



PROCEDURE NUMBER  
REF150SE Update

ISSUED: 3/20/2015

Title:  
REF150SE  
Update Procedure

**Caution Electrical Shock Hazard:**

**To prevent electrical shock make sure the AC POWER CORD IS NOT CONNECTED TO THE REF150**

**DO NOT touch the Vacuum Tube Socket Pins when inserting or removing the vacuum tubes, as there may be hazardous voltages present even after the REF150 has been switched "Off" for a period of time.**

**If the REF150 has been "ON", allow the Hot Vacuum Tubes to cool first before removing.**

**1.0 PURPOSE**

The purpose of this document is to define the process for updating the **REF150** Amplifier to a **REF150SE** Amplifier.

**2.0 SCOPE**

This document specifies materials, equipment, and assembly instruction and safety precaution requirements for assembling the SE Update Kit.

**3.0 EQUIPMENT****3.1. Hand Tools Required:**

3.1.1 Diagonal cutter, Needle Nose Pliers, Nut Driver, and Phillips Screwdriver, Allen Wrench (*or Hex Driver*)

**3.2. Solder Tools Required**

3.2.1. Small and Large Tips, High Power Solder Iron, Solder Remover or Solder Sucker

**3.3. Kit Includes**

Quantity	Description	Part Number
1	Top Cover SE Badge	10132310
1	Rear SE Badge	10132410
8	Tube Dampers	20004660
2	#10 "IT" Lock Washer	21310000
1	#10 X 5/16" X 3/16" Spacer	21410001
1	Fuse Holder	23002500
1	Lug	23103100
4	6H30P Tube	32002301
8	KT150 Tube	32002601
1	7 Amp Fuse	34500706
1	250V 4A Fuse	34600402
4	1.0Ω 3W Resistor	43100006
4	2.1 Uf 425V Capacitor	53200615
1	Bridge Rectifier Board Assembly	PCB870
1	AC Cap Board Assembly	PCB871-150
1	Plastic Insulator Shield	N/A
2	15.75" 16 GA White Wire	N/A
2	15.75" 16 GA White Wire With Black Sleeve	N/A
2	15.5" 16 GA Clear Wire	N/A

4.0. **PROCEDURE**

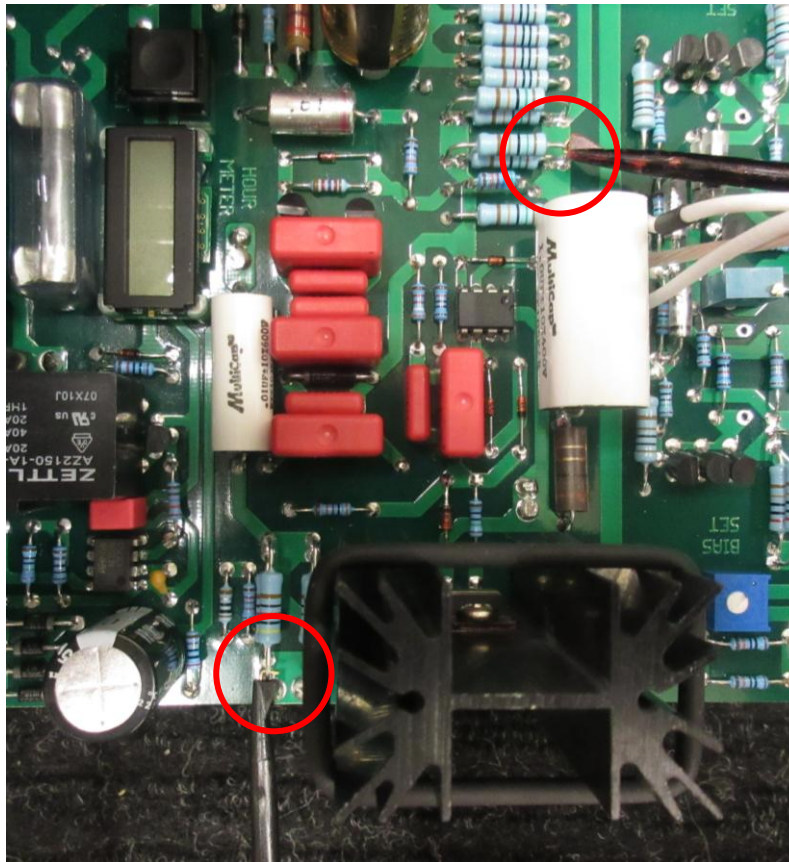
4.1. **Top Cover and Input Wire Removal**

4.1.1. Remove 18 – #6 Screws that secure the Top Cover to the Chassis.

4.1.2. Remove Top Cover.

4.1.3. **Discharge the Power Supply!!**  
*Refer to Figure 1 for the Discharge Points*

**Figure 1**



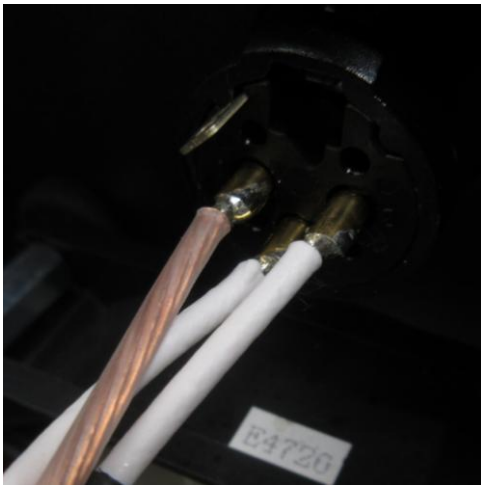
4.1.4. Remove the 8 – KT120 and 4 – 6H30P Tubes.

4.1.5. Use a large tip Solder Iron to remove 6 – Output Wires from the 2 – XLR Connectors.  
*Refer to Figure 2 for an example of an adequate Tip*  
*Refer to Figure 4 for the XLR after wire removal!*

**Figure 2**



**Figure 3**



**Figure 4**



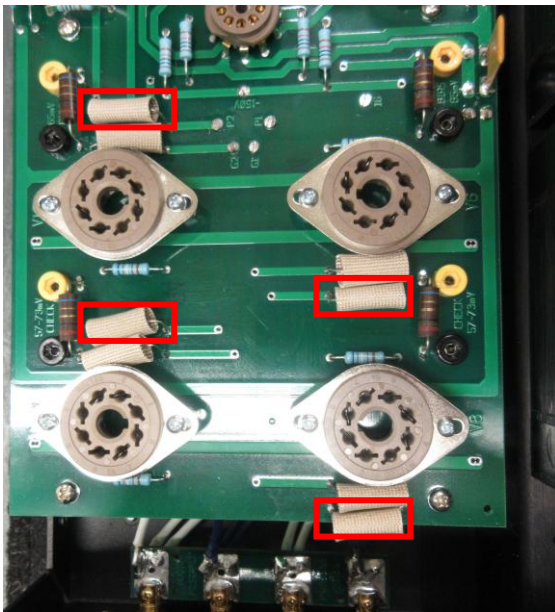
4.2. **Resistor Replacement**

4.2.1. Remove 4 – 1- 1.0Ω 2W Resistors from both the Audio and Power Supply Board.  
*Refer to Figure 5 and Figure 6*

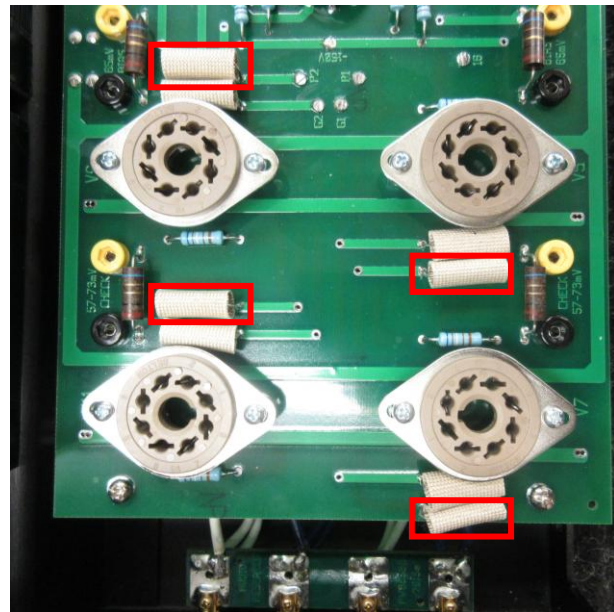
4.2.2. Prepare the 8 – 1.0Ω 3W Resistors with the sleeves from the removed resistors in  
*Step 4.2.1.*  
*Refer to Figure 7(left to right)*

4.2.3. Solder the prepared 8 – 1.0Ω 3W Resistors into the Audio and Supply Board.  
*\*Make sure to heat the component and through hole enough so as not to pull the  
through hole pads out with the components!*

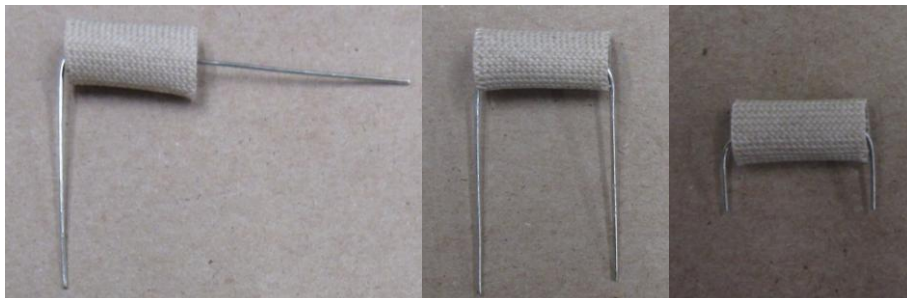
**Figure 5**  
(Audio Board)



**Figure 6**  
(Power Supply Board)



**Figure 7**



4.3. **Bridge Rectifier Removal**

4.3.1. Remove Front Panel by removing the 4 – #10 Screws and Lock Washers that secure the Handles to the Front Panel and to the Chassis.

*Refer to Figure 8 and Figure 9*

*\*Use care not to strip the screws when removing, and not to scratch Front Panel with the Handles!*

4.3.2. Remove the 4 – #6 screws securing the Cap Board to the Chassis to free some space up so that you can make room to remove the Power Supply Board.

*Refer to Figure 10*

4.3.3. Unsolder the 2 – White and 2 – Blue Wires from the Power Supply board that come from the Rectifier.

*Refer to Figure 11*

4.3.4. Remove the 8 – #6 Screws and Washers securing the Power Supply Board to the Hex Spacers.

4.3.5. Remove the Rectifier Bridge by removing the Hex Nut and Washer securing it to the Chassis; set the Hex Nut, Lock Washer and #8 Screw aside for remounting the new Bridge Rectifier Board.

4.3.6. Unsolder the 2 – Red Wires from the Bridge Rectifier and discard.

*Refer to Figure 12*

4.3.7. Solder the 2 – Red Wires to The Bridge Rectifier Board Assembly (PCB870) in the locations labeled “RED”.

*Refer to Figure 13*

*Refer to Figure 14 for Step 4.3.8 and Step 4.3.9.*

4.3.8. Adhere 1 – Adhesive Backed Plastic Shield to the Chassis concentrically aligning the hole in the center with the hole used to mount the Bridge Rectifier.

*\*Note the orientation of the Plastic Shield!*

4.3.9. Place the screw removed in *Step 4.3.5* back through the chassis and place 1 – #10 “IT” Lock Washer, 1 – #10 Spacer and 1 – #10 “IT” Lock Washer over it.

4.3.10. Place the Rectifier Bridge Board Assembly and secure with the Hex Nut and Lock Washer removed in *Step 4.3.5*.

*Refer to Figure 15*

*\*Note the orientation off the Rectifier Bridge Board!*

4.3.11. Solder the 2 – Blue and 2 – White wires from the Rectifier Bridge Board to the Power Supply Board.

*Refer to Figure 16*

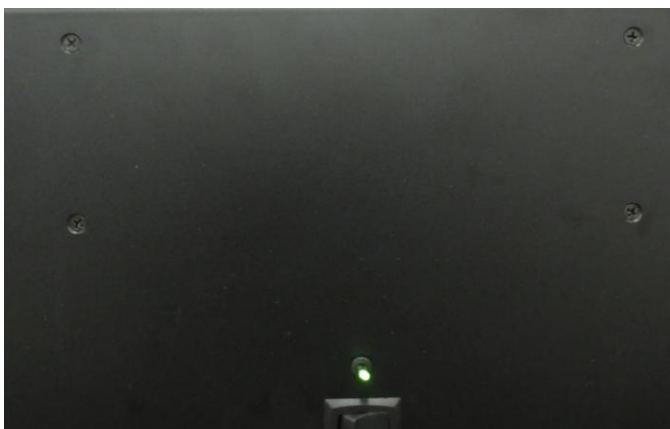
4.3.12. Mount the Power Supply Board back to the Hex Spacers on the Chassis with the 8 – #6 Screws and Lock Washers removed in *Step 4.3.4.*

4.3.13. Mount the Cap Board back to the chassis with the 4 – #6 Screws removed in *Step 4.3.2.*

**Figure 8**



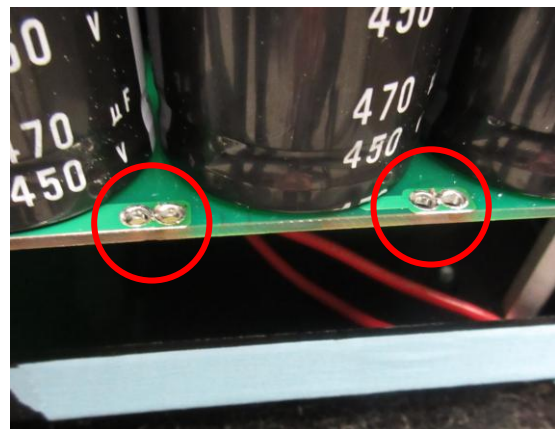
**Figure 10**



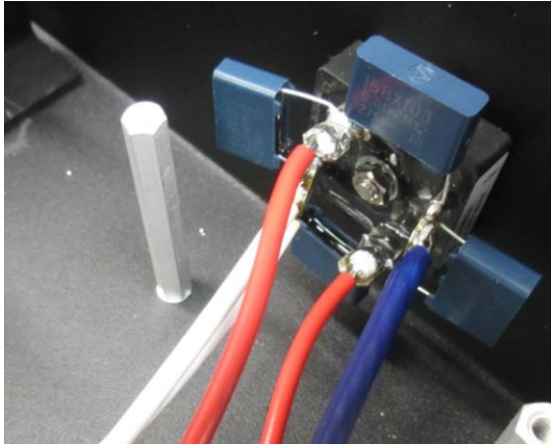
**Figure 9**



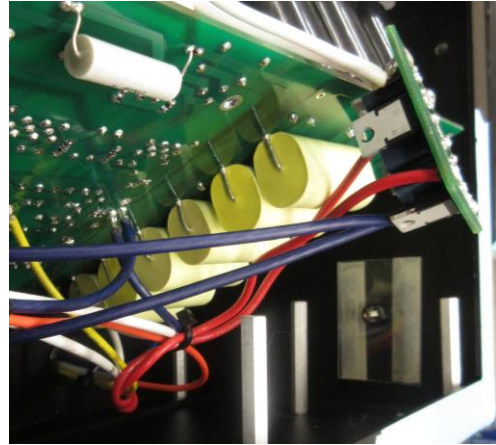
**Figure 11**



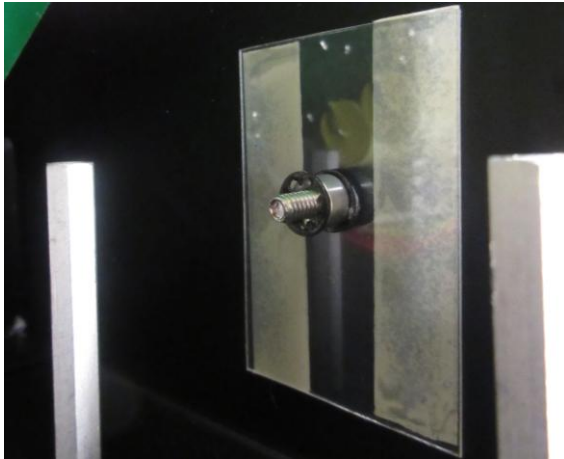
**Figure 12**



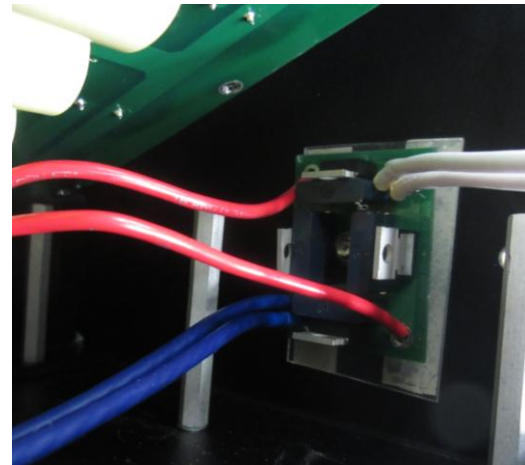
**Figure 13**



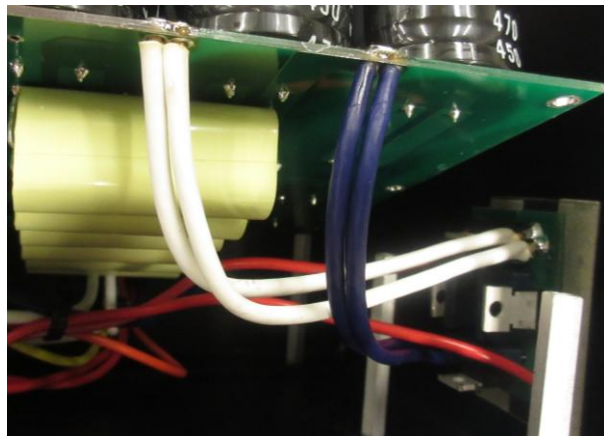
**Figure 14**



**Figure 15**



**Figure16**





#### 4.4. IEC Replacement

*\*Note: Due to revisions of the model, take note of the location that each wire connected to a terminal on the IEC comes from. Some older units may have different color wires coming from the Fuse Holder and also from the Power Supply Board.*

*\*For Instruction purposes I will refer to the color of the most recent revision and also where it comes from!*

4.4.1. Loosen the terminal screws on the IEC that hold the Blue Wire (from P.S. Board) and Brown Wire (from tip of fuse holder).

*Refer to Figure 17*

4.4.2. Remove the Ground Lug, set aside the Screw and Hex Nut for remounting the new Ground Lug.

4.4.3. Remove the 2 – #6 Screws securing the IEC to the chassis.

*Refer to Figure 18*

4.4.4. Discard the old IEC with the GRN/YEL wire and Ground Lug.

4.4.5. Unsolder the 2 – Brown Wires (may be blue on older units) on the Fuse Holder Leads and discard the short one from the tip.

*Refer to Figure 19*

*\*Use caution as the leads may break without proper handling! If the leads do break there is one extra Fuse Holder in the kit!*

4.4.6. Solder the Blue Wire (from P.S. Board) to the bottom of the AC Cap Board and place the AC cap board into the chassis.

*Refer to Figure 20*

*\*This will be a tight fit, make sure to not wreck the wires on the Ac Cap Board!*

4.4.7. Mount the AC Cap Board to the chassis with the screws removed in *Step 4.4.3.*

*Refer to Figure 18*

4.4.8. Solder the Brown Wire from the AC Cap Board to the tip of the Fuse Holder, and the Brown Wire (from power supply board) still in the chassis to the top lug.

*Refer to Figure 21*

4.4.9. Mount the Ground Lug attached to the GRN/YEL Wire from the AC Cap Board to the chassis with the Screw and Hex Nut removed in *Step 4.4.2.*

*Refer to Figure 18 & Figure 21*

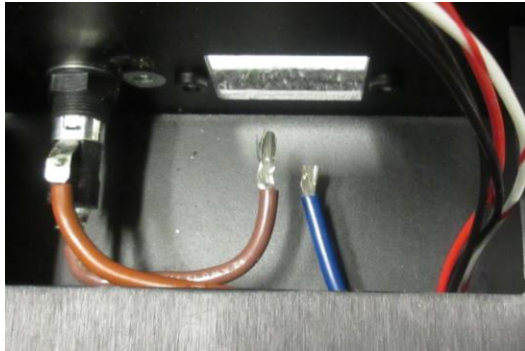
**Figure 17**



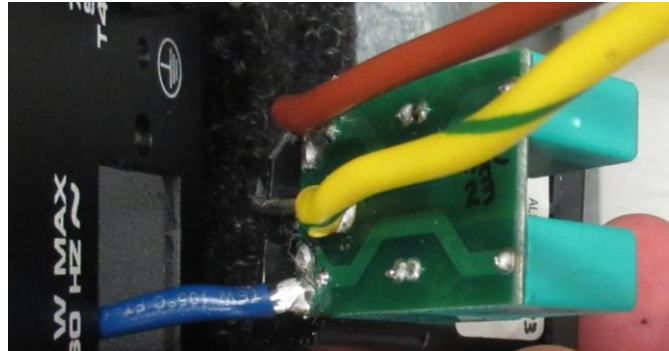
**Figure 18**



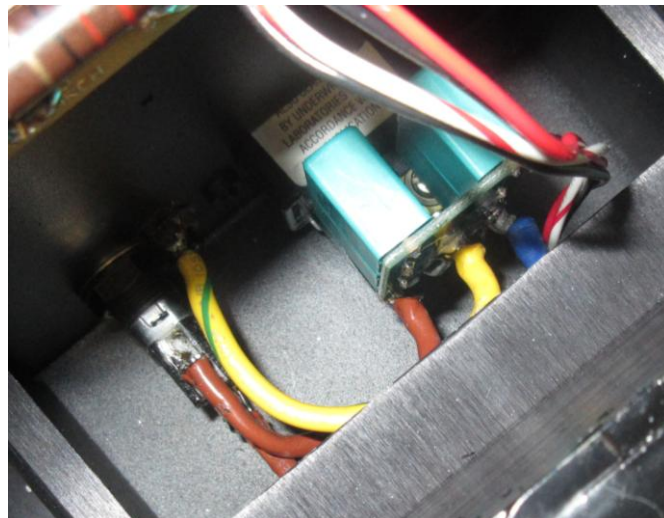
**Figure 19**



**Figure 20**



**Figure 21**



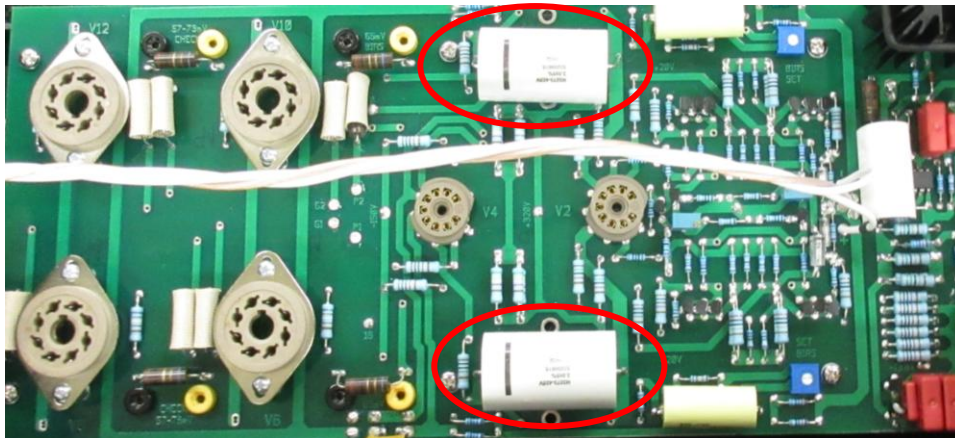
4.5. **Capacitor Replacement** (Optional)

4.5.1. Remove the 4 – Capacitors from the main board and the smaller capacitors underneath them under the board.

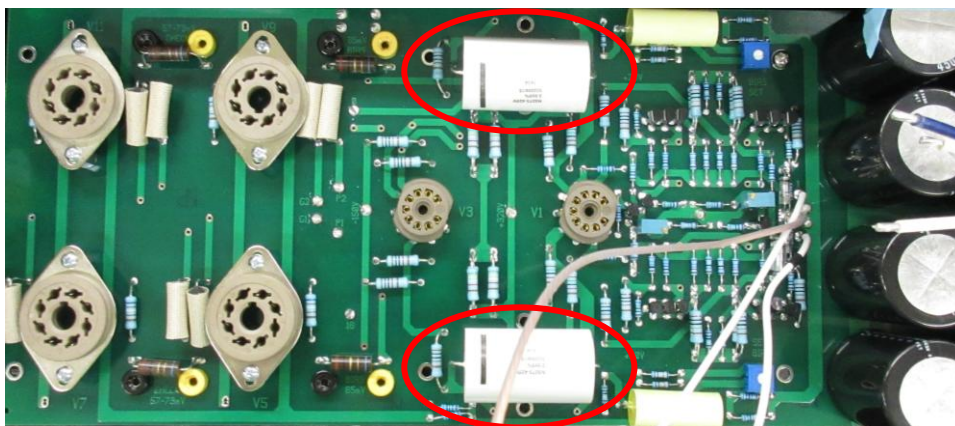
4.5.2. Solder the 4 – Capacitors to the main board in the same locations as the ones removed in *Step 4.5.1.*

*\*Note the orientation of the capacitors!*

**Figure 22**  
(Right Audio)



**Figure 23**  
(Left Audio)



4.6. **Input Wire Install and Panel**

*\*Make sure the following wires are through the through hole before soldering and when soldering use extreme caution not to melt and damage the wire insulation!*

*Repeat Steps 4.5.1 – 4.5.4 for each channel*

4.6.1. Solder 1 – 16 GA White Wire w/Sleeve from the update kit to the “+” location on the main board.

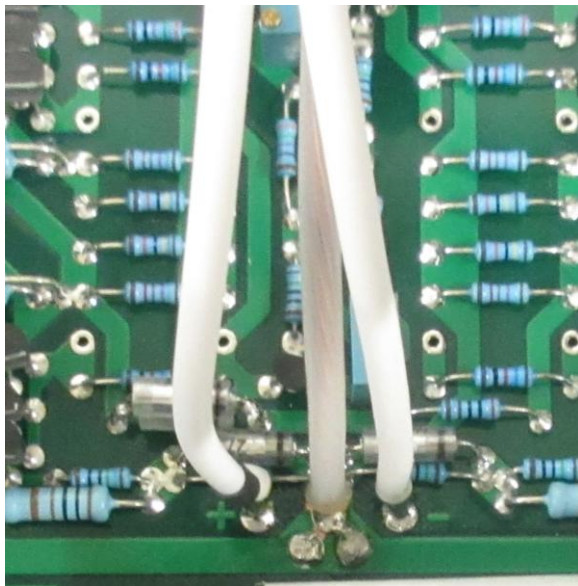
4.6.2. Solder 1 – 16 GA Clear Wire from the update kit to the Ground location on the main board between the “+” and “-” locations.

4.6.3. Solder 1 – 16 GA White Wire from the update kit to the “-” location on the main board.

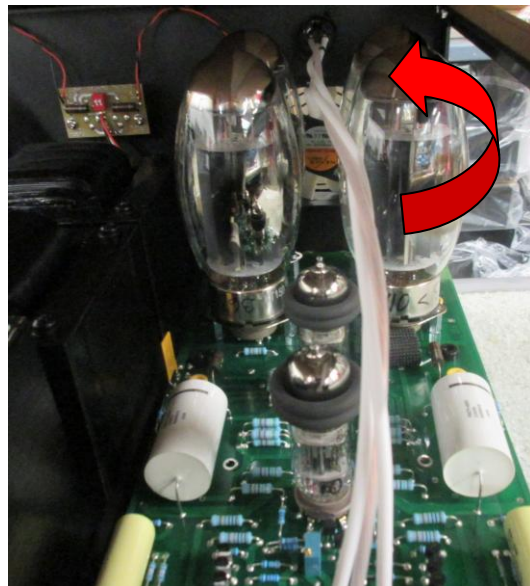
4.6.4. Twist the 3 – Wires in 1-1/2 ***Counter Clockwise Rotations*** (when standing at the front of the unit) and then place in the respective locations in the XLR Connectors and solder.

*Refer to Figure 25 to make sure the wires are in the correct orientation!*

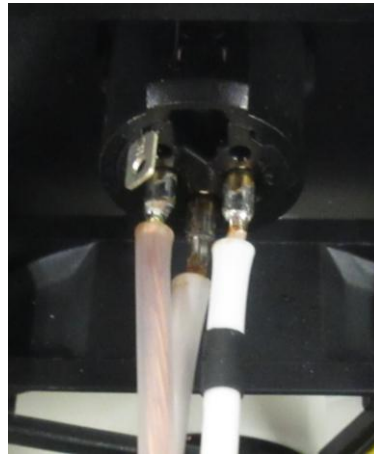
**Figure 24**



**Figure 25**



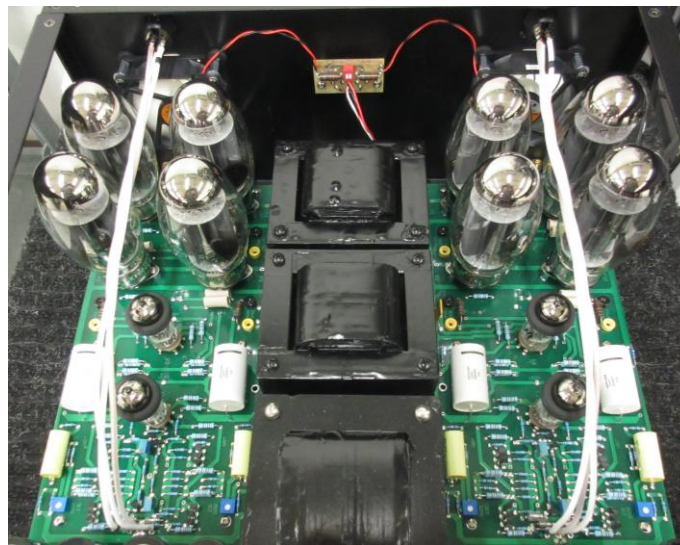
**Figure 26**



- 4.6.5. Place 8 – KT150 Tubes into the sockets and 4 – 6H30P Tubes in the other sockets, place 2 – Damping Tubes around each 6H30P Tube.

*Refer to Figure 27 and Figure 28*

**Figure 27**



**Figure 28**



*\*Refer to the old 6H30P Tubes  
for tube damper placement!*

- 4.5.6. Mount the 2 – Handles back on the Front Panel and secure to the Chassis with the 4 – #10 Screws and Washers removed in *Step 4.3.1.*  
*Refer to Figure 8 and Figure 9*
- 4.5.7. Place the Top Cover on the chassis and secure with the 18 – #6 Screws removed in *Step 4.1.1.*
- 4.5.8. Place 1 – Top Cover SE Badge (10132310) on the Top Cover and 1 – Rear SE Badge (10132410) on the back of the Chassis.  
*Refer to Figure 29 and Figure 30*

**Figure 29**



**Figure 30**

