

Lighthouse Electric
VTPS4 Power-Supply for STA1 Pre- Amp

WARNING. This circuit carries potentially lethal voltages. Do not touch any part of it with bare hands while under power. Filter capacitors can carry high voltage charge long after power was turned off. After disconnecting power, wait until filter capacitors are discharged. Measure voltage with voltmeter to be sure. If you do not know how to handle high voltage devices, get help from an experienced technician.

Circuit Description

VTPS4 power supply is a full wave rectifier utilizing a silicon diode bridge. Two separate transformers are used to supply high-voltage plate DC and filament AC. C101-C105 capacitors are for switching noise reduction. 'R105' may be used for a stand-by switch. 'Choke' is the connection for an external series resistor. R101 and R103 are bleeder resistors, which drain the charge from filter capacitors.

The C112 capacitor serves as a bypass cap to decrease ripple voltage and HF noise. Since this is a solid state power supply, plate HT voltage is developed instantly, before the tube cathode had a chance to heat up. This can lead to cathode stripping, which eventually may destroy the tube. Delaying the plate voltage supply with a stand-by switch, will prevent that. The low voltage auxiliary circuit can be used to generate DC filament voltage (limited to 1A max). An input resistor of a few Ohms may be used to regulate output voltage.

Circuit Assembly

Start with assembling the PCB. Since only two filter caps are used, install jumpers in place of C109 and C111. Then install two resistors R101, R103 (120k/0.5W), four ceramic capacitors C101 thru C104 (1500pf 1kV), and film capacitor C112. Finally install the bridge rectifier BR1 and electrolytic filter capacitors C108 and C110 (47uF 450V).

Make sure the polarity of the electrolytic capacitors and diode-bridge is correct.

B+ is the plate voltage output and B- is the common (COM) connection. All input/output connections are made by soldering wires directly to marked points however, pin terminals can be used (not supplied) to make it easier to solder and unsolder wires. Use longer wires that can be later trimmed to the desired length. After installing all components, clean the board with a toothbrush off all residues under a hot water stream. Let the board dry completely before installing. The series resistor is installed off of the PCB on a supplied solder-terminal strip (see diagram). Remaining free terminals can be used to make the transformer power-input connections and filament connections. Use regular solder and non-acid solder paste for these connections.

Since the power transformers are UL rated (double insulation, 4kV Hi-Pot tested) a power-ground connection is not required. Therefore use non-grounding, two-lead power cord. However, for safety reasons, careful attention to power cord connection is essential. To avoid any possible wire insulation damage, use isolated cable strain-relief or grommet when feeding power cord through metal chassis. Connect the hot (usually black) wire directly to the fuse holder and neutral (usually white) to power transformers. Connect the other fuse terminal to the main on-off switch. Run a wire from the on-off switch to the other transformer terminal. Make all wire to PCB connections before installing the board on stand-off in the chassis.

Transformer Connections TR1:

115 VAC Input Voltage: L (1+5) and N (2+6)

230 VAC Input Voltage: L (1) and N (6) connect jumper 2 & 5

Plate Output: HT (7) HT (12), connect jumper 8 & 11

Transformer Connections TR2:

115 VAC Input Voltage: L (Blk+Blk) and N (Red+Red)

230 VAC Input Voltage: L (Blk) and N (Red), connect center Red & Blk

Filament AC Output: Blue - Yel for 6.3V (second Blue wire not used) or Blue - Blue for 12.6V

PARTS LIST:

BR1 = Diode Bridge 1A 1000V

C108, 110 = 47uF/400V

R101, 103 = 120k 0.5W

5 pos. Terminal Strip

Series Resistor = 1k 3W

C101-C104 = 1500pF/1kV ceramic

C112 = 0.15uF/630V

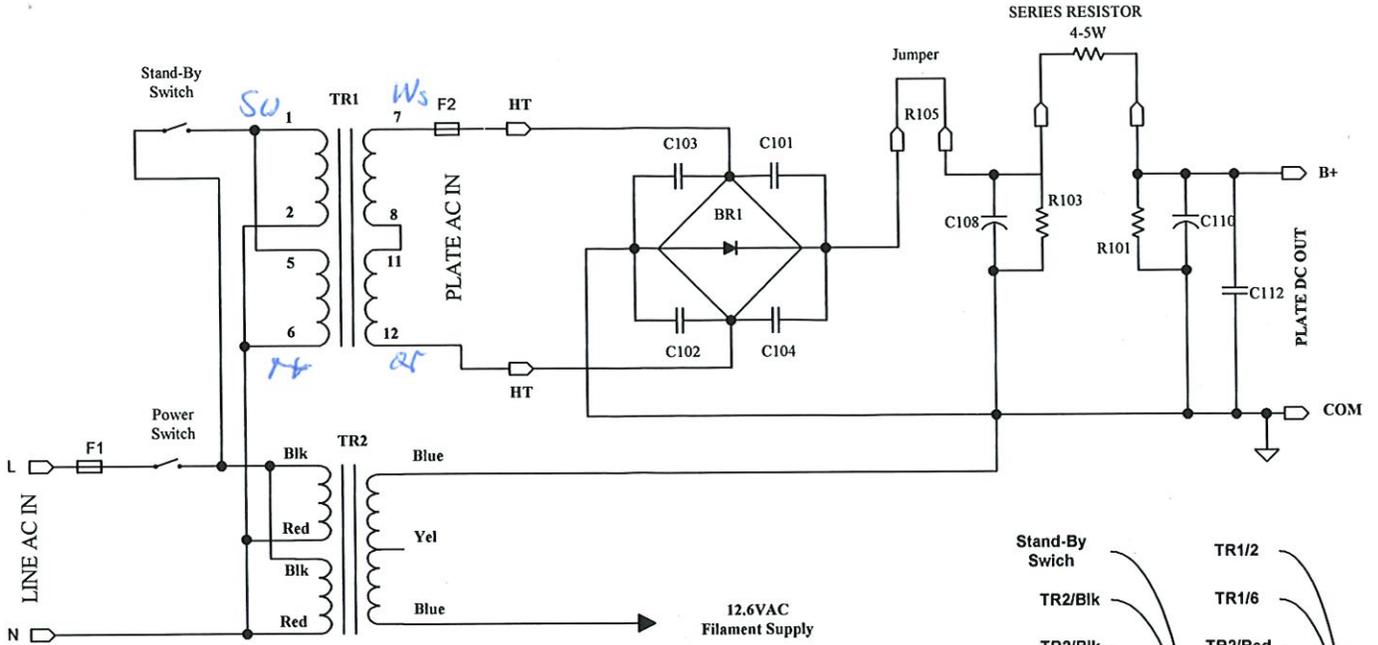
F1 = 0.75A Fuse

F2 = 0.1A Fuse

(Power and Stand-By Switch not supplied)

Lighthouse Electric VTPS4 Power-Supply

VTPS4 schematic with "Stand-By" switch for LH-Electric STA1 Pre-Amp

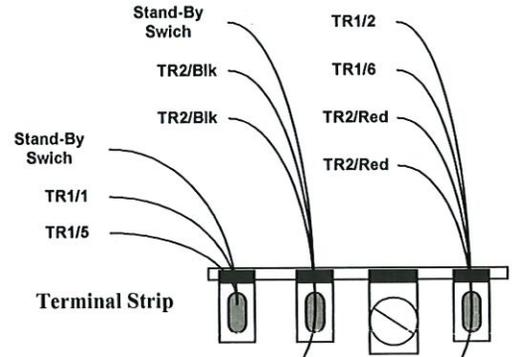


Transformer Connections TR1:

115 VAC Input Voltage: L (1+5) and N (2+6)
 230 VAC Input Voltage: L (1) and N (6) connect jumper 2 & 5
 Plate Output: HT (7) HT (12), connect jumper 8 & 11

Transformer Connections TR2:

115 VAC Input Voltage: L (Blk+Blk) and N (Red+Red)
 230 VAC Input Voltage: L (Blk) and N (Red), connect center Red & Blk
 Filament Output: Blue and Yel, (second Blue wire not used).

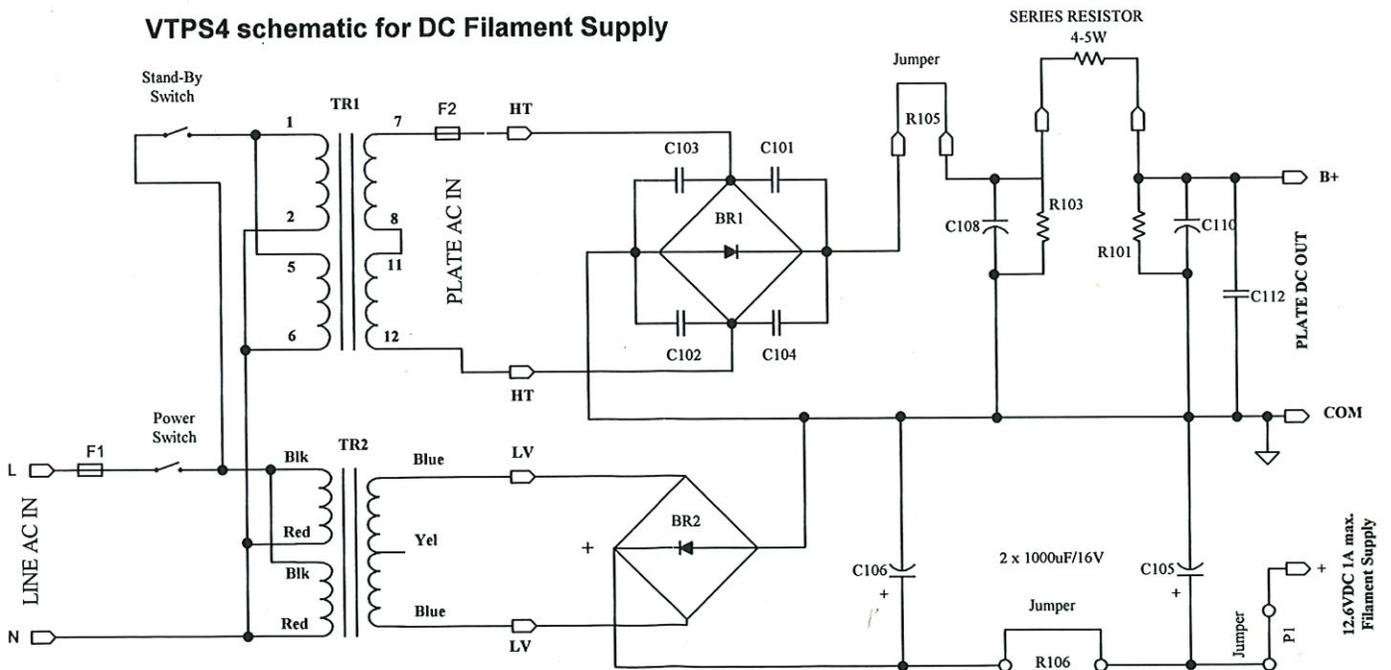


To Power Switch

To Line Neutral

TR1 & TR2
Line Connections

VTPS4 schematic for DC Filament Supply



12.6VDC 1A max.
Filament Supply

Lighthouse Electric STA1LG STEREO TUBE PRE-AMP

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Our original STA1 kit has a gain of 60, which is completely unsuitable for audio input signals of more than 500mV. Modern CD players, Tuners and Tape Decks have output voltages of 1000mV and more. Such high input signal will overdrive the pre-amp stages and cause distortion. This inspired us to go back to the drawing board and re-design this circuit. The outcome is an excellent sounding pre-amp with only 15dB (or 5.6 times) gain. Frequency response is flat from 25Hz-50kHz +/-1.5dB. We have changed only a few components and the input tubes. Input sensitivity is 0.7V minimum.

NOTE: There are component numbering errors on the PCB top print, please use the PCB assembly diagram for component placement.

ASSEMBLY INSTRUCTIONS

Start PCB assembly with the smallest parts like the wire jumpers. There are five jumpers to install on the PCB. First, install the solid wire jumpers J1, J2 and J3 on the top (component) side of the PCB. Next, install the filament solid wire jumpers, as shown on a separate page. These are best installed on the bottom (copper) side of the PCB. Now, populate the board with the components. Start with resistors. Do not install more than 4-6 resistors at a time, as it will be difficult to solder them. Cut off the ends and install the next batch. Next install the plastic capacitors, then the electrolytic capacitors. Make sure the polarity of the electrolytic capacitors is correct. Next, install two signal jumpers on the top side, as shown on the STA1-LG PCB Modification page. These jumpers are made out of short pieces of shielded cable. First drill two small holes (0.035) for the small solder terminals. Scratch off the solder mask (paint) around the hole to expose bare copper. Solder inserted terminal to exposed copper (ground plane). Measure and cut two pieces of shielded, single wire cable. Separate 3/8" of the shield braid from both ends of the cable. Cut off the shield on one side and insulate with shrink tubing. Twist the shield together on the other side. There should be about 3/8" lead wire exposed on both ends. Now solder in these two jumpers, as shown on the modification page. The shield ends are soldered to the terminals (grounded). Next install the ceramic tube sockets. Unlike all other components, the tube sockets are installed on the solder (copper) side of the PCB. Install the 3.3k 3W power resistor (top or bottom side) as the last item. Carefully inspect the assembled PCB for any errors. Supplied solder contains organic flux, which can be cleaned with hot water. To give a nice shiny look brush the solder side under hot water stream. Finally rinse off both PCB sides under hot water. Shake off excess water and set aside to dry. Blowing off excess water with a vacuum cleaner and drying with a hair dryer will speed up drying time.

LOUDNESS Switch Connection (Optional).

A DPST ON-OFF switch is needed. As shown on a separate page, connect one side of the switch (both poles) to common GND bus and the other side to each end of 220uF axial capacitors (negative pole). The other end of each capacitor is connected to C8 and C28 respectively. Use an extension wire if the capacitor leads will not reach the PCB.

Follow proper grounding techniques to avoid oscillation and hum. Grounding should follow one path to a central chassis grounding point (e.g. one of the power supply mounting screws). Use separate leads for high current carrying circuits, like speaker and PSU connections.

Use one conductor shielded cable for all inputs, outputs, volume control and three conductors shielded cable for tone controls. Ground only one side of the shielded cables. Use supplied heat-shrink tubing for isolating non-grounded end of cable.

For more info on that topic look here: http://www.lh-electric.4t.com/gnd_loop.htm

The universal layout of the PCB, makes it possible to change the circuit to your own design.

PARTS LIST:

R1, R11, R15, R21, R31, R35 = 1k
R2, R22 = 680k
R3, R13 = 27k/0.5W
R4, R24 = 1k
R5, R9, R25, R29 = 150k
R6, R10, R26, R30 = 10k
R7, R27 = 82k
R8, R28 = 1M
R17, R37 = 470k
R12, R32 = 1.2k
R23, R33 = 27k/0.5W
R14, R34 = 15k/0.5W
R16, R36 = 1.8k
R18, R38 = 10k
V1, V2, V3 = 12AU7/ECC82 tube

C1, C21 = 0.22uF/100V
C2, C22 = not used
C3, C9, C23, C29 = 0.1uF/400V
C4, C7, C24, C27 = 0.0022uF/100V
C5, C25 = 0.022uF/100V
C6, C26 = 100pF/50-100V Ceramic
C8, C28 = 220uF/16V (optional)
C10, C30 = not used
C11, C31 = 4.7uF/100V
C12, C32 = 10uF/350V
C13 = 22uF/350V
C14 = 0.01-0.022uF/400-630V
P1 = 1Meg lin. Pot. Dual Bass Control
P2 = 500k lin. Pot. Dual Treble Control
P3 = 250k log. Pot. Dual Volume Control

TESTING AND OPERATION

It is assumed that all components; jumpers, wires and controls are correctly installed and connected. Make a final inspection of the power supply connections. If a solid state power supply is used, it is strongly recommended to install a "Stand-By" switch. More information about this can be found on our web site: <http://www.lh-electric.4t.com/techsprt.htm>

Make sure the board is secured to a chassis or by other means fastened. Install the tubes in their sockets. If a power supply is used with a rectifier tube, do not install this tube at this time.

Make a drawing or memorize the locations of the following test points:

HT B+ input

Filament input

Cathode V1a, V1b, V2a, V2b, V3a, V3b

Anode V1a, V1b, V2a, V2b, V3a, V3b

1. Measurement - Filament Voltage

Switch your Multi Meter to 20-50 VDC (if DC filament) or AC (if AC filament).

Connect the COM probe to common chassis ground (B-).

(Stand-By switch ON or disconnect HT plate supply), turn the main power switch on.

Measure the filament voltage at input and at each tube. It should be 12.6V +/- 2%

Turn power off.

2. Measurement - HT, Cathode and Anode Voltages.

Switch your Multi Meter to at least 500 VDC. If you use a solid state power supply without a Stand-By switch, be prepared to make measurements as soon as the power switch is turned on. Proceed to step 4.

Step 1. Install the rectifier tube (if any) in the PSU.

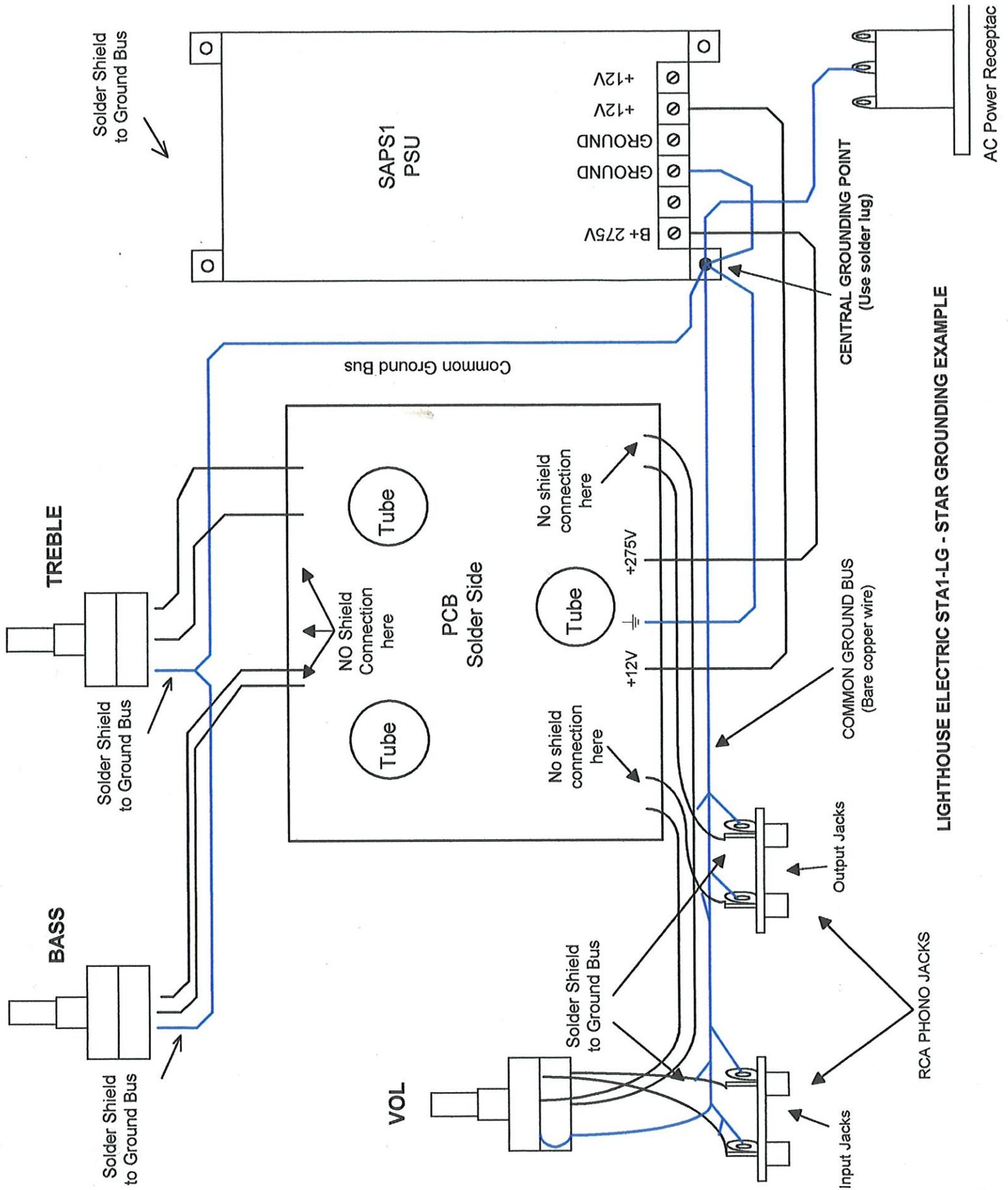
Step 2. Turn the main power switch on (Stand-By on, no HT). Let the tubes warm up, 2-3 minutes.

Step 3. Switch the HT B+ on (Stand-By switch off).

Step 4. Quickly measure B+ HT input voltage, if present at full value proceed to next step, otherwise turn power off immediately Check for wiring errors.

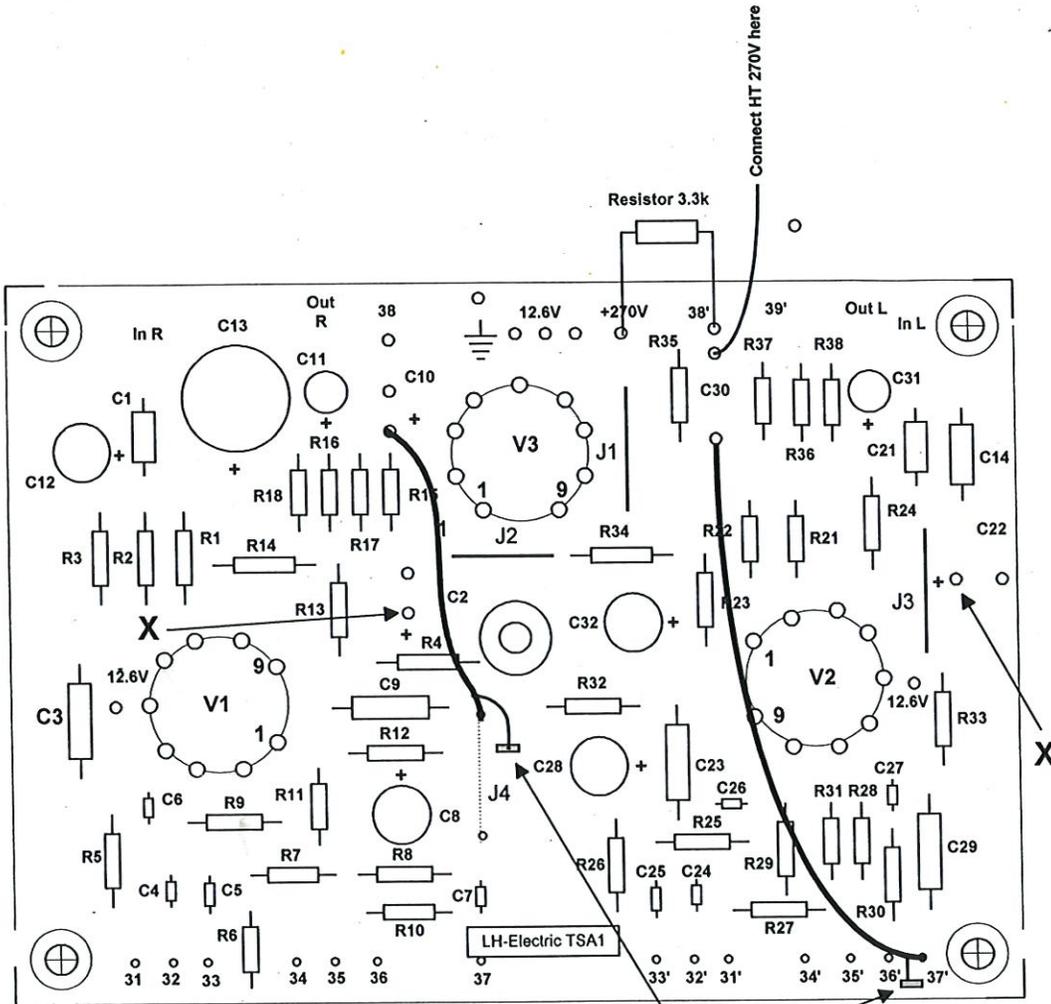
Step 5. Measure cathode voltage at each triode This voltage indicates correct tube operation. Finally, measure plate voltage at each triode. Measured voltages should be within +/- 10%. This completes this part of testing.

The amplifier is ready for listening tests.



LIGHTHOUSE ELECTRIC STA1-LG - STAR GROUNDING EXAMPLE

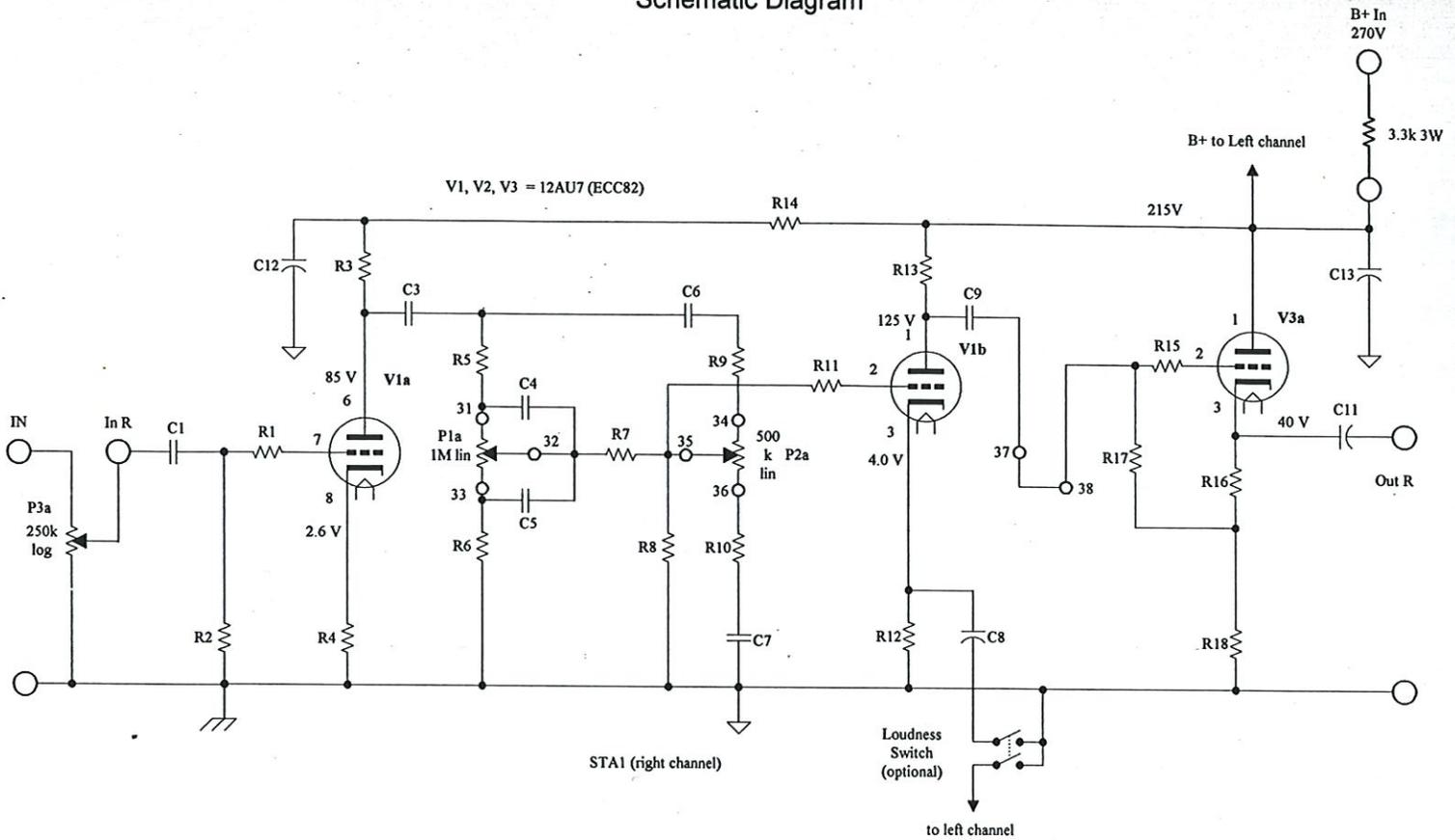
Lighthouse Electric STA1-LG PCB modification



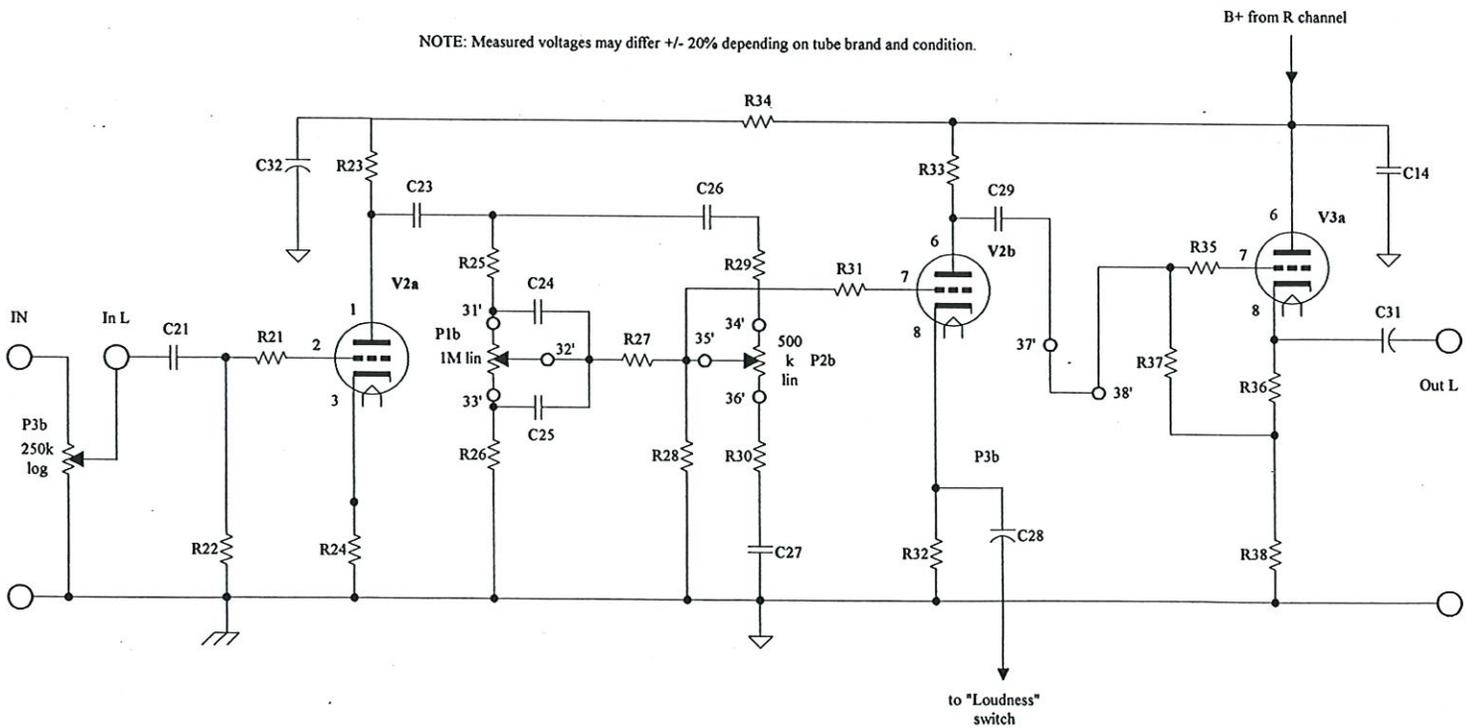
Drill hole here and insert terminal.
Solder shield to terminal

Connect "Loudness" capacitors
as indicated with X

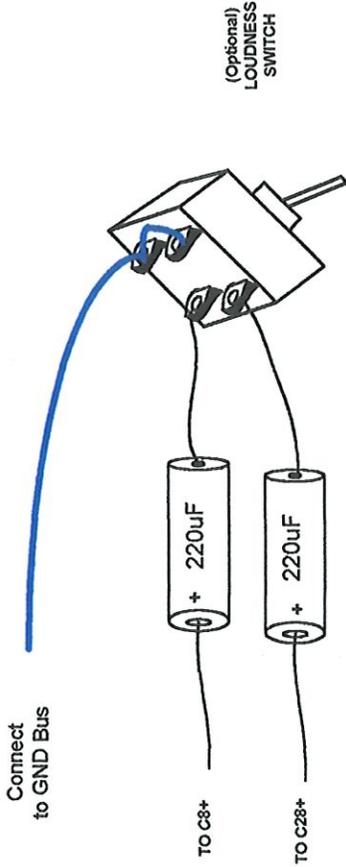
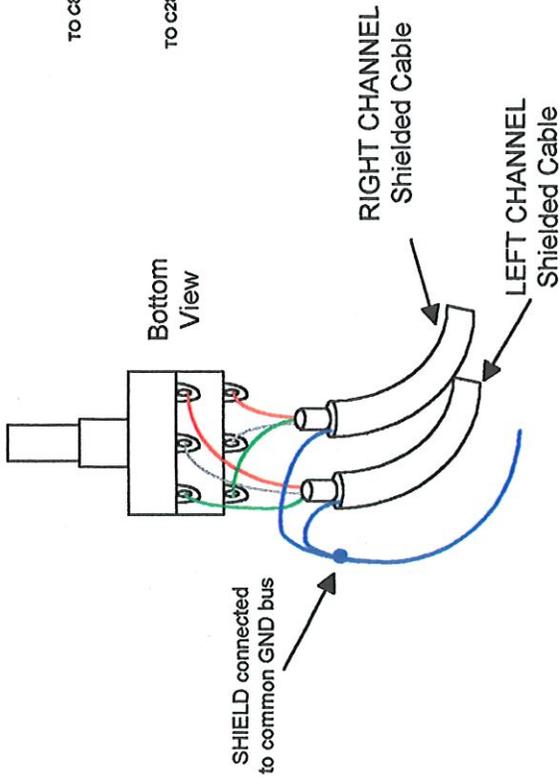
Lighthouse Electric Stereo Tube Pre-Amp STA1-LG Schematic Diagram



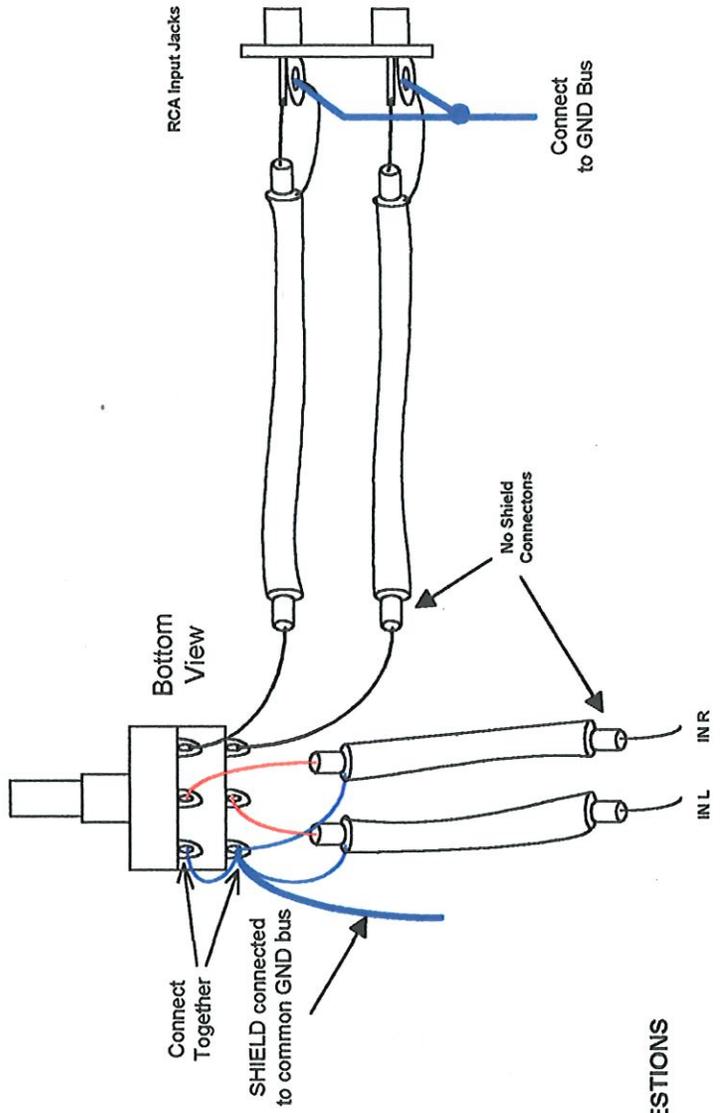
NOTE: Measured voltages may differ +/- 20% depending on tube brand and condition.



TREBLE AND BASS CONTROLS CONNECTIONS



VOLUME POTENTIOMETER CONNECTIONS



Use three-conductor shielded wire for Bass and Treble connections

LIGHTHOUSE ELECTRIC STA1-LG - WIRING SUGGESTIONS

