Project Sunrise

USER MANUAL OCTOBER 10TH 2011

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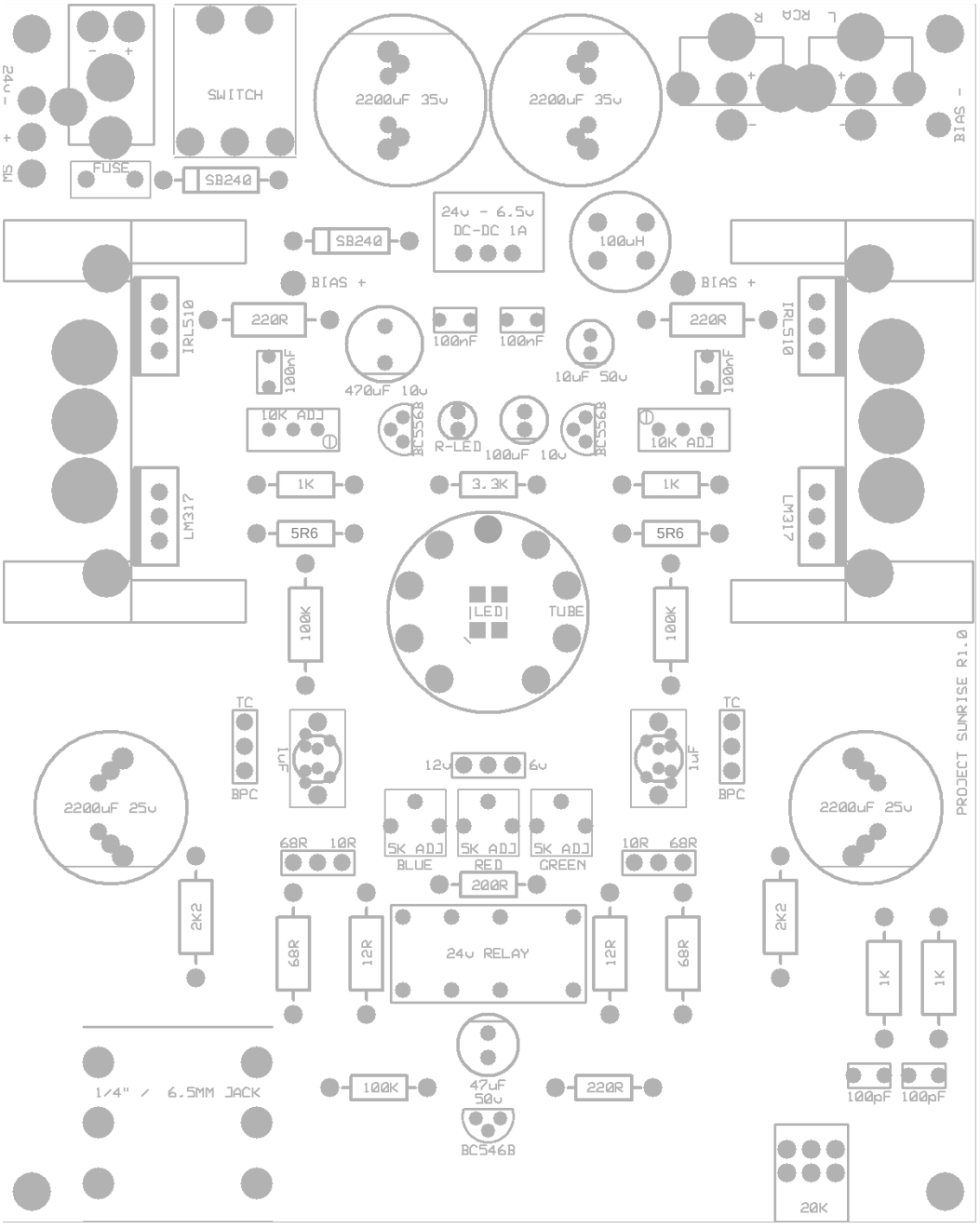

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WARNING:

Although Project Sunrise runs at a generally safe 24VDC, Injury from improper assembly is quite possible. The main danger comes from installing the polarized capacitors backwards as they can only be installed in one direction much like a battery (more detail on capacitor installations comes later in this manual) If a capacitor is installed backwards, it may burst resulting in burns or eye injury. **If you are not experienced in electronics or electronic kit assembly, it would be wise to have an experienced electronics person review your work before powering the unit on.** Upon first power up, wear eye protection and be wary of any burning smells or electrical noises such as loud pops or buzzes. If you followed this installation guide properly and all components are in their proper places and were installed in their proper orientation, you will soon be enjoying your amplifier without issue!

GARAGE1217.COM IS NOT RESPONSIBLE OR LIABLE FOR INJURY, PROPERTY LOSS OR DAMAGE AS THE RESULT OF ASSEMBLY OR USE OF THIS "DO IT YOURSELF" KIT. SUNRISE IS CONSIDERED A HOBBY LEVEL PRODUCT. IT CONTAINS NO ELECTRICAL CERTIFICATIONS AND IS NOT ADVERTISED AS SUCH. USE AT YOUR OWN RISK.

Thank you for purchasing the Project Sunrise Headphone Amplifier Kit. This kit requires minimal electronics and soldering knowledge. The layout is easy to follow and setup is a snap! Please make sure to follow the instructions outlined in this guide and you will be enjoying your amp in no time. First, lets go over the tools and items required for your build which are as follows:

Required Assembly Tools:

- Soldering iron, 25W minimum – Variable temp soldering station preferred with 1.5 – 2mm wide chisel tip
- .032 diameter 60/40 or 63/37 Tin/Lead solder is recommended. Lead free is difficult to work with and not recommended
- Magnifying glass (recommended but not required)
- Rubber Gloves (recommended but not required)
- 3M Green Scotch Brite (recommended but not required)
- 3/32th Allen Key
- 1/16th Allen Key
- Flush cuts
- 90% Isopropyl alcohol (recommended but not required)
- Paper Towels (recommended but not required)
- Digital Multi Meter (DMM or DVOM)

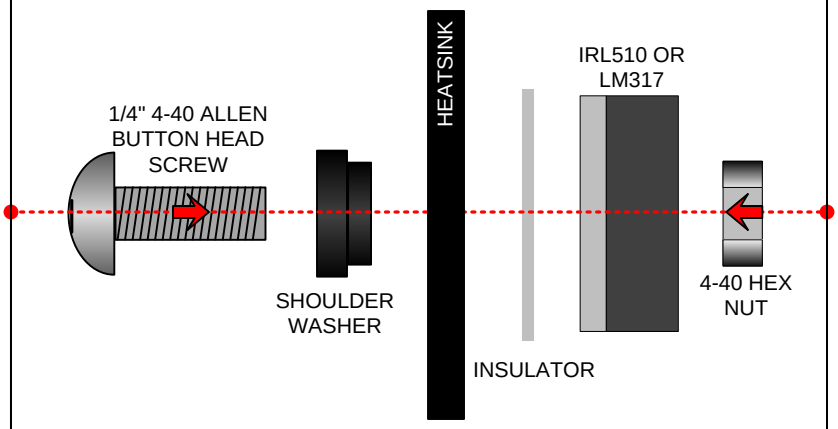
Before You Start Soldering:

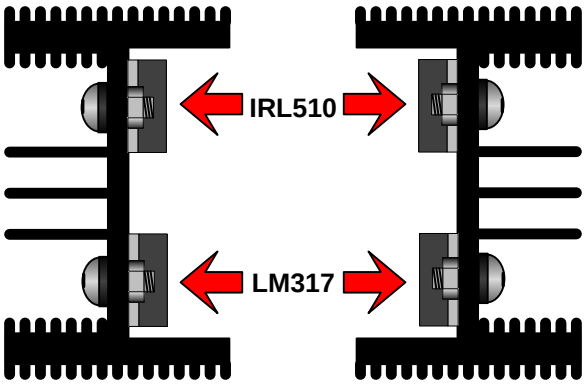
Prep work needs to be done. Wash your hands thoroughly and dry. Put on the recommended rubber gloves and scrub down the PCB (circuit board) on both the front and back side with 90% isopropyl alcohol to clean any residuals off of the board from manufacturing. Once the board has been cleaned, set it on a dry paper towel out of the way. Try to use the rubber gloves during the entire assembly process to keep oils off of the board and solder joints.

Heatsink Assembly Preperation:

Pre-assemble the heatsinks as shown below. The insulators and shoulder washers MUST be used appropriately and as shown or a short will occur, damaging the amplifier. Do not over tighten the allen bolts. They should be tightened down securely without crushing the insulating shoulder washer. Make sure the IRL510 and LM317 devices are pointing straight down once secured. After each heatsink is completed, set it on its side so the leads that go into the PCB are not bent.

IRL510 AND LM317 DEVICES MUST BE ATTACHED TO THE HEATSINK IN THE FOLLOWING ORDER. FAILURE TO DO SO WILL RESULT IN DAMAGE TO THE AMPLIFIER





POSITION IRL510 AND LM317 DEVICES AS SHOWN

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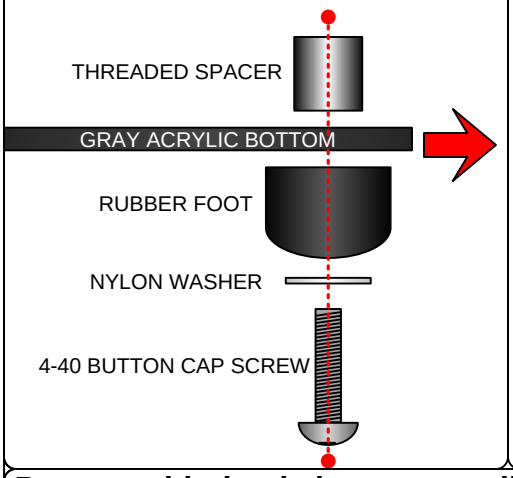
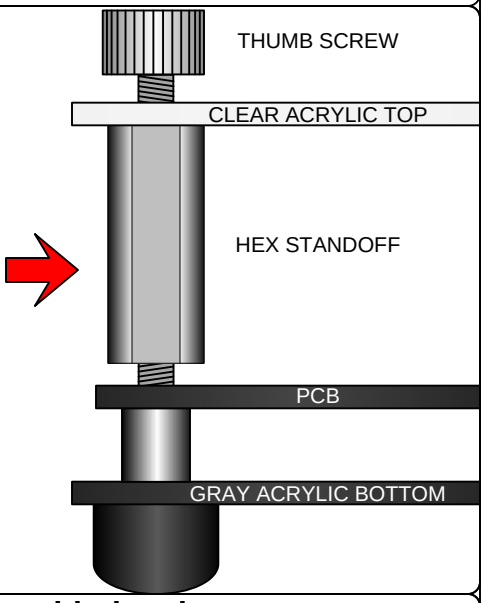
Bottom Chassis Prep / Final Chassis Assembly:

ASSEMBLE EACH OF THE 4 RUBBER FEET AS SHOWN, ATTACHING EACH FOOT TO THE GRAY SMOKED ACRYLIC BOTTOM CHASSIS



- ONCE THE PCB HAS BEEN ASSEMBLED, SET IT ONTO THE FOUR THREADS STICKING OUT OF THE BOTTOM GRAY ACRYLIC CHASSIS THAT YOU PREVIOUSLY ASSEMBLED.
- THREAD ON EACH OF THE FOUR HEX STANDOFFS ONTO THE THREADS THAT ARE NOW PROTRUDING THROUGH THE PCB, SECURING THE PCB TO THE GRAY ACRYLIC CHASSIS BOTTOM. PROCEED TO POWER ON THE UNIT (AS DESCRIBED ON PAGE 2, WEARING EYE PROTECTION AND AT A SAFE DISTANCE IN CASE OF A MISTAKE IN ASSEMBLY)
- ONCE THE AMPLIFIERS FUNCTIONALITY HAS BEEN TESTED AND THE UNIT HAS HAD A CHANCE TO FULLY WARM UP FOR 30 MINUTES, SET THE BIAS AS DESCRIBED LATER IN THIS MANUAL BEFORE PLACING THE TOP CLEAR ACRYLIC COVER IN PLACE

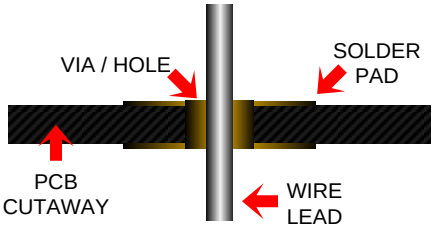


Proper soldering is key to a quality final product. If you are new to soldering, here are some basic guidelines to follow. It would be wise to buy a copper project board and a few cheap resistors or other components to practice with before starting this project.

Soldering and Solder Joints:

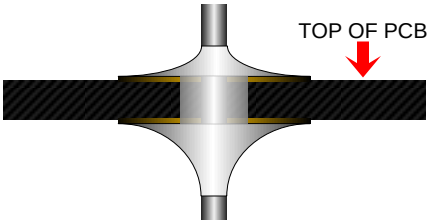
- For best results and maximum conductivity of any component, Wipe each lead down using Green Scotch Bright. Only one or two passes are required, making sure all of the surface has been cleaned. This removes oxidation or any other build up on the metal that has accumulated over time. Once cleaned, it is a good idea the further clean the wire leads with 90% isopropyl alcohol. Make sure all alcohol has evaporated prior to soldering as alcohol is VERY FLAMMABLE.
- Do not use to much or to little solder on each joint. See images below to get an idea of what you should be looking for
- The idea is to heat the pad and the component wire lead quickly and efficiently so that solder flows to each equally. Wetting the tip of your iron with a very small amount of solder will aid in quickly heating up the pad and wire lead.
- Having to heat the component for long periods of time, especially capacitors is not a good thing. When soldering capacitors, heat them only long enough to ensure a quality joint and let the unit cool down for a few minutes before soldering the other side (especially on small capacitors)
- The solder joint should look bright and metallic. A dull or dark gray looking joint is referred to as a "cold solder joint" Cold solder joints may not pose a problem initially, but can show up later in the amps life as a short.
- After every solder joint, make sure to clean the flux off your soldering iron tip with a wet sponge that should be provided with your soldering iron kit.

CUTAWAY OF A VIA AND SOLDER PAD PRIOR TO SOLDERING:



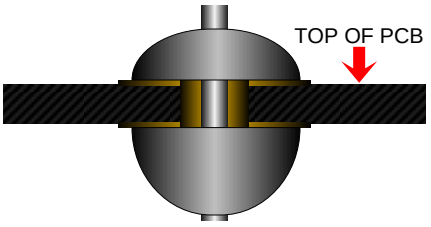
PROPER SOLDER JOINT:

- Solder is bright and shiny. It is curved smoothly starting at the edge of the solder pad until it reaches the lead from the component
- Solder should fill the via and flow through the board slightly. It is ok to add solder to the top side of the board, however it is not required



IMPROPER SOLDER JOINT:

- A large blob of solder, often dull in color is not desired. The solder may not flow into the via hole and cause a poor connection or failure later in the amplifiers life.



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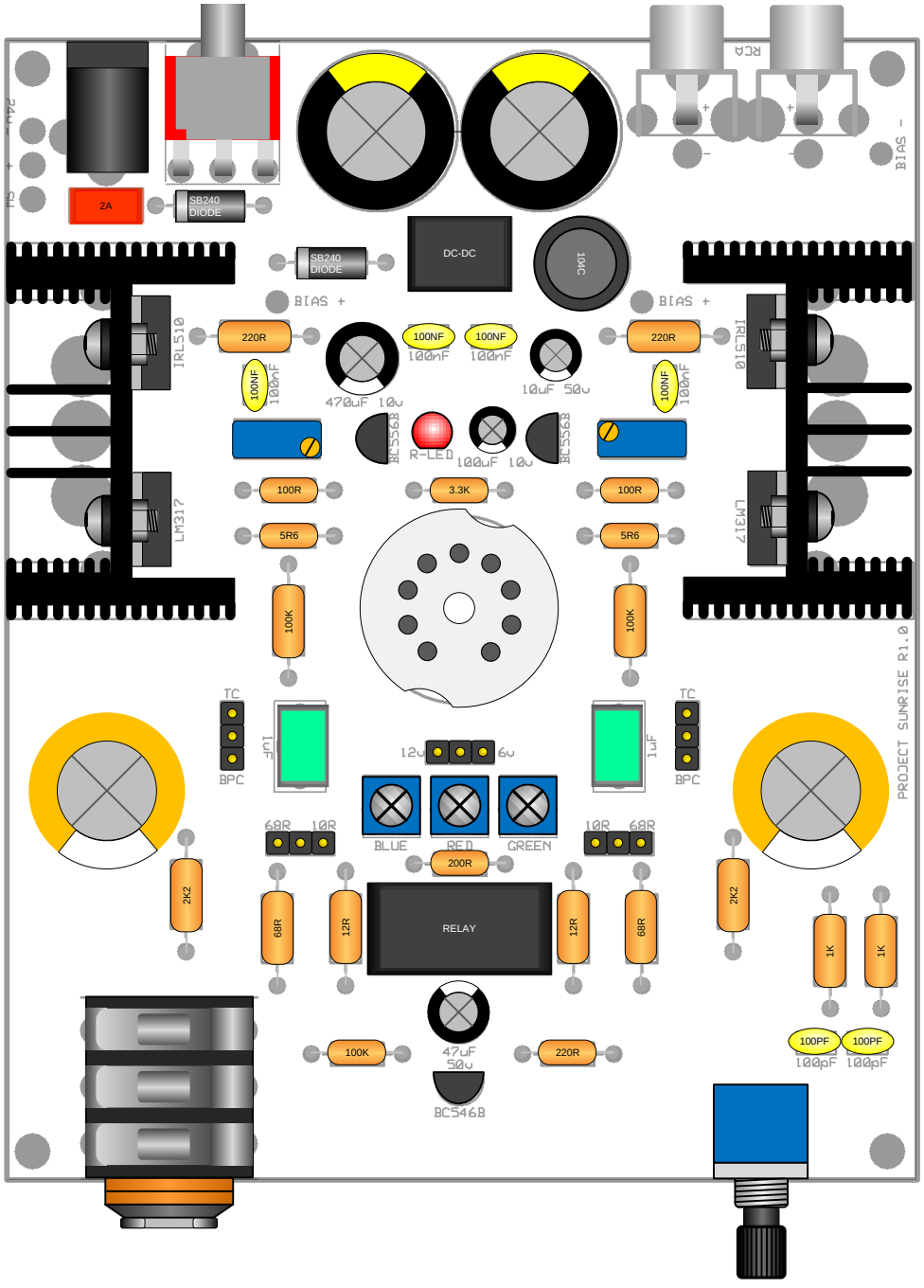
Assembly Guide



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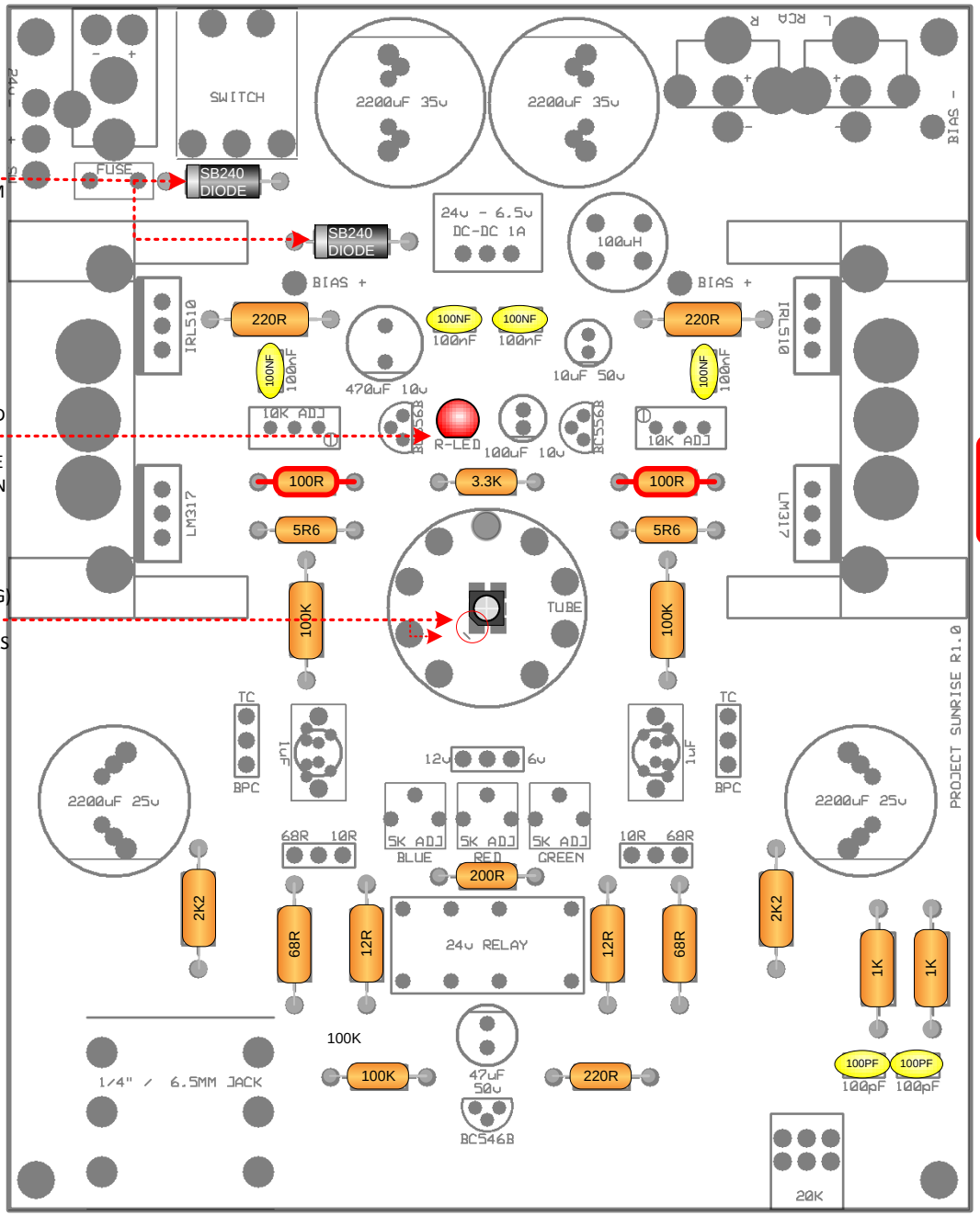
STEP 1: POPULATE ALL SMALL COMPONENTS ON THE BOARD WHICH INCLUDE:

- 2.29 X 6.1MM RESISTORS
- 3.68 X 8.74MM RESISTORS
- DIODES
- 100nF / 100pF CAPACITORS (DO NOT MIX UP 100NF AND 100PF CAPS AS THEY ARE DIFFICULT TO TELL APART)
- RGB TUBE LED / BIAS CIRCUIT LED

GRAY CATHODE BAND MARKING ON DIODE MUST FACE AWAY FROM THE CENTER OF THE PCB AS SHOWN

FLAT SPOT OR THE SHORT LEAD ON RED LED (INDICATES NEGATIVE SIDE OF LED) MUST FACE TUBE SOCKET AS SHOWN

NOTCH ON THE RGB LED (ORIENTATION MARKING) MUST FACE THE WHITE MARKING ON THE PCB AS SHOWN



REVISION: 1K CHANGED TO 100R HIGHLIGHTED IN RED

PLEASE TAKE CAREFULL NOTE! PROJECT SUNRISE USES 2 TYPES OF RESISTORS. THE RESISTORS MARKED RN LG ON THE LABEL ARE FOR THE AUDIO SIGNAL PATH ONLY! THEY ARE MUCH LARGER IN SIZE THAN THE OTHER RESISTORS AND EASY TO IDENTIFY.

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STEP 2: POPULATE ALL MID SIZE COMPONENTS WHICH INCLUDE:

- TRANSISTORS
- SMALL CAPACITORS “DO NOT INSTALL 2200uF CAPACITORS AT THIS TIME
- FUSE
- INDUCTOR
- VOLIME POTENTIOMETER / LED TRIMMERS / BIAS TRIMMERS
- DC INPUT JACK / POWER SWITCH / RCA JACKS
- JUMPER PINS
- RELAY
- TUBE SOCKET

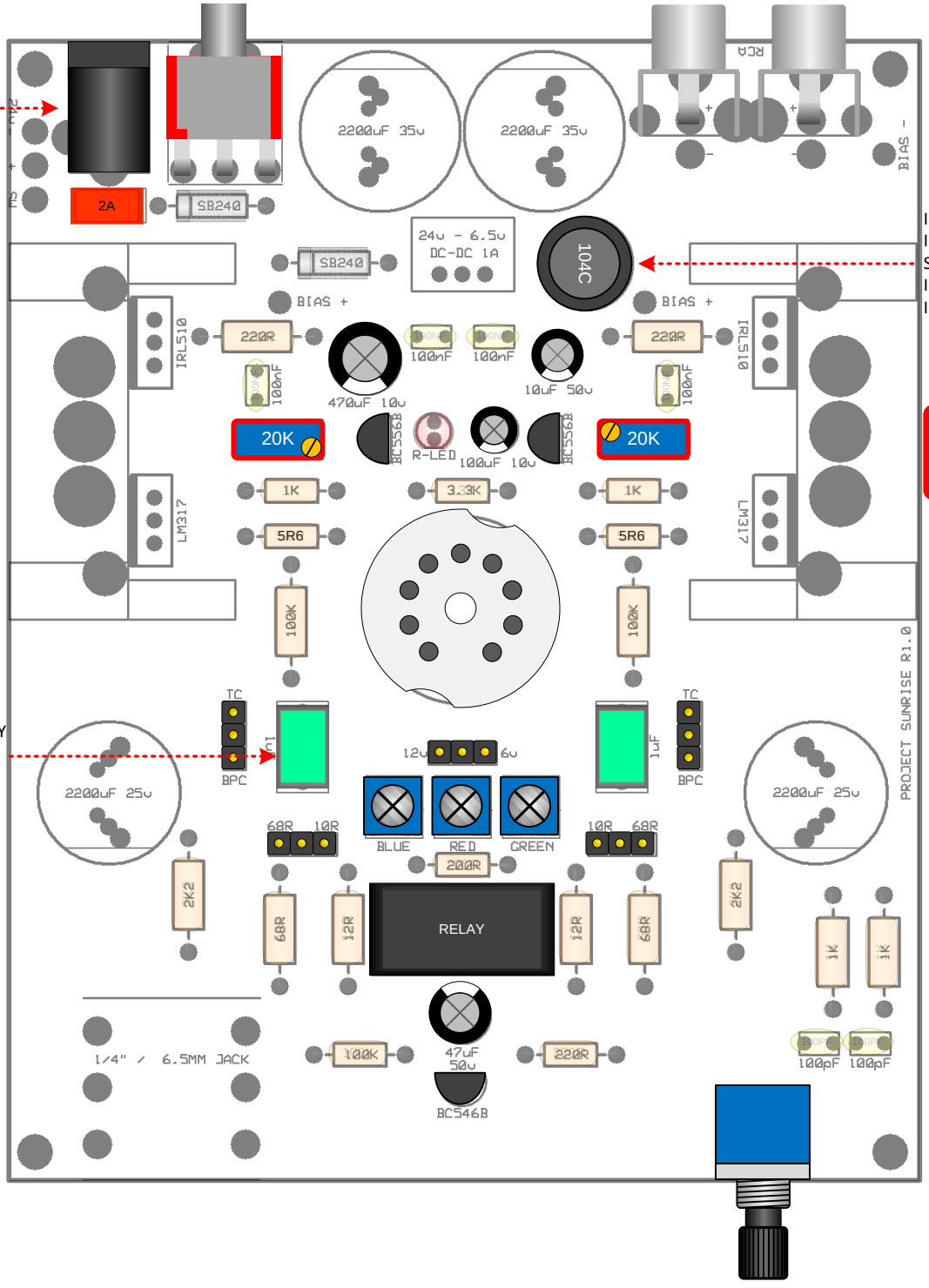
POLARIZED CAPACITORS MUST BE INSTALLED IN THE CORRECT DIRECTION (WILL HAVE A STRIPE DOWN THE SIDE DESIGNATING POLARITY) INSTALL THIS STRIPE FACING THE FLAT SPOT ON THE CAPACITOR OUTLINE ON THE BOARD

PLEASE NOTE: CENTER PIN OF DC SOCKET IS POSITIVE / 24VDC+

INSTALL THE INDUCTOR IN THE EXACT POSITION SHOWN. DO ROTATE OR INSTALL THE INDUCTOR IN ANY OTHER POSITION

REVISION: 10K CHANGED TO 20K HIGHLIGHTED IN RED

INPUT CAPACITORS ARE BIPOLAR MEANING THEY HAVE NO STRIPE AND CAN BE INSTALLED IN EITHER DIRECTION



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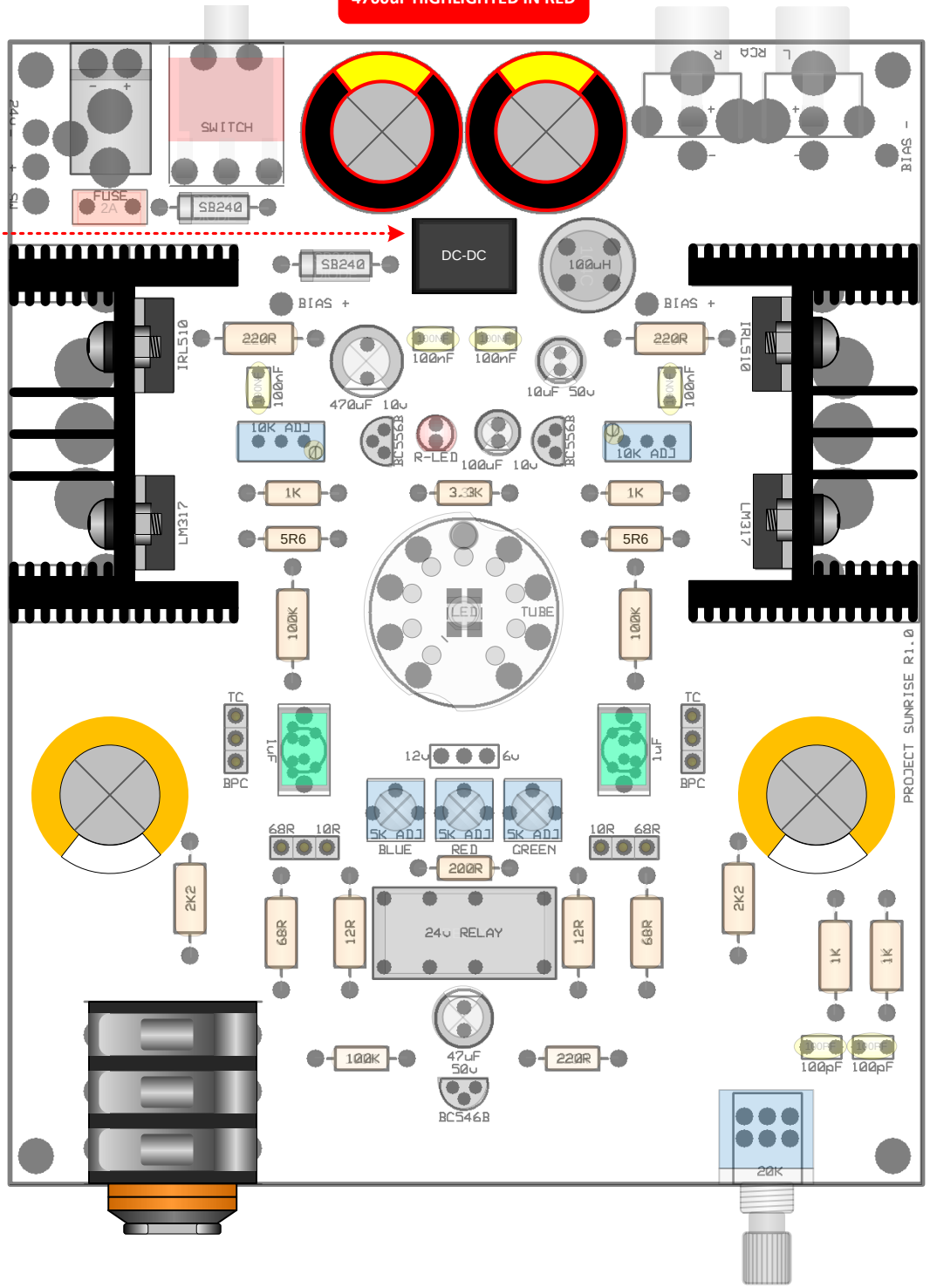
STEP 3: POPULATE ALL LARGE SIZE COMPONENTS WHICH INCLUDE:

- ASSEMBLED HEATSINKS WITH LM317 AND IRL510 DEVICES
- ¼" / 6.3MM HEADPHONE JACK
- DC-DC CONVERTER
- NICHICON FG 2200uF CAPACITORS

REVISION: 2200uF CAPACITORS CHANGED TO 4700uF HIGHLIGHTED IN RED

LETTERING ON THE DC TO DC MUST FACE THE REAR POWER SUPPLY CAPACITORS! DO NOT INSTALL WITH LETTERS FACING THE FRONT OR SERIOUS DAMAGE CAN OCCURE TO THE AMP



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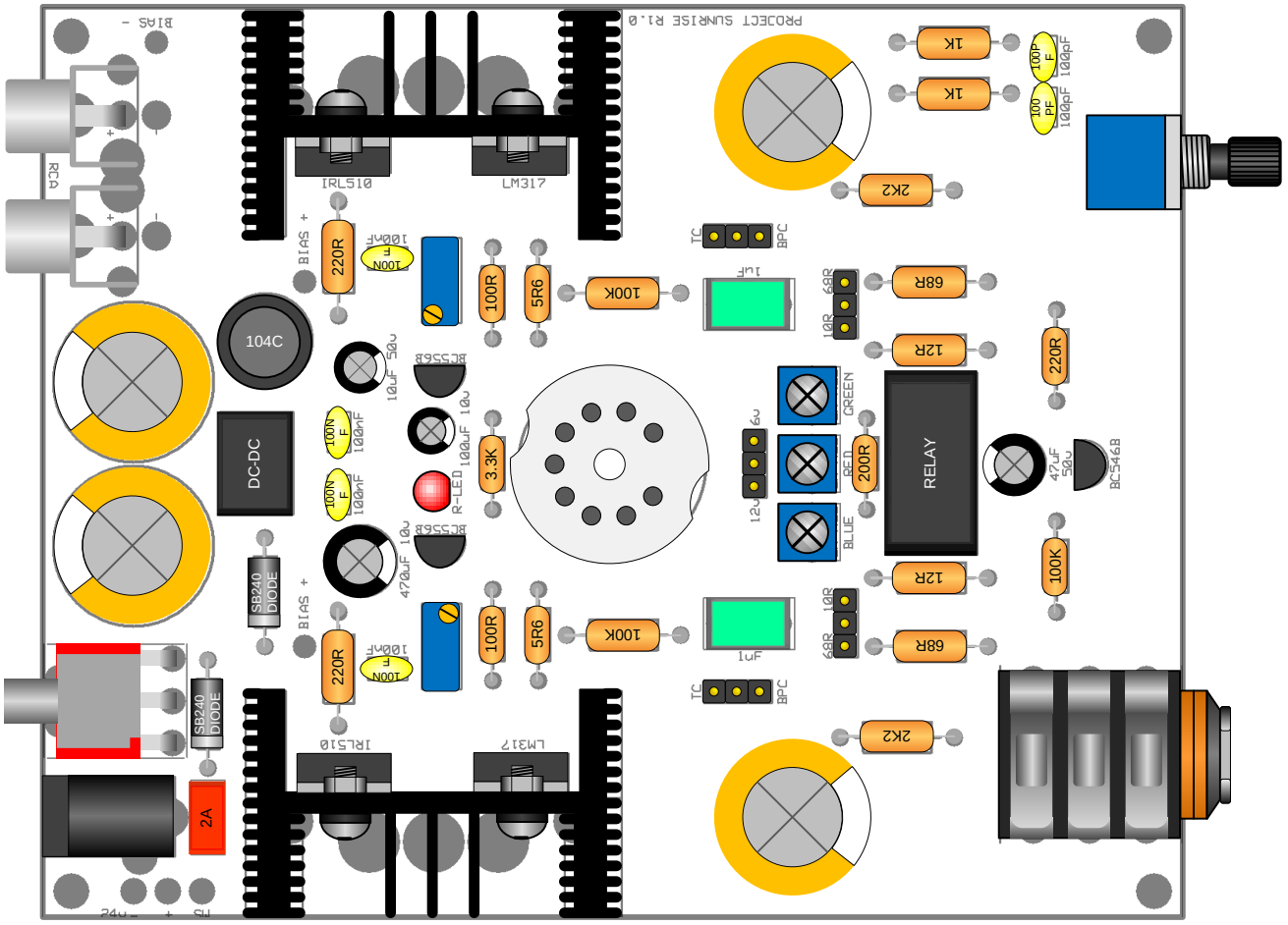
COMPLETED SUNRISE LAYOUT AND PHOTO:



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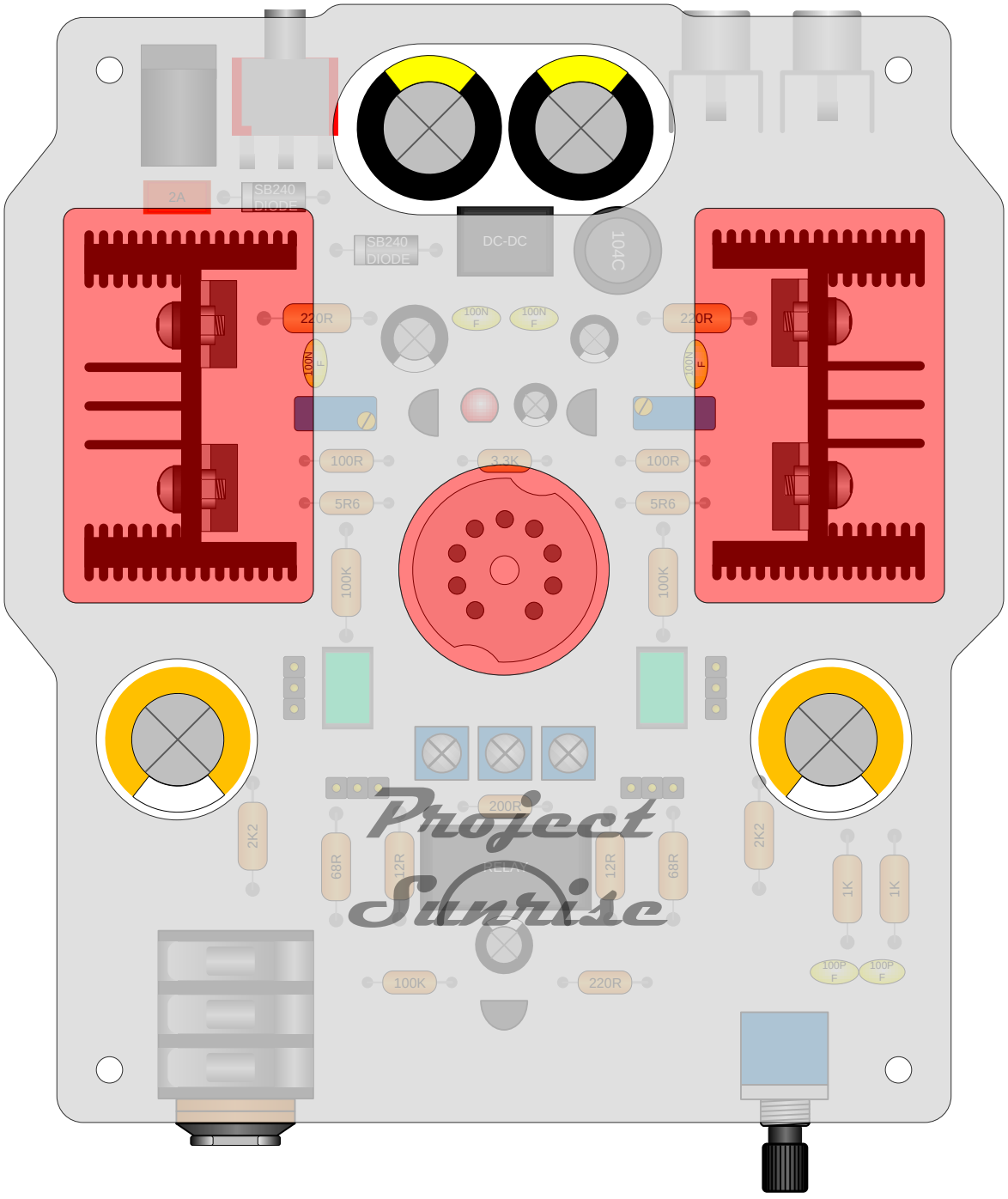
EXTREME HEAT WARNING:

Project Sunrise runs in Class A operation generating high temperatures on the heatsink assemblies. Never touch the heatsink assemblies or tube during operation or severe burns may occur. Temperatures in excess of 70C / 158F are common in these areas.

ONLY OPERATE THE AMPLIFIER IN A WELL VENTILIATED AREA!
NEVER COVER THE AMPLIFIER OR OPERATE IN A CLOSED OR CONFINED SPACE SUCH AS A CABINET!

See areas of caution below highlighted in red.



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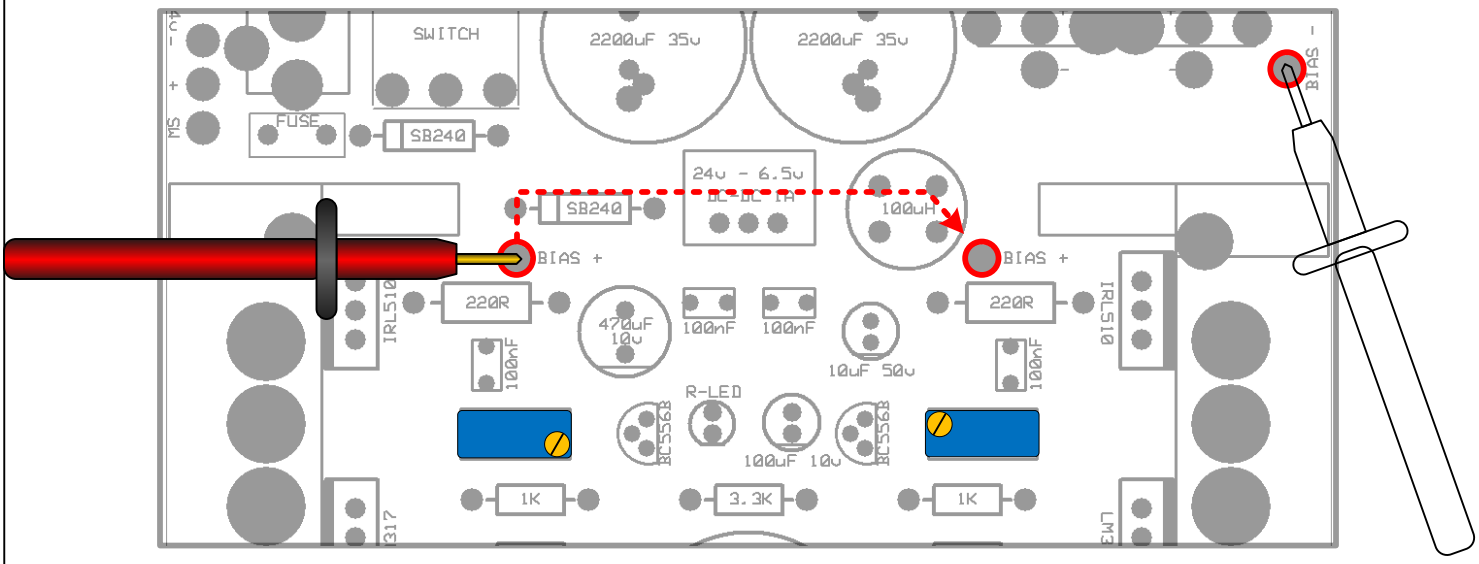
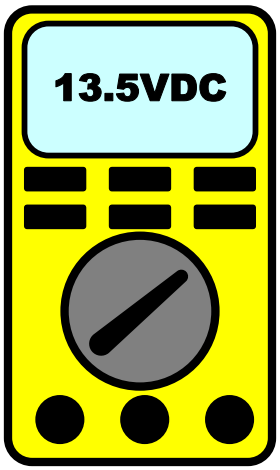
Setting the bias on Project Sunrise is a quick and painless. Follow the steps and guide below!

- First, make sure no equipment such as headphones, an mp3 player or other source device is plugged into the amplifier
- Turn the volume knob down counterclockwise (its lowest setting) and make sure the power is off
- Insert your tube of choice into the amplifier and make sure all proper jumper tabs have been placed according to your tubes voltage and how you want to use the amplifier
- Set your Multi-Meter (DVOM or DMM) to voltage DC. Set the range for 20VDC. The Bias test points are large enough for you to insert the probes of most DMM's directly into the board so you do not have to hold the probes up. Make sure no metal parts of your probe touch any other components on the amplifier as a short could occur.
- Turn on the amplifier and watch the voltage for around 30 seconds. If the voltage does not appear on screen, power down the amplifier and turn each of the blue 25 turn trimmers 10 turns counterclockwise. Power on the amp again and re-check. If it measures under 20, let the amp warm up for 15 minutes
- Once the amp is warmed up, measure each of the two positive bias points in real time while turning the adjustment screws. (Counterclockwise will lower voltage, clockwise will raise voltage) Dial in each side to around 13.5VDC
- Plug your music source into the RCA jacks on the back side of the amplifier. First, only use a cheap set of headphones to test the sound of the amp in case of any assembly issues. Once you are satisfied the amp is functioning properly, plug in your favorite headphones and enjoy the amp! Re-check the bias every 30 minutes for the first few hours and make any tweaks as needed. Please remember to disconnect headphones, source devices and turn the volume its lowest settings prior to tweaking bias

Once bias measures stable, every few months or longer depending on how much you listen to the amp, it may need its bias calibrated again. This is normal. Also every time you make a change such as changing tubes or changing input capacitor jumpers, you will need to re-calibrate the bias





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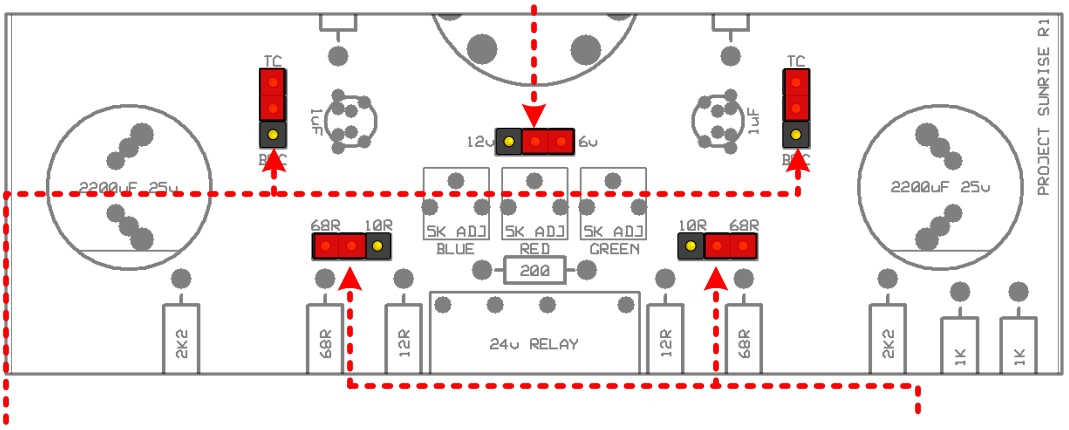
Project Sunrise has several jumpers settings to customize the amp the way you would like it. Below gives you the details on what these jumper settings do!

THE 12V / 6V JUMPER ALLOWS YOU TO USE BOTH 12 AND 6 VOLT TUBES. BEFORE POWERING ON YOUR AMPLIFIER, YOU MUST MAKE SURE WHAT VOLTAGE YOUR TUBE RUNS AT AND SET IT ACCORDINGLY VIA THE JUMPER. ATTACH THE JUMPER TAB TO THE CENTER PIN AND TO THE SIDE PIN CLOSEST TO THE VOLTAGE YOU DESIRE (12v OR THE 6v SIDE)
(EXAMPLE OF 6V SETTING IN RED)



INPUT CAPACITORS CAN BE BYPASSED PER YOUR PREFERENCE. WITH INPUT CAPS BYPASSED, YOU MAY HEAR A SCRATCHY SOUND WHEN ADJUSTING VOLUME. THIS WILL NOT DAMAGED YOUR HEADPHONES OR YOUR AMPLIFIER
TC = THROUGH CAP (EXAMPLE SETTING IN RED)
BPC = BYPASS CAPACITOR

OUTPUT RESISTANCE IS CONFIGURABLE BETWEEN THE DEFAULT 68OHM AND 10 OHM. HIGHER OUTPUT IMPEDANCE WILL HAVE A SLIGHT EFFECT ON BASS AND TREBLE FREQUENCIES WHICH IS ALSO DEPENDANT ON YOUR HEADPHONES
(EXAMPLE OF 68OHM SETTING IN RED)

Another feature of Project Sunrise is an adjustable RGB (RED GREEN BLUE) LED under the tube. RGB LED's can produce almost any color desirable. We understand this is not an audiophile feature or a feature that has anything to do with the sound of the amplifier, however to us it is an important one. Each of us has a favorite color that is enjoyable to look at. Using the three trimmers located below, you can dial in any color you desire and also the brightness of that color. Often manufacturers tie you into their specific color scheme on their products. We feel it is important for you to choose the color you desire which can set an enjoyable mood when listening to your music. Adjust the brightness and color by turning each of the trimmers with a small jewelers screwdriver.

RGB LED
COLOR CHANGING

COLOR / BRIGHTNESS
ADJUSTMENT TRIMMERS