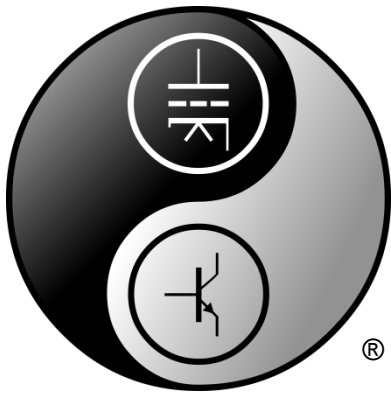


Liquid Lightning[®] 2T

Tube Hybrid or Solid State Electrostatic Headphone Amplifier



cavalli audio

Congratulations! You're now the proud owner of the Cavalli Audio Liquid Lightning® Electrostatic Headphone Amplifier!

Amplifier Break-In

Most amplifiers need at least 150 hours of continuous use, playing music, to reach their full sound signatures. We recommend at least 200 hours for the Liquid Lightning®.

Your Liquid Lightning® Amplifier has been playing music for at least _____ hours at near full volume. Confirmed by _____.

If this number is less than 200 hours we recommend that, when you're not listening, you leave the amp on continuously with your CD player in loop mode for enough hours to reach the 200 hour point. It is not necessary to leave headphones attached. In fact, **we recommend that you disconnect your headphones** when not listening during this break-in period.

At this point - and not before this point – will the amplifier reach the level of performance enabling you to accurately judge its sound quality and to determine whether it meets your critical listening standard.

Before you judge the sound quality of the amp please follow this procedure!

Return Policy

You may return your Liquid Lightning® amplifier within 30 days of delivery. Returning the amp within this time period will incur a 30% restocking fee.

Liquid Lightning® - Solid State or Tube Hybrid

The Liquid Lightning® 2T amplifier comes in either a solid state or tube hybrid version. Both amplifiers are the same basic Cavalli Audio electrostatic headphone circuitry – giving you superb sound from durable high voltage designs and components. The new LL2T amplifiers have a processor controlled optical volume control for ease of use and control.

Important points to remember about the Cavalli Audio Liquid Lightning® 2T Electrostatic headphone amplifier

The Liquid Lightning® uses high voltage Mosfets. Mosfets are more durable than bi-polar junction transistors and can be run at higher power levels in the same space.

The amp has both single ended (RCA) and two fully balanced (XLR) stereo inputs. The second balanced input has a loop out for connecting to other equipment. The input type is selectable with a 3-position front panel toggle switch. The single ended input has an internal solid state chip-based phase splitter to create a balanced signal to drive the amp fully balanced.

Power is controlled by a standby power circuit activated by a custom made Piezo power switch. Full power on is indicated by a small white LED underneath the power button. See the individual section on start up for Tube or SS to understand the behavior of this LED.

The Liquid Lightning® uses 400V rails for a theoretical output voltage swing of 1600V (a standardized way of specifying the output voltage excursion of electrostatic amplifiers).

Operation

Your Liquid Lightning® amplifier has been operated for at least 100 hours for quality control and to give the Mosfets and other parts an opportunity to break in. However, most amplifiers don't fully settle, open up, and "relax" until they are played for at least 100 to 150 hours of operation. The Liquid Lightning® also follows this timeline up to 200 hours (see page 3). Your new amp will continue to improve with regard to bass impact, more open sound, warmth, and "sweetness," so we strongly recommend that you accumulate these important hours on your Liquid Lightning® electrostatic headphone amplifier by playing it as much as possible so that you may fully enjoy its performance as soon as possible.

The startup sequence is different for the Tube or SS versions. Please read your section carefully so that you understand how the amplifier power up properly.

Your power inlet has been set for the voltage you specified. The first two steps are common to both amps:

- 1) Insert the power cord.
- 2) Flip the standby switch on the power inlet at the rear of the amplifier. The power switch on the front panel should light white.

Solid State Start Up

- 1) Pushing the power switch turns the amp on (see notes below about "The Power Switch"). The white LED under the power switch will light indicating that the amp is on.
- 2) We recommend that you let the amp warm up for about 15-30 minutes before connecting headphones and listening (although this is not required).
- 3) You can leave the amp in standby mode (power switch lit, but white LED off) for any length of time.
- 4) If the white LED does not light when you push the power piezo switch or if it lights briefly and then turns off, please contact Cavalli Audio support at support@cavalliaudio.com.

Tube Hybrid Start Up

- 1) Pushing the power switch turns the amp on (see notes below about "The Power Switch").
- 2) The LED under the power switch will first glow red. It will stay red for about 15 seconds while the amplifier waits until the tubes are fully heated.
- 3) After about 15 seconds the LED should change from red to white indicating that the rails have been applied to the amplifier circuits.

- 4) We recommend that you let the amp warm up for about 15-30 minutes before connecting headphones and listening (although this is not required).
- 5) You can leave the amp in standby mode (power switch lit, but white LED off) for any length of time.
- 6) If the red/white LED does not light when you push the power piezo switch or if it lights briefly and then turns off, please contact Cavalli Audio support.
- 7) If the LED turns red but never turns white, please contact Cavalli Audio support at support@cavalliaudio.com.

Important - Power Supply Internal Protection

The Liquid Lightning's power supply has an automatic shutdown feature. The power supply monitors the power (current) being used by the amplifier section. If this usage exceeds a pre-determined amount (because the amplifier is drawing too much current) the power supply turns the Liquid Lightning® completely off.

If your amplifier turns itself off under normal conditions this indicates a problem. Do not continue to cycle the power and please contact Cavalli Audio at support@cavalliaudio.com.

Power Cycling

The power circuit in the Liquid Lightning® will not allow you to instantly turn the power off and then on again (making you wait about one second). Even with this protection we recommend that you don't cycle the power quickly. If you turn off the power wait about 30 seconds before turning it back on again. This helps to protect the high voltage circuitry and gives it time to respond to the power off and power on conditions.

If there is power interruption at the line/mains the Liquid Lightning® will turn off and stay off.

This also protects the amplifier against rapid power glitches that can otherwise damage the electronics.

Headphone Outputs

The Liquid Lightning® Electrostatic Headphone Amplifier is equipped with two Stax type 5 pin output jacks. The #1 upper jack is always set for Stax Pro Bias (580V). This will be the normal jack for any Stax Pro electrostatic headphone.

WARNING: DO NOT USE STAX NORMAL BIAS HEADPHONES WITH THIS AMPLIFIER.

The #2 lower jack is set for what you selected when you purchased the amp. The three possibilities are:

- Stax Pro – 580V (same as #1 jack)
- Sennheiser HE60 – 540V
- Sennheiser HE90 – 500V

These bias voltages are set with jumpers in the power supply and can be changed in the field, but **ONLY BY A QUALIFIED HIGH VOLTAGE TECHNICIAN** who knows safe procedures around very high voltages. Changing #2 jack bias **SHOULD NOT BE ATTEMPTED BY ANYONE ELSE.**

The Liquid Lightning® headphone jacks are a unique design. No metal surfaces are accessible at the front of the jacks, protecting listeners and, especially children, from accidentally touching the high voltage outputs.

Changing Bias on 2 Jack

As mentioned above, this step should only be performed by a **QUALIFIED HIGH VOLTAGE TECHNICIAN** or by Cavalli Audio.

There are two jumper blocks in the power supply near the transformers, one labeled **LHJ** and the other labeled **BJ**. **LHJ** selects whether the #2 jack bias will be 580V or one of the other voltages. Set the jumper to the **HBIAS** side for 580V. Set it to the **LBIAS** side for the other voltages.

When **LHJ** is set to **LBIAS** then use **BJ** jumper to set #2 jack bias to either 500V or 540V. These voltages are labeled on the PC board. Move the jumper to the voltage desired.

To access the power supply board, first turn off the amp. Unplug the amp. **Let the amp sit for at least 12 hours (yes 12 hours).** Remove the six screws that hold the cover on at the bottom of the case. Slide the cover back and off the amplifier. This will expose the power supply board for setting the jumpers.

Replace the cover before reconnecting the power cord and turning on the amp.

Extended On Time (please read this)

The Liquid Lightning® amplifier will benefit from some warm up time, about a half hour to an hour. We **do not recommend**, however, that you leave the amp on for extended periods of time when not listening. Leaving the amp constantly on will shorten component life and will not (after the initial break-in period) benefit the sonic character of the amp. We do not recommend, for example, turning the amp on Friday evening and turning it off Sunday evening if you plan on listening for only a few hours each day.

The Front Panel Power Switch

Your Liquid Lightning® Headphone Amplifier is equipped with a Piezo power switch. Piezo switches virtually never wear out from either mechanical or electrical failure. However, Piezo switches operate differently from mechanical switches and touch switches. The action of a Piezo switch is somewhere in between a touch switch and a mechanical switch.

Touch switches require only a touch to the sensitive surface of the switch to cause it to respond. Touch switches, obviously, are sensitive to nearly any kind of touch and will sometimes activate even when you don't want them to. A mechanical pushbutton switch requires that you cause the switch mechanism to make some amount of travel as you push it.

A Piezo switch is similar to a touch switch in that there is no detectable mechanical travel, but there must be some small deflection of the front face of the switch. Thus, a Piezo switch feels like a touch switch where you must apply some small amount of pressure to activate the switch. This pressure is low, but not zero. Take some time to understand and feel how your Piezo switch works and then it should operate without issues for the life of your amplifier.

Volume Control and Knob

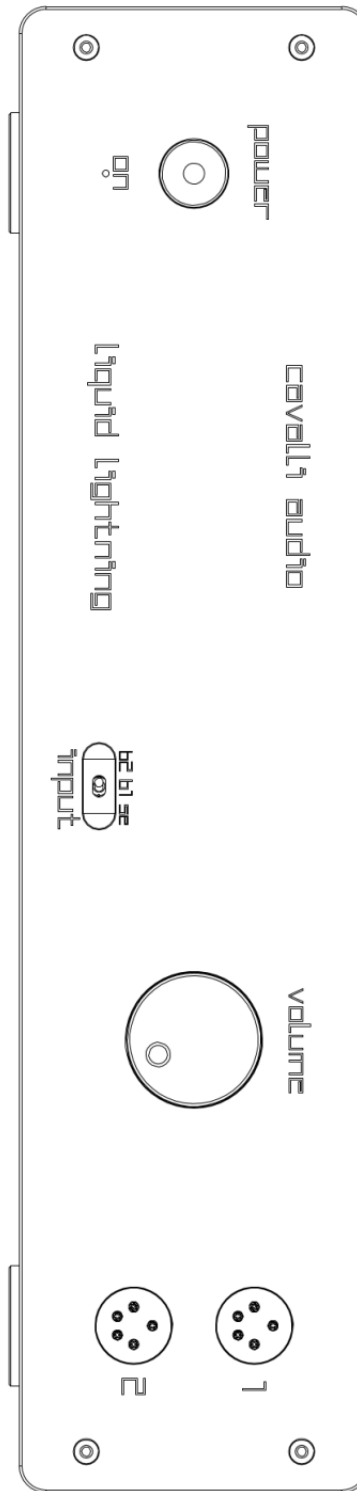
The volume control knob is attached to a small control pot at the front panel. This small control pot activates the digitally controlled analog volume control which is situated at the rear of the amplifier near the input section.

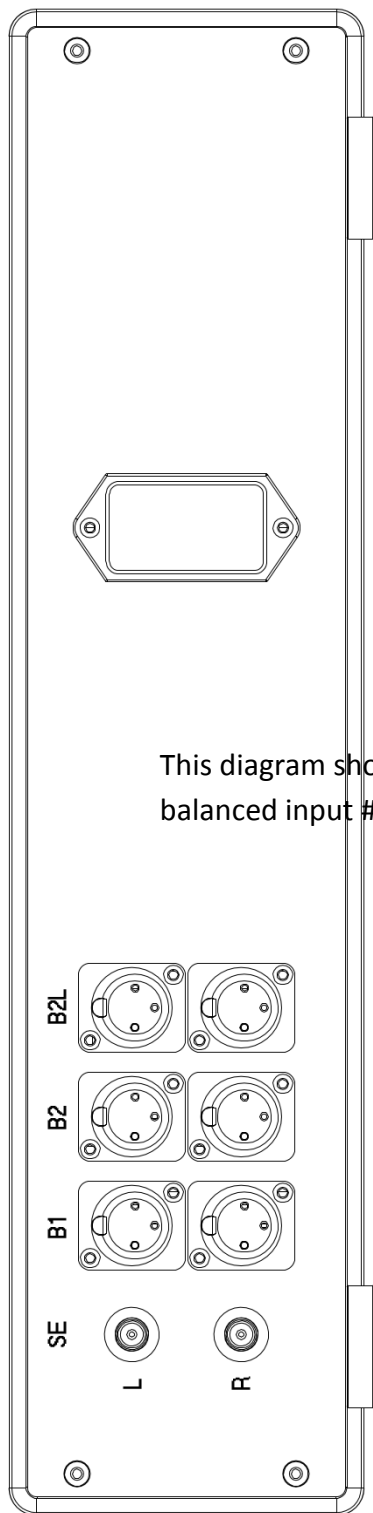
Optical Volume Control

The LL2T uses a processor controlled, optical volume control. The attenuation curve of this volume control is set to mimic the curve of the TKD pots we use in our other amplifiers. At the very lowest volume setting the amplifier uses a mute circuit to completely silence the volume level. You will hear a slight step down in volume from its minimum value to zero. This is normal.

Front Panel Controls and Jacks

the power switch on the left, the on light below it, the input toggle switch for inputs #1 and #2. Bias on jack #2 is set according to your selection.





Rear Panel Jacks and Power Inlet

This diagram shows the input jack arrangement. The leftmost jack is the single ended RCA balanced input #1, then balanced input #2 and loop out of balanced #2. Power inlet has a

Installing New Tubes and Re-Biasing the Tube Hybrid Amplifier

Your tube amplifier is supplied with four 6S4A high voltage triodes. The 6S4A is strictly New Old Stock (NOS). And though your original tubes should give you many thousands of hours of listening time, you may, at some point, need to change out the tubes.

Your amplifier has been supplied with another set of new 6S4A tubes for when you need to replace the originals.

When the tubes are replaced the amplifier must be re-biased in order to work properly. The re-biasing procedure is simple and will not require you to open the amplifier.

What You Will Need to Re-Bias

- 1) A digital voltmeter (DVM) with probes that will fit into the individual connector holes in the output jacks.
- 2) A small flat head screwdriver that will fit onto the heads of the biasing screws accessible through the bottom of the amplifier (see Fig. 1).

To re-bias the amplifier you must be familiar with using a digital voltmeter and probes to measure voltages.

WARNING: WHEN THE NEW TUBES ARE FIRST INSERTED THERE MAY BE HUNDREDS OF DC VOLTS AT THE OUTPUT JACKS. MAKE SURE THAT YOUR PROBES AND TEST LEADS ARE HIGH VOLTAGE SAFE AND THAT YOU KNOW WHAT YOU'RE DOING. IF YOU ARE NOT COMFORTABLE WITH THIS PROCEDURE PLEASE GET HELP FROM SOMEONE WHO UNDERSTANDS HOW TO WORK AROUND SEVERAL HUNDRED DC VOLTS.

The Measurement Points

There are five points where you will attach the probes of your DVM during the biasing process. Four of these are pins in the output jacks and one is on the back of the chassis.

Please see Fig. 2 for the jack test points. The Stax jack is arranged like a clock. The left channel output connectors are a 9 and 12 on the face. The right channel outputs are at 3 and 7.

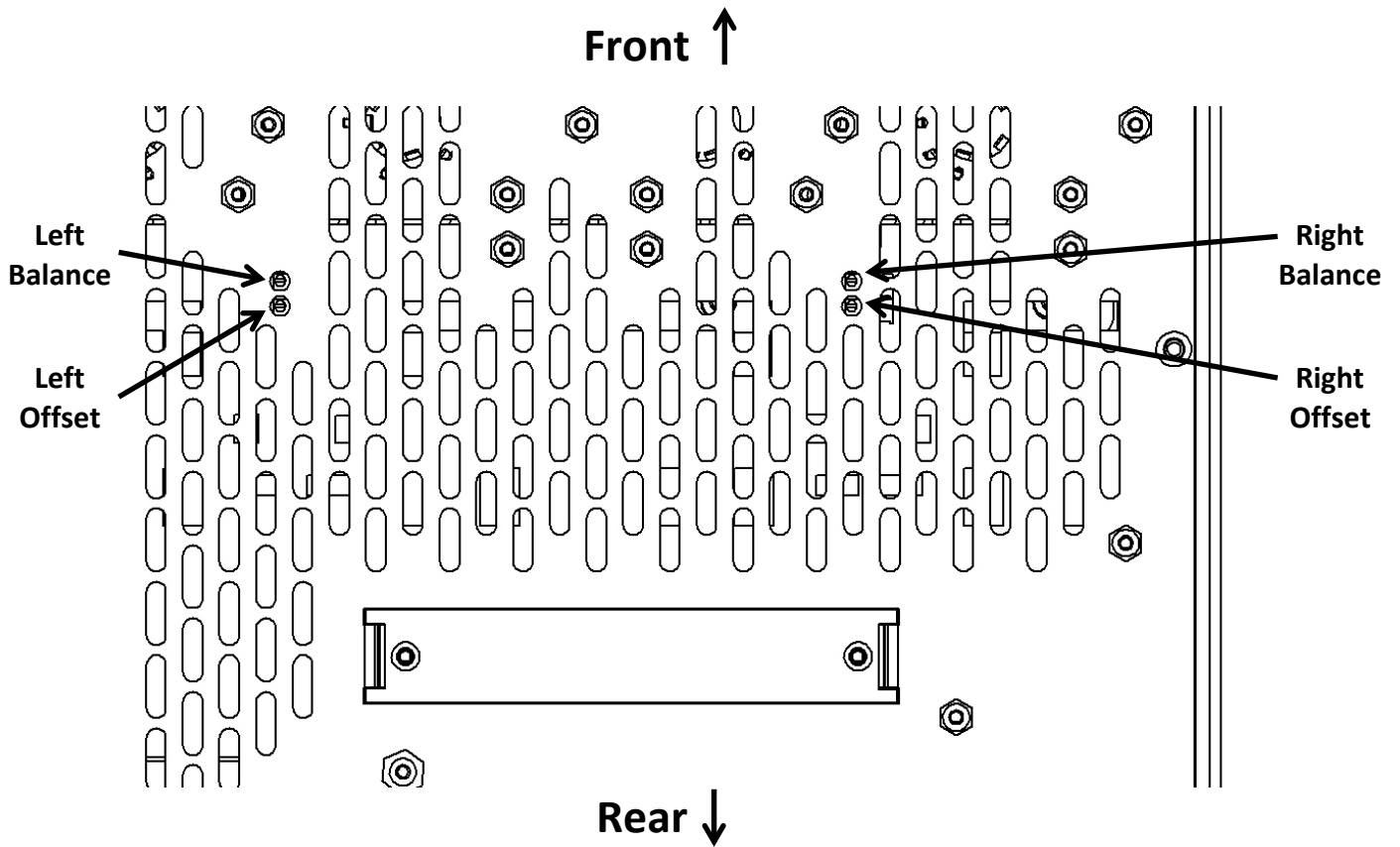


Figure 1 – Trimpots looking at bottom.

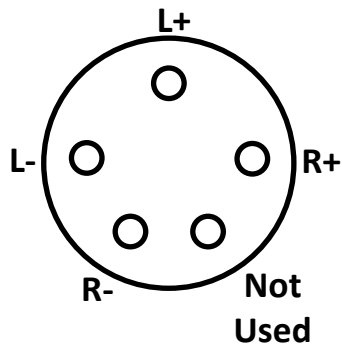


Figure 2 – Output pins of Stax jack shown from front.

The test point on the rear of the amp is the RCA jack barrel or the chrome push tab used by the XLR jack. Any of the 6 tabs will do for the measurement. See Fig 3.

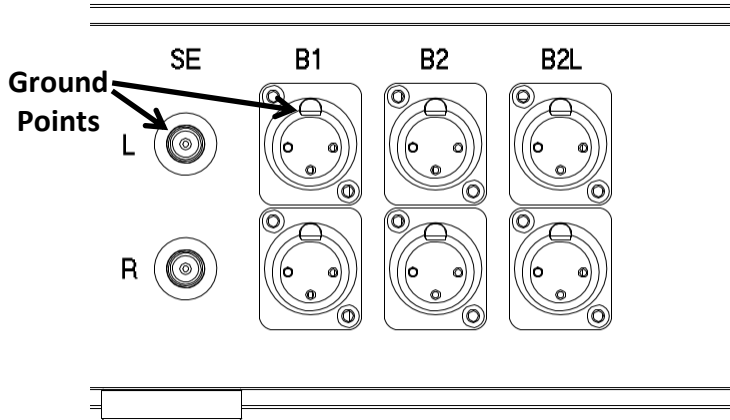


Figure 3 – Ground Points on rear panel. Use RCA jack barrel or XLR jack push tab.

Installing New Tubes

To install new tubes, first turn off the amplifier, unplug it from the line/mains and let it sit for at least 1 hour. Remove each of the tubes carefully so as not to damage the tube socket. It may be necessary to wiggle the tube around a bit to get it loose from the socket. Take all four tubes out and set them aside so that you don't mix them up with the new tubes. Keep these tubes in case you have an emergency need for a tube later on.

NOTE: IT IS RECOMMENDED THAT YOU CHANGE ALL FOUR TUBES AT THE SAME TIME SO THAT THE FULL SET HAS THE SAME NUMBER OF OPERATIONAL HOURS ON EACH TUBE.

Remove the new tubes, one at a time from their boxes and install them. You may have to wiggle them down into the tube sockets. Make sure that the tubes are fully inserted and that the tops of the tubes are not sticking up past the top of the enclosure.

Re-Biasing

After the new tubes are properly installed you can power on the amplifier. First turn the amp on its left side so that you can reach the trimpots. Use a cloth or other soft material to protect the side of the amp that it is resting on.

Push the power button. If there are any faults turn off the amplifier and contact Cavalli Audio. If the white light under the power switch lights after 15 seconds and the tube heaters are all glowing orange, then you can proceed.

Please follow these steps:

1. Most DVMs will auto range. Please make sure that your DVM can handle at least 500V measurements.
2. Put the two test leads into **L+** and **L-** on the front jack (either jack).
3. Rotate the **Left Balance** trimpot until this voltage is less than +/-1V.
4. Put the two test leads into **R+** and **R-**.
5. Rotate the **Right Balance** trimpot until this voltage is less than +/-1V.
6. Remove test leads.
7. Put one test lead into **L+** and connect the other to one of the **Ground Points** on the rear of the amplifier.
8. Rotate the **Left Offset** until this voltage is less than +/-1V.
9. Put the test lead into **R+**.
10. Rotate the **Right Offset** until this voltage is less than +/-1V
11. Repeat steps 2-10.
12. If you cannot make these adjustments to within +/-1V please contact Cavalli Audio.
13. If the biasing produced is successful, place the amp on its feet and let it run for about 1 hour.
14. Repeat steps 2-10.
15. At this point you can listen to the amplifier.
16. After 50 hours of run time repeat the biasing procedure.
17. After 100 hours of run time repeat the biasing procedure.

After 100 hours of run time the biasing should remain stable. If it does not remain stable it is likely that there are one or more bad tubes. Please contact Cavalli Audio.

Ventilation

The Liquid Lightning® dissipates close to 100W of power. It is very important that you ***DO NOT OBSTRUCT THE AIRFLOW AROUND THE AMPLIFIER***, especially from the bottom to the top and into the sides. Do not put anything on the top of the amp that blocks ventilation holes. Do not put the amp on a surface that might block ventilation or reduce airflow from the bottom. Do not restrict the airspace around the amplifier. ***Leave at least 10" at the top and 3" at the sides if possible.*** The top cover of the amp will run hot and the volume knob will be warm!!

What about those tweaky things like cables, power cords, better feet and such that I've heard so much about?

Everyone has an opinion on this one, and we can say without a doubt that at this level of performance *every* change makes a difference. The extent to which this change is an *improvement* is, of course, the subject of much debate. Such is the nature of high-performance audio.

One of our closely-held opinions with regard to the entire matter of "What makes 'better sound' better?" can be summed up in a few short words – "if the musical result of the change MOVES YOU, then it is worth considering. If not, spend those discretionary funds obtaining more of your favorite music!"

OK, so now comes that time when we require you to read some verbiage written in legalese. If you understand all of it, you're probably an attorney. If you don't understand all of it, you're one of the rest of us who doesn't like reading this any more than we like requiring that you read it....but here it is.....

Warranty

All Cavalli Audio-made products come with a 1-year warranty for parts and labor. Tubes are warranted for 90 days. Warranty does not include fully insured shipping costs to Cavalli Audio. Warranties are not transferable unless pre-authorized in writing by Cavalli Audio. If the repair is due to customer damage or negligence, repairs will be charged as parts and labor, which will be quoted before work is performed. **For warranty support please contact support@cavalliaudio.com or, if purchased from one of our authorized retail outlets, please contact the authorized retailer from whom you purchased it.**

Any modifications to this product which have not received written factory approval nullify all claims and void the warranty. Should a modified product be returned to the factory for repair the owner will be required to pay all necessary charges for the repair in addition to those charges required to return the product to its original configuration.

Removal or alteration of original Cavalli Audio serial numbers voids the factory warranty. **Product with altered or missing serial numbers will be considered counterfeit product.** Cavalli Audio will not repair or in any way indemnify any counterfeit or cloned product.

Now that you've read all that, and we assume that you have, in fact, read the above essential verbiage, we're hoping and trusting that you have found reading this owner's document to have been both useful and entertaining; enhancing your ability to enjoy your Cavalli Audio Liquid Lightning® headphone amplifier. Now, GET BACK TO ENJOYING YOUR MUSIC!

Standard Warranty Limitations

EXCEPT FOR THE EXPRESS WARRANTIES STATED HEREIN, CAVALLI AUDIO MAKES NO OTHER REPRESENTATIONS OR WARRANTIES AND CAVALLI AUDIO HEREBY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY, NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS, FITNESS FOR A PARTICULAR PURPOSE, PERFORMANCE, SATISFACTORY QUALITY, OR ARISING FROM A COURSE OF DEALING, USAGE OR TRADE PRACTICE. IN ADDITION, CAVALLI AUDIO DOES NOT WARRANT THAT THE PRODUCT WILL SATISFY YOUR REQUIREMENTS, IS WITHOUT DEFECT OR ERROR, OR THAT THE OPERATION OF THE PRODUCT WILL BE UNINTERRUPTED. BECAUSE IT MAY NOT BE POSSIBLE FOR CAVALLI AUDIO TO KNOW THE EXACT PURPOSES FOR WHICH CUSTOMER ACQUIRED THIS PRODUCT, CUSTOMER ASSUMES FULL RESPONSIBILITY FOR CUSTOMERS INSTALLATION, USE AND THE RESULTS OF THAT USE.

Limitation of Liability

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If you have any questions or comments, please contact us at sales@cavalliaudio.com or at info@cavalliaudio.com. We look forward to hearing from you!

For Your Protection

Ventilation: In order to improve sound quality, your Liquid Lightning® amplifier runs **warm** and thus requires free air circulation of **at least 10” at the top and 6” at the sides** of the product. Never place the amplifier in an enclosed space with restricted air flow. Never place it near another source of heat. Excessive heat **will** shorten the life of the product.

Water and moisture: **NEVER** use the Liquid Lightning® amplifier near water. **NEVER** handle the amplifier while in contact with water. **NEVER** let the amplifier come into contact with water. **NEVER** spill water or other liquids into it.

Power Sources: Make sure that the voltage/frequency stated on the back label on your amplifier is compatible the line/mains voltage in your location.

Grounding: The electrical ground in this amplifier is an important safety feature. **Do not defeat ground with special plugs, power cords, etc. Doing so will void your warranty.**

Power Cords: If you use your own power cord, use one that meets the standards of your location.

Power and Signal: Cables should never be connected or disconnected with equipment powered up. Failure to heed this warning may damage or destroy equipment.

Servicing: To reduce the risk of fire, electrical shock or other injuries, the user should not attempt to service the amplifier beyond what is described in this manual. All other servicing must be referred to **authorized** service personnel.



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