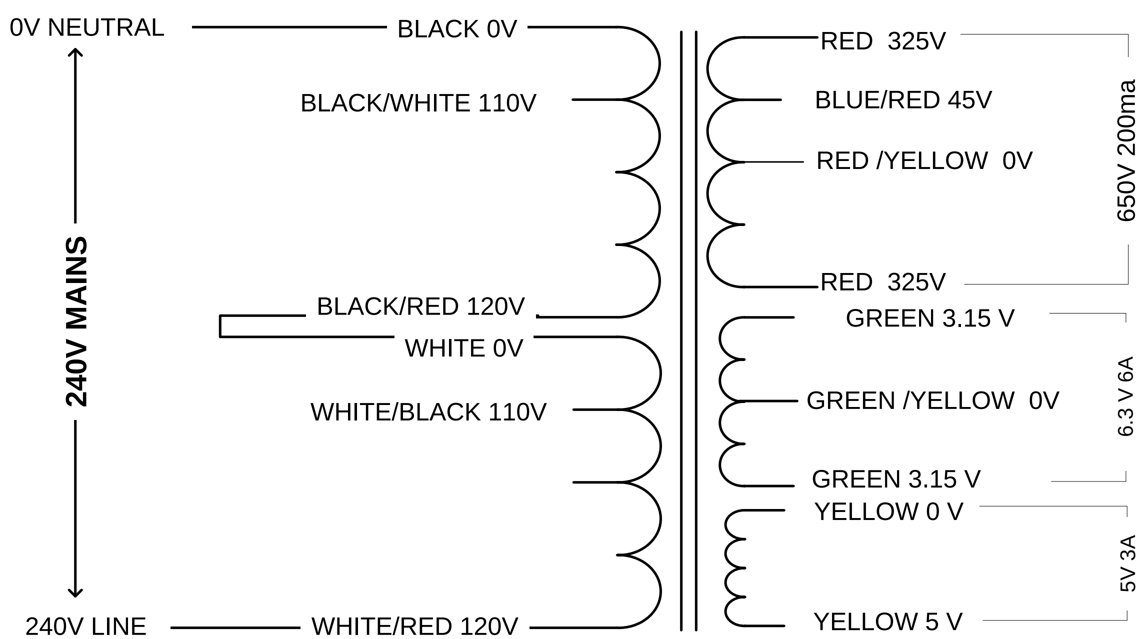
OSD POWER TRANSFORMER 120V HOOK-UP



OSD POWER TRANSFORMER 220V HOOK-UP



OSD POWER TRANSFORMER 230V HOOK-UP



OSD POWER TRANSFORMER 240V HOOK-UP

Appendix 8- OSD Bill of Materials

DESCRIPTION	QTY	CHECK
OVERDRIVE SPECIAL DESIGN KIT WITH TRANSFORMER SET, CHASSIS		
OSD RESISTORS	1	
METAL FILM RESISTORS - THROUGH HOLE 1WATT 1 OHMS 1%	2	
METAL FILM RESISTORS - THROUGH HOLE 390 OHMS 1% 50PPM	1	
WIREWOUND RESISTORS - THROUGH HOLE 5WATTS 470 OHMS 5%	2	
CARBON FILM RESISTORS- THROUGH HOLE 470 OHMS 5%	1	
WIREWOUND RESISTORS - THROUGH HOLE 5WATTS 500 OHMS 5%	1	
METAL FILM RESISTORS - THROUGH HOLE 3WATTS 820 OHMS 1% 100PPM	1	
CARBON FILM RESISTORS- THROUGH HOLE 1K OHMS 0.05	2	
METAL OXIDE RESISTORS 1.0K OHMS 5% TOL	1	
METAL FILM RESISTORS - THROUGH HOLE 1/2WATT 1.5K OHMS 1% 100PPM	4	
METAL OXIDE RESISTORS 2.2K OHMS 5% TOL	1	
METAL FILM RESISTORS - THROUGH HOLE 3WATTS 4.7K OHMS 5%	1	
CARBON FILM RESISTORS- THROUGH HOLE 5.1K OHMS 5%	2	
CARBON FILM RESISTORS- THROUGH HOLE 10K OHMS 0.05	2	
METAL OXIDE RESISTORS 22K OHMS 5% TOL	1	
CARBON FILM RESISTORS- THROUGH HOLE 24K OHMS 5%	1	
CARBON FILM RESISTORS- THROUGH HOLE 33K OHMS 5%	1	
CARBON FILM RESISTORS- THROUGH HOLE 68K OHMS 0.05	1	
CARBON FILM RESISTORS- THROUGH HOLE 100K OHMS 0.05	3	
METAL FILM RESISTORS - THROUGH HOLE 1/2WATT 100K OHMS 1% 100PPM	4	
CARBON FILM RESISTORS- THROUGH HOLE 110K OHMS 5%	1	
CARBON FILM RESISTORS- THROUGH HOLE 150K OHMS 5%	1	
METAL FILM RESISTORS - THROUGH HOLE 1/2WATT 150K OHMS 1% 100PPM	1	
METAL OXIDE RESISTORS 150K OHMS 5% TOL	1	
CARBON FILM RESISTORS- THROUGH HOLE 180K OHMS 5%	1	
CARBON FILM RESISTORS- THROUGH HOLE 220K OHMS 0.05	5	
METAL OXIDE RESISTORS 220K OHMS 05% TOL	1	
CARBON FILM RESISTORS- THROUGH HOLE 1M OHMS 5%	3	
CARBON FILM RESISTORS- THROUGH HOLE 4.7M OHMS 5%	1	
METAL FILM RESISTORS - THROUGH HOLE 1/2W 22M OHMS 1%	4	
OSD CAPACITORS	1	
CERAMIC DISC CAPACITORS .25LS 15PF 1KV 10%	1	
CERAMIC DISC CAPACITORS .25LS 270PF 1KV 10%	2	
CERAMIC DISC CAPACITORS .25LS 300PF 1KV 10%	2	
CERAMIC DISC CAPACITORS .25LS 500PF 1KV 10%	2	
CAPACITOR - 600V 716P SERIES POLYPROPYLENE CAPACITANCE: .001 UF	1	
CAPACITOR - 600V 716P SERIES POLYPROPYLENE CAPACITANCE: .002 UF	1	

CAPACITOR - 600V 716P SERIES POLYPROPYLENE CAPACITANCE: .0047 UF	2	
CAPACITOR - 600V 716P SERIES POLYPROPYLENE CAPACITANCE: .01 UF	2	
CAPACITOR - 600V 716P SERIES POLYPROPYLENE CAPACITANCE: .022 UF	1	
CAPACITOR - 600V 716P SERIES POLYPROPYLENE CAPACITANCE: .047 UF	2	
CAPACITOR - 600V 716P SERIES POLYPROPYLENE CAPACITANCE: .1 UF	4	
MULTILAYER CERAMIC CAPACITORS MLCC - LEADED 0.1UF 50VOLTS Y5V +80/-20% 2.5MM LS	2	
TANTALUM CAPACITORS - SOLID LEADED 50V 1UF 10% LS=5.08MM	1	
50V, AXIAL LEAD ELECTROLYTIC 4.7 UF	2	
50V, AXIAL LEAD ELECTROLYTIC 10 UF	2	
CAPACITOR - JJ ELECTRONICS 500V AXIAL LEAD ELECTROLYTIC CAPACITANCE: 47 UF	4	
CAPACITOR - JJ ELECTRONICS 500V AXIAL LEAD ELECTROLYTIC CAPACITANCE: 100 UF	1	
ALUMINUM ELECTROLYTIC CAPACITORS - AXIAL LEADED 100UF 100V 85C 20% 10X26	1	
OSD POTENTIOMETERS	1	
POTENTIOMETERS POTENTIOMETERS LINEAR 2K	1	
TRIMMER RESISTORS - THROUGH HOLE 5K OHMS 10MM RND TOP ADJ	1	
POTENTIOMETER - FENDER 10K LINEAR BIAS SCREW	1	
POTENTIOMETER - ALPHA AUDIO 3/8" BUSHING RESISTANCE: 100 KOHM	1	
POTENTIOMETER - ALPHA AUDIO 3/8" BUSHING RESISTANCE: 250K A	2	
POTENTIOMETER - ALPHA LINEAR 3/8" BUSHING RESISTANCE: 250 KOHM	2	
POTENTIOMETER - ALPHA AUDIO 3/8" BUSHING RESISTANCE: 500 KOHM	1	
POTENTIOMETER - ALPHA AUDIO 3/8" BUSHING RESISTANCE: 1 MOHM	1	
POTENTIOMETER 1M OHMS PLAIN SOLDER LUGS	1	
OSD SOCKETS	1	
SOCKET - BELTON MICALEX 8 PIN OCTAL MIP	2	
SOCKET - BELTON 9 PIN MINIATURE TOP MOUNT	3	
TUBE SHIELD - FOR 9-PIN MINIATURE ALUMINUM MULTIPLE COLORS COLOR: ALUMINUM	3	
TUBE CLIP - BELTON FOR OCTAL SOLD INDIVIDUALLY	2	
OSD JACKS	1	
JACK - CLIFF 1/4" MONO SOLDER LUG	1	
JACK - SWITCHCRAFT 1/4" MONO 2-CONDUCTOR SHUNT TIP	1	
JACK - SWITCHCRAFT ¼" MONO 2-CONDUCTOR OPEN CIRCUIT	3	
CIRCULAR DIN CONNECTORS MALE 5-PIN CABLE REAN	1	
CIRCULAR DIN CONNECTORS FEMALE 5-PIN CHASSIS REAN	1	
OSD HARDWARE	1	
RECEPTACLE - AC WITH 5X20MM FUSE HOLDER	1	
CARTRIDGE FUSES CARTRIDGE FUSES 250V .5A SLO-BLO 3AG	1	
FUSE - SLOW-BLOW 250V MINIATURE 5MM X 20MM 2 AMPS	1	
FUSE HOLDER - SCREW TYPE 3AG-TYPE	1	
GROMMETS & BUSHINGS GROMMETS & BUSHINGS SB 500-6 BLK	2	
GROMMETS & BUSHINGS GROMMETS & BUSHINGS SB 875-11 BLK	1	
LAMP - FENDER STYLE PREMIUM PILOT ASSEMBLY	1	
JEWEL - FENDER STYLE COLOR: RED	1	

DIAL LAMP - #47 T-3-1/4 6.3V 0.15A BAYONET BASE	1	
TEST PLUGS & TEST JACKS BANANA JACK RED	2	
TEST PLUGS & TEST JACKS BANANA JACK BLACK BU-31602-0	1	
TERMINAL STRIP - 2 LUG 2ND LUG COMMON HORIZONTAL	3	
TERMINAL STRIP - 3 LUG 2ND LUG COMMON HORIZONTAL	1	
TERMINAL STRIP - 5 LUG RD LUG COMMON HORIZ	1	
KNOB - CHICKEN HEAD MINI HIGH-QUALITY BRASS INSERT SET SCREW COLOR: BLACK	10	
SWITCH - CARLING TOGGLE SPST ON-OFF SIDE SOLDER LUGS	2	
SWITCH - CARLING MINI TOGGLE DPDT 2 POSITION	3	
SWITCH - ROTARY 1 POLE 3 POSITION	1	
OSD FASTENERS	1	
MACHINE SCREW PHILLIPS PAN HEAD 4-40X5/16 L	20	
HEX NUT EXT TOOTH LOCKWASHER 4-40	6	
TERMINALS TERMINALS LUG LOCKING MATTE TINNED#4	4	
MACHINE SCREW PHILLIPS PAN HEAD 6-32X3/4 L	7	
MACHINE SCREW PHILLIPS PAN HEAD 6-32X3/8 L	3	
HEX NUT EXT TOOTH LOCKWASHER 6-32	3	
INTERNAL TOOTH LOCK WASHER #6 CHROME	7	
STANDOFFS & SPACERS .500 STD SPACER	7	
TERMINALS TERMINALS LUG LOCKING MATTE TINNED#6	3	
MACHINE SCREW PHILLIPS PAN HEAD 8-32X3/8 L	9	
HEX NUT EXT TOOTH LOCKWASHER 8-32	9	
TERMINALS TERMINALS LUG LOCKING MATTE TINNED#8	1	
MACHINE SCREW PHILLIPS PAN HEAD 10-32X1-3/4 L	4	
ANCHOR (CAGE) NUT 10-32	4	
OSD WIRE	1	
26 GUAGE SOLID CORE WIRE RED	5	
22 GUAGE SOLID CORE WIRE (VARIOUS COLOURS)	15	
22 GAUGE TWISTED PAIR RED/BLACK	4	
22 GUAGE STRANDED TINNED COPPER WIRE 600 VOLT PVC RED	2	
18 GUAGE STRANDED WIRE BLACK	18	
18 GUAGE STRANDED WIRE WHITE	18	
BELDEN RG174/U COAXIAL CABLE	120	
HEAT SHRINK TUBING 1MM	4	
HEAT SHRINK TUBING 3MM	8	
HEAT SHRINK TUBING 6MM	4	
CABLE TIE 4 IN BLACK 18 LBS	10	
OSD OVERDRIVE RELAY BOARD	1	
LINEAR VOLTAGE REGULATORS 1A POS VOL REG	1	
ALUMINUM ELECTROLYTIC CAPACITORS - RADIAL LEADED 3300UF 10V ELECT NHG RADIAL	2	
MULTILAYER CERAMIC CAPACITORS MLCC - LEADED 0.1UF 50VOLTS Y5V +80/-20% 2.5MM LS	1	
STANDARD LEDS - THROUGH HOLE STANDARD LEDS - THROUGH HOLE RED DIFFUSED	2	

TWO RELAY PCB WITH PSU	1	
LOW SIGNAL RELAYS- PCB THRUHOLE HI-SENS DPDT 5VDC 150MW SEAL	2	
BRIDGE RECTIFIERS BDGE RECT 1.5A50V	1	
CARBON FILM RESISTORS- THROUGH HOLE 510 OHMS 1/4 WATT	2	
RECTIFIERS 1000V 1A RECTIFIER GLASS PASSIVATED	9	
5 CONDUCTOR 22AWG SOLID CORE CABLE	16	
CORD - POWER 18 AWG 3 CONDUCTOR DETACHABLE BLACK IEC LENGTH: 8 FEET	1	
OSD EYELET BOARD	1	
COPPER 18 GA SOLID BUS BAR	1	
ALUMINUM TAPE	1	
CHASSIS OSD ALUM	1	
FOOTSWITCH - FOR MARSHALL TWO BUTTON LED	1	
TRANSFORMER PT-650EX OSD	1	
TRANSFORMER OT OSD	1	

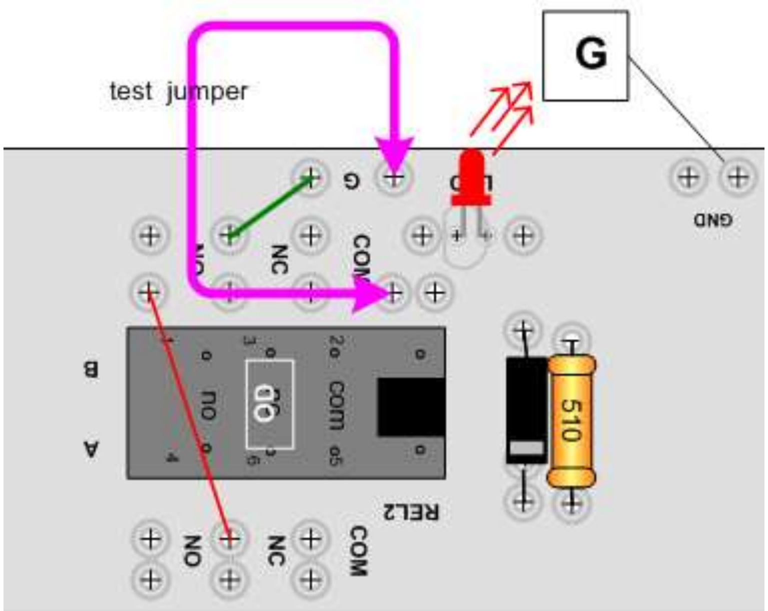
ADDENDUM – FOOTSWITCH - RELAY BOARD CONNECTION

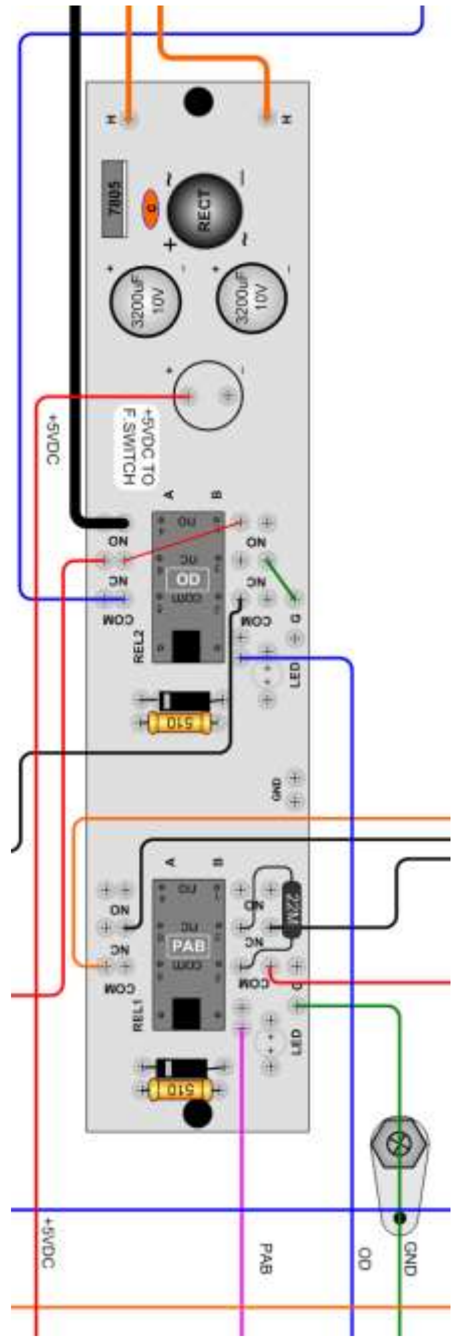
To Test the Overdrive RELAY Board

WITH NO TUBES INSTALLED

To test the RELAY board, you need to first confirm that the PCB power supply is developing 5VDC.

Turn the power on and measure the DC voltage between the PCB pad labelled B+ (this is not amp B+!)on the board and the pad labelled G (ground) .





You should have measured 5VDC between the RELAY 5V+ and G (ground).

Apply 5VDC to each RELAY coil by means of small jumper. Run the jumper between the LED Cathode to the ground bus to test. When applied, the LED should illuminate as you energize each coil.

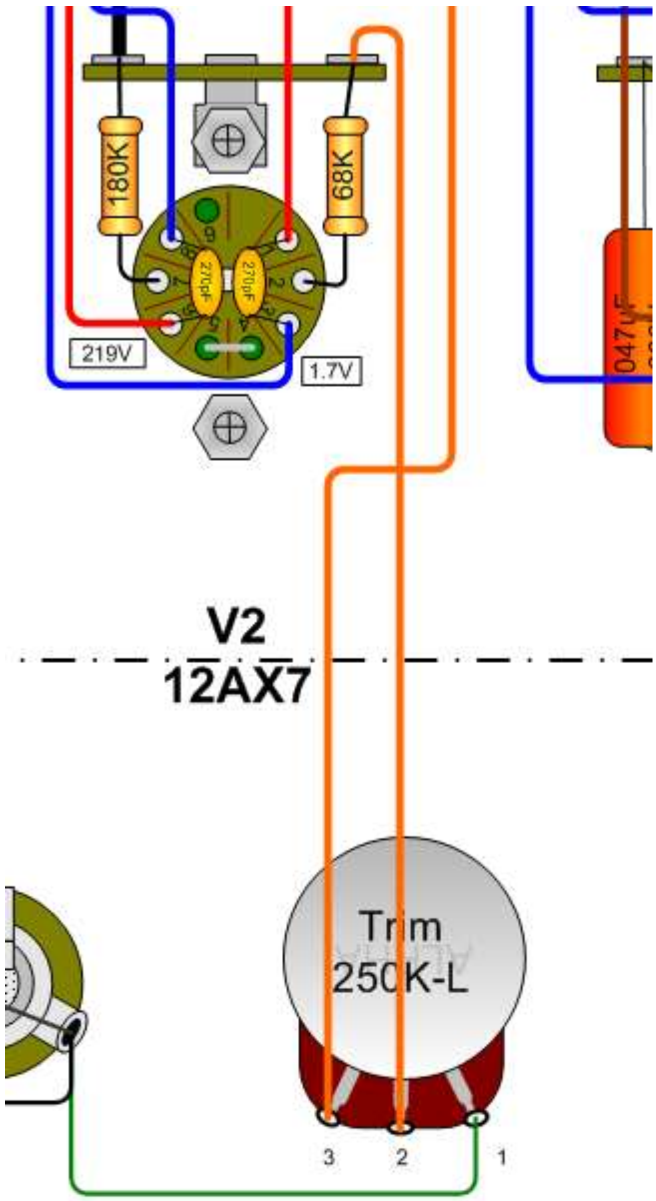
TIP: If you build the Footswitch now, you can also test the RELAY board using the footswitch.

ADDENDUM – TRIM POT CONNECTION

Version 17 of the OSD layout incorrectly reverses the leads to the Trim Pot.

While functional, the direction of trim is unnaturally reversed.

Connect the 220K to pin 3 and the Ground to pin 1 of the supplied Trim Pot. This also matches the schematic.



CORRECT TRIM POT WIRING LAYOUT

Trinity Amps Schematics and Layouts