



# **Tube Effects Loop Builders Guide**

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## Thank You

Thank you for purchasing your 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!

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

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# 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	28April20	FIRST RELEASE
2.0	21Oct20	TriLator / Standard Fx release
2.1	13/11/20	TRIWATT implementation updated
2.2	17/01/21	Updated 2-ch switch; added mounting dimensions
2.3	21/01/21	Added detailed Fx set-up with instruments
21.2	8Jun21	Updated to latest board revision.



# TUBE EFFECTS LOOP

***Introducing the world's first sub-mini vacuum tube, Dumbleator based Fx loop!***

There are now two versions of our Tube Fx product. The Standard and the TriLator. The latter adds frequency specific feedback on the return gain stage that is the same as the Dumbleator used with many Overdrive special amps. Hence it is named the TriLator.

Our Tube Fx uses a 6N17B sub-miniature dual-triode vacuum tube-based series FX loop. It employs high voltage, has zero-loss, is built on a PCB and includes an optional true-bypass switch.

This all tube FX loop add-on module can be fitted to virtually any guitar tube amplifier.

The FX loop is optimized for insertion between preamp and driver stages, the low noise, non-clipping, analog effects loop utilizes a 6N17B sub-miniature dual-triode vacuum tube. It is designed with a cathode-follower send stage and a return gain stage both of which can be adjusted.

There are two versions. The standard and the TriLator. The latter adds frequency specific feedback on the return gain stage that is the same as the Dumbleator used with many Overdrive special amps. Hence it is named the TriLator. ***This is the world's first sub-mini vacuum tube, Dumbleator based Fx loop!***

The mounting requirements are simple (Power, Ground, Signal In, Signal Out, 2 heater wires) and it is held in place by chassis mounting the ¼" jacks. Jack spacing is 1.5"

Power drain on the B+ is minimal and the unit features a voltage regulator to minimize noise and simplify installation. This eliminated the need for a voltage dropping resistor. Similarly, heater current draw is minimal. The 2 internal trim (level) pots can be accessed directly through the jacks (no chassis removal) or internally by using a small flat-bladed screwdriver.

The PCB footprint is small (3 holes), yet both the send and return levels can be adjusted for nearly any loop requirement. Low cost stomp boxes and pedals work just as well as thousand-dollar rackmount effect units.

The SEND is configured as non-interrupt, so it can be used as a Preamp/Slave Line Out. When no connection is made, the unit accurately passes signal but there is also an optional panel mounted true bypass switch.

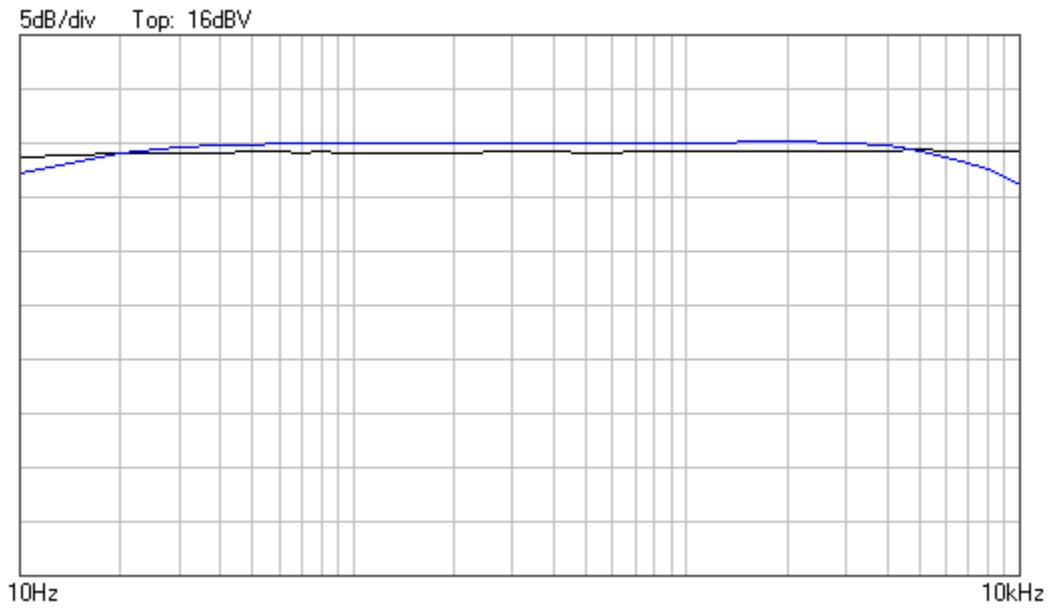
The input signal is attenuated by about 20 db to avoid clipping the SEND side triode. The RETURN side has 30dB gain, so the Fx Loop can still be set beyond unity.

To maintain headroom the minimum B+ voltage is 220V.

This FX loop kit makes inserting any effect or pedal, less intrusive to the tone of your amp.

## Trilator Fx FREQUENCY REPSONSE

This is a bode plot of v. 4.24A bypassed (black - lower) and engaged (blue - higher).



The topology is the same as Dumbleator design that utilizes Local Negative Feedback but values were optimized to get a flatter frequency response.

# FX LOOP INSTALLATION

**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.**

## PREPARE THE CHASSIS FOR THE Fx BOARD

The Fx board needs to be mounted in holes 1-1/2 inch apart with a third hole to accommodate the BYPASS SWITCH. OSD amps have the holes pre punched so you may need to drill your own holes to suit.

## THE BYPASS SWITCH

When the cables are unplugged, and the PCB is powered, the Fx loop is bypassed, but you may want to use the bypass switching option so you can easily compare the Effect in and out of circuit. So a DPDT switch is included.

## INSTALLING THE FX LOOP

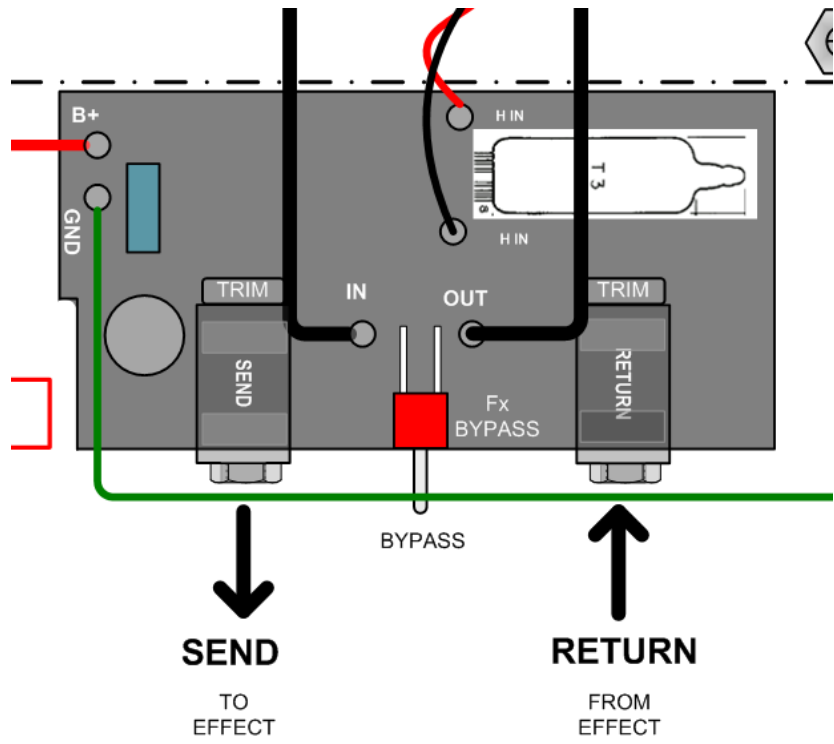
The installation requires you to connect an INPUT, OUTPUT, GROUND, HIGH VOLTAGE (B+) and HEATER VOLTAGE. Use shielded wire for IN and OUT connections. The Fx board should be inserted between the preamp and phase inverter. Typically, just before a PI input.

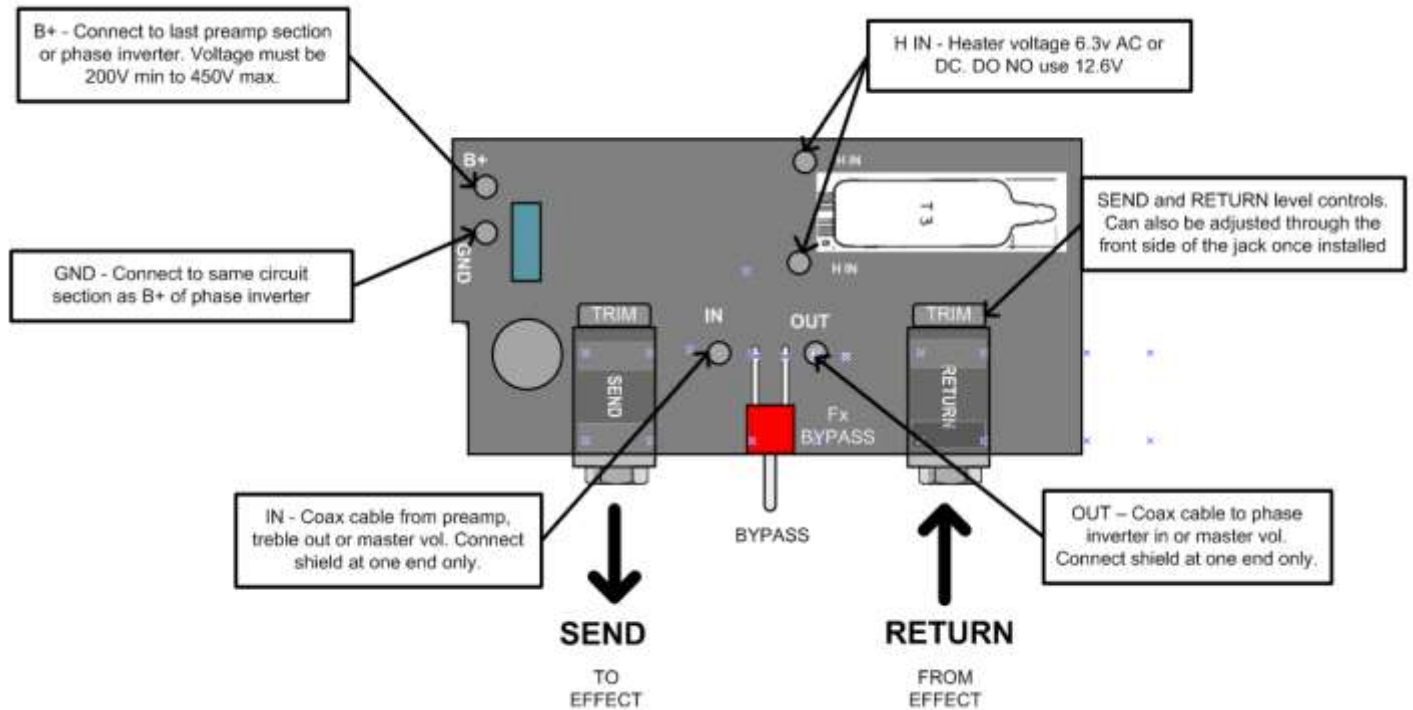
Ensure that that the proximity of the Vacuum tube to components is no less than 1/4" . At that distance, the temperature of the component will reach a safe 40 degrees C which is less than half the typical temperature allowed.

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 RG174U coaxial cable to connect and connect the shields to a close and convenient ground point. For noise elimination, you should never connect the shield of the cable at both ends. **ONE END ONLY.**

2. **OUTPUT OUT** Should go to your master volume if available or directly into the phase inverter input. Use RG174U coaxial cable to connect and connect the shield to a convenient 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 can also used to ground shielded cable from input and output if no other convenient point is available. 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. After installation, remeasure and follow the B+ adjustment process.

5. **HEATER VOLTAGE H IN** This tube only works with 6.3V AC or DC. **DO NOT** use 12.6V! Wires for this voltage are connected to holes labelled H IN 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.

6. **INSTALL THE FX BOARD** With all the wires connected, remove the nuts from the SEND and RETURN jacks. Fit them through the previously drilled holes in the chassis. Use the fibre washers to set the depth of thread in the hole. Screw on the jack nuts back on to hold the Fx PCB in place. Tighten.

7. **HIGH VOLTAGE B+ ADJUSTMENT** 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 step 4. 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.

# SETTING UP 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.

We recommend initially setting the SEND level to 3 O'clock then adjusting the RETURN level for unity (should be around 11 o'clock or so) and adjust from there. Adjust 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 an 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. Set it to 1V @ IN
- use the scope to measure the INPUT to the loop.
- attenuate the SEND signal from about -14db to -20dB or about 200 mV (1/5<sup>th</sup>) to 100mV (1/10<sup>th</sup>) 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.

## NOTE

- SEND and RETURN measured at the tip of respective jack
- INPUT and OUTPUT measured on the circuit board as labelled.

## GUITAR PICKUP VOLTAGES

<i>Hard Strum</i>	<b>Neck, Single Coil</b>	<b>Middle Single Coil</b>	<b>Neck + Middle Parallel</b>	<b>Neck+ Middle Series</b>	<b>Bridge Humbucker</b>
Peak mV	64	91	79	325	510
Peak-Peak	128	181	159	649	1020
<i>Tom's Guitar Projects</i>					

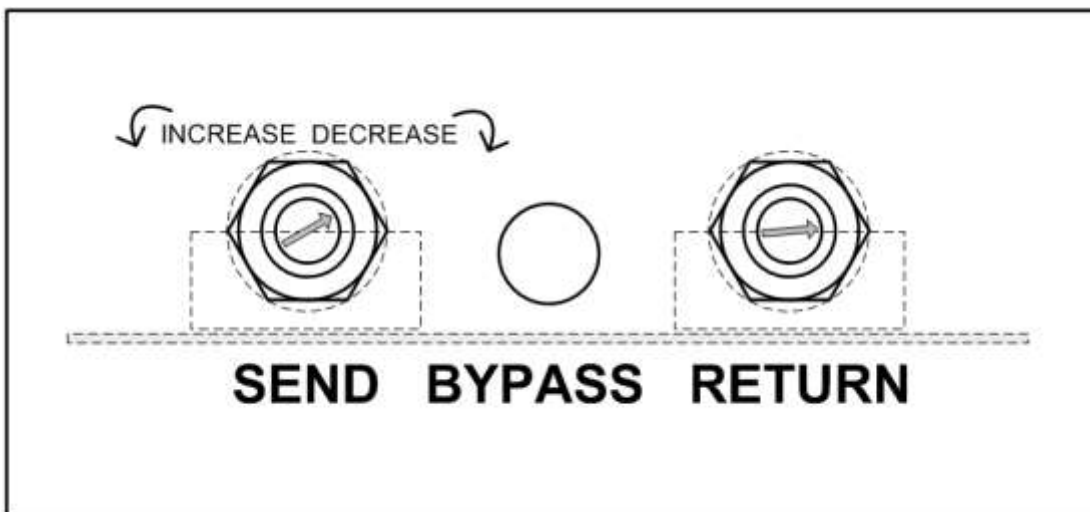
Average Pickup voltage range from 128 -1020 mV peak to peak. 500mV is a reasonable compromise for initial setup though you might also consider 300 mV.

This is a starting point, as any pedal or effect will make this vary depending on the output level. Many effects have a volume control, so it can be adjusted there as well to keep unity.

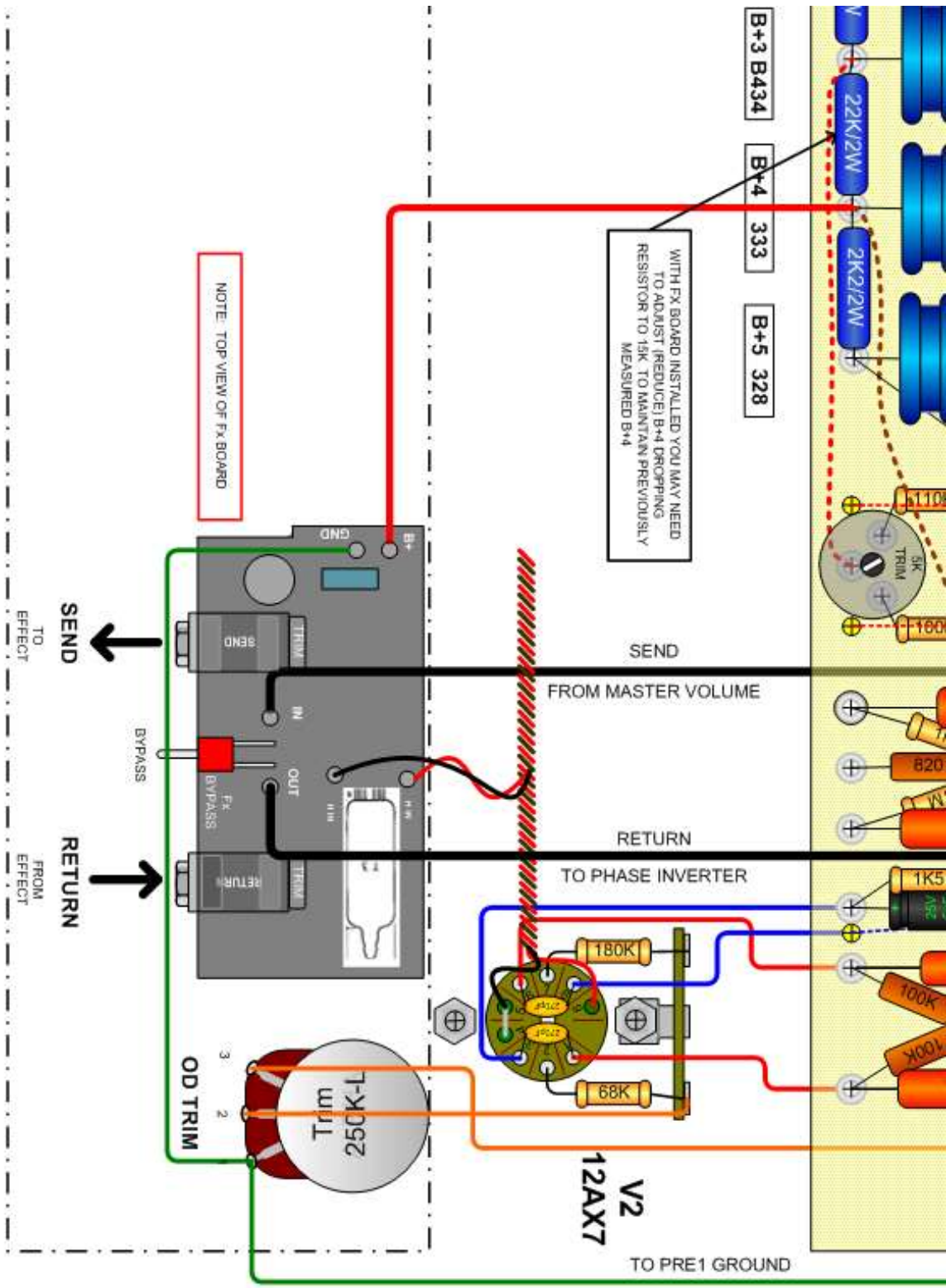
Most effects are expecting a guitar level signal, so you have to drop the SEND signal by about -20dB. By having an adjustable SEND, you can also send line level to record.

Once the Fx loop is installed and B+ set-up, connect a power cable and speaker cable, then power on the amp. Connect an instrument cable, as well as two patch cables into the SEND and RETURN jacks. Connect them to your effects unit. Put the amp in Play mode if equipped with a Standby switch. 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.

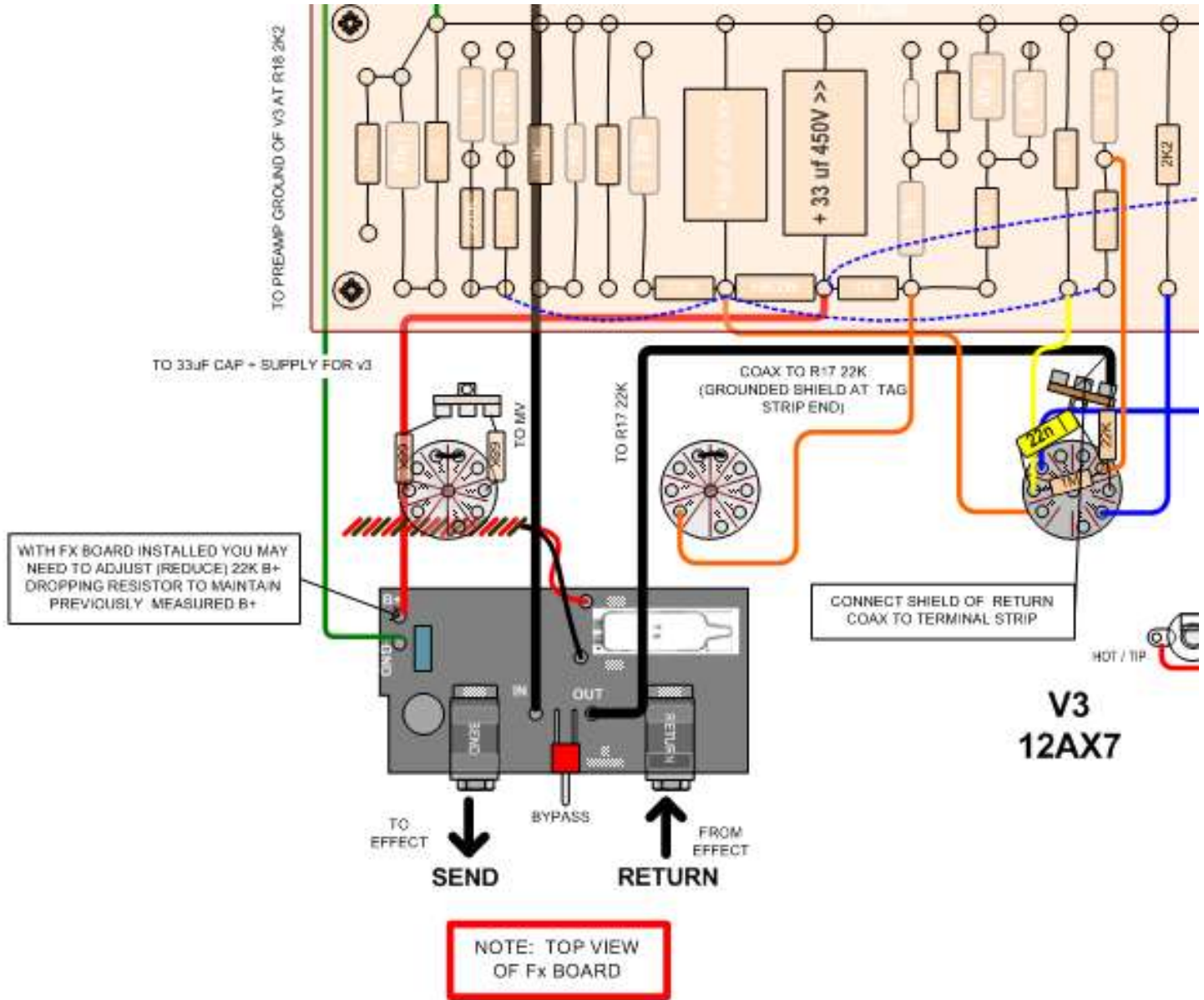
**NOTE:** When there is nothing plugged into the Fx jacks, the Fx unit passes signal. Only when something is plugged into the SEND/RECEIVE does the unit get inserted into the signal path. Then the BYPASS switch becomes “active”.



## OSD TUBE FX INSTALLATION



# TRIWATT Tube Fx Installation

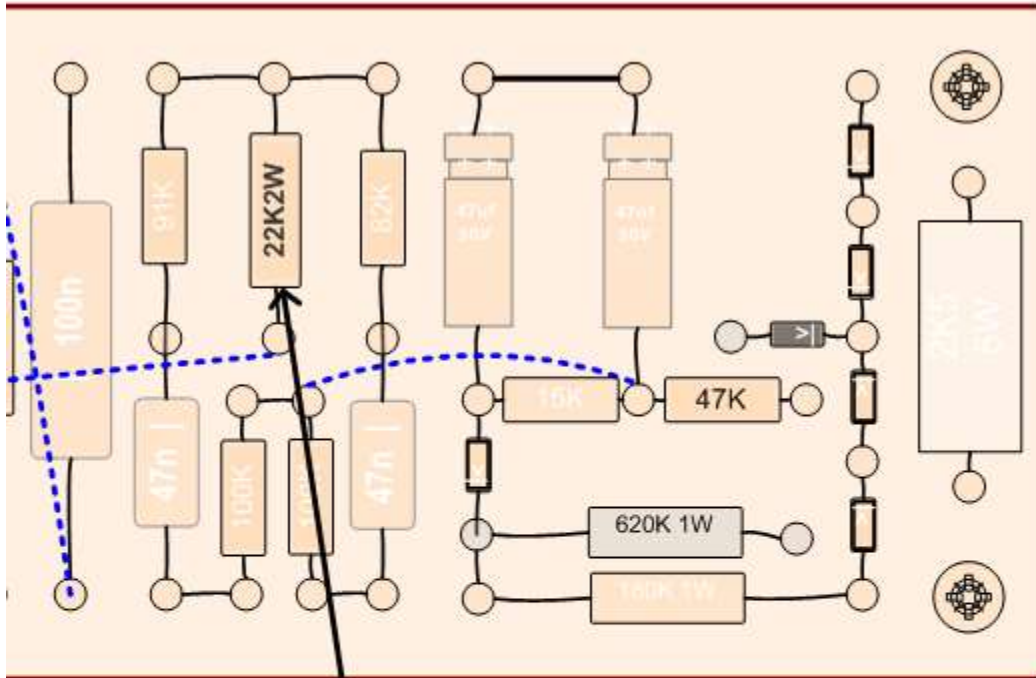


## Notes:

- Sending from the Treble to Fx then to MV works well.
- A 1M resistor from the board Out / RETURN to Ground may reduce hiss.

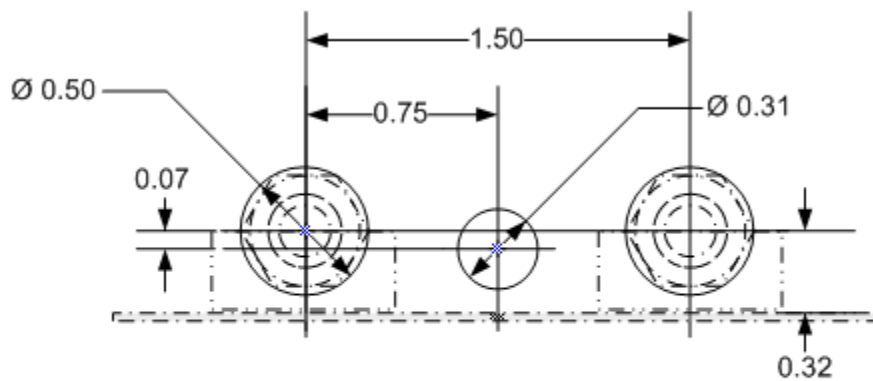
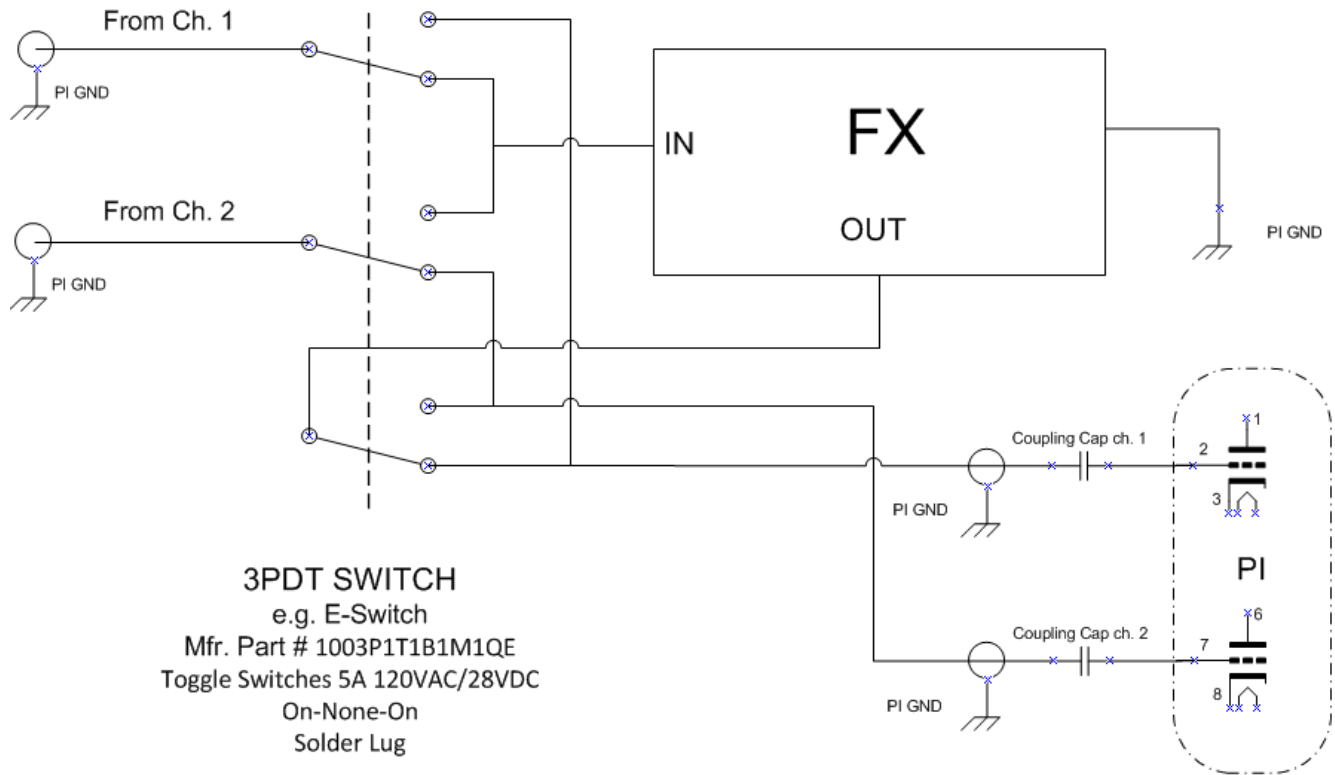


## TRIWATT Tube Fx Installation (dropping resistor)



**B+ NODE:** Measure voltage.  
If necessary, replace 22K with 15K or  
add 22K parallel to 22K to reduce  
and adjust for Fx board load. Maintain  
PI voltage as measured w/o Fx board  
in place

# 2-Channel Switched Fx Installation



**Tube Fx Mounting Template**

# Tube Fx Tube Replacement

The 6N17B is a military grade miniature vacuum tube and is unlikely to ever require replacement. However, the following guide will help should that occur. Desolder the pins of the tube. Replace as per drawing below.

