

## **Little Lab Power Diminutive Audio reference Ultra low Noise Power Supply**

**This LLP** power supply is intended to provide precise regulation with extremely low Noise throughout the Audio bandwidth, Thus providing Your LISA III Headphone Amplifier a Reference quality Regulated Clean DC voltage of 24 Volts DC @ 100 Milliamp nominal up to a intermittent 300 Milliamp of Available Current. The *LLP* contain both pre and post regulation circuitry, to provide the absolute lowest AC ripple component for a velvety Background of Silence from your Amplifier. Wide bandwidth is extremely important in an Audio Reference Class Power supply to maintain a consistently low impedance over the entire Audio range thus allowing your Amplifier to maintain a consistently low output impedance for critical damping of the Headphones at all frequencies not just the low Bass typical of Power supplies powering small Headphone Amplifiers.

**Back To elegantly Simple Circuitry** Is the theme of this LLP power supply. Since Diminutive size and Reference Audio Quality are both design goals here, there is no room for complex solutions. If one carefully assess what actually makes a difference in the sound of your Amplifier is the quality of its power supply. Now that we know the quality of the power supply is very influential in what an Amplifier connected to it sounds like we can investigate what qualities makes the Amplifier/Power supply system sound better and what ones have little or no effect upon sound But simply improve performance in areas that are not of real importance sonically.

**The AC mains power** enters the LLP via a IEC power cord receptacle and into the PC Board Mounted EMI power Line Mains Filter that filters both common mode as well as differential Noise This removes Radio frequency interference and other High Frequency noise that otherwise would contaminate the AC mains power entering the unit. The AC from this filter delivered to the Ultra low noise Toroidal power transformer. This 14 Watt Transformer is specified at both 50 and 60 Hz and includes two 115 volt windings to allow international voltage operation from 100-230 VAC@50/60 Hz. the output from the power transformer is Dampened by a snubber network across the transformer's secondary windings, to suppress rectifier diode noise in the Transformer. The AC outputs of the two dampened secondary windings are impressed upon a Full wave Bridge rectifier using Shockley diodes for low switching noise. Primary Reservoir storage and filtering is provided by a low ESR high temperature Electrolytic Capacitor for Long life and high performance over a wide frequency range.

**The Regulation Circuitry** Is designed from the ground up for Extreme DC precision and vanishing low noise. The techniques employed in the LLP are at the Cutting edge of Linear Power supply design. At the heart of this stage is a fully discrete component Error Amplifier, An error amp is commonly used in a circuit where error correction is required. The output of the whole system now fed back into the input of the Error amp. This will allow the amp to compare the output (of the whole system) to the input signal and correct as needed. The error amp when used in a circuit, which needs little current at its output, can still monitor the output and correct as needed. This Error amp stage utilizes ultra low noise bipolar small signal transistor of the type generally reserved for use in low noise Audio Electronics such as Microphone and Magnetic phono preamplifiers. This assures that the output of the LLP is free from Excess internally generated noise.

This Precision error amp is supported by a constant amount of current from a Temperature stable ultra precise current source for a constant output current in the face of wide temperature ranges to maintain Class A operation for the Utmost in Linearity. All voltage regulation circuits use some kind of reference voltage to define the correct operating point. The voltage reference most often used, a zener diode generates more noise than precision circuits tolerate. Precision low noise voltage references are often employed in laboratory power supplies that are to power sensitive instrumentation however these are slow and prone to instability. The voltage reference for the LLP's error amp is a string of Blue LED's. The Blue LED is extremely fast and quiet. LED's also have a temperature drift that is a polar opposite of silicon and thus the Silicon Based error amp changing in one direction with temperature the LED characteristics are changing in exactly the opposite direction and thus provide for a totally temperature stable power supply eliminated a major source of low frequency noise. This Critical voltage reference as are all the other voltage references within the LLP are supplied by a constant current via precise FET Current sources; this substantially improves the accuracy of the voltage reference resulting in cascading gains in all areas of performance. The error amp drives a High speed Driver Transistor This in turn powers the high current output transistor. The chosen output device is one of the most linear power Transistors of its type and pass along pure DC to the Amplifier while preserving all the accuracy of the error amp.

## ***Features you Need***

***Soft Start*** circuitry applies power slowly so the transition from no power to full operating voltage does not happen instantaneously at power start up like on most conventional power supplies, rather the soft start circuitry allows the voltage to slowly come up taking about one second for the full transition from no voltage to full operating voltage. Soft start lessens the shock the electronic components of your Amplifier must experience each time power is applied and substantially reduces the likelihood of damage to the Amplifier from high inrush currents.

***International Voltage capability*** the Rear panel of the LLP contains an IEC mains power cord socket so as to allow connection of the LLP to any AC mains sockets via the Proper IEC power cord for your country. Inside the LLP is a plug in jumper block for any voltage from 100-260 VAC@ either 50 or 60 Hz. All Mains connected Electronic components carry safety certifications from most international regulatory agencies like UL in the **USA** and CE for the **EU**, In addition to compliance with, Pacific Rim and other areas of the world. The Design also conforms to these stringent safety requirements.

***Front Panel operational Monitoring*** Three of the *LED's* used as voltage references in the LLP's High performance Discrete component regulation circuitry are placed along the center of the front panel and visible through small holes in the front. Two *Blue LED's* used as the voltage reference for the error Amplifier show that proper regulated voltage is upon the LLP's output jack. The third *LED* is *RED* and is used in the Current source for the *Blue LED* voltage reference. This indicates that the regulator is operational and an output voltage is present upon the DC output jacks but if the two blue LED's are not also glowing this voltage could be outside the nominal operating range and the power supply should not be connected to the Amplifier until serviced.

***Front Panel Voltage trim*** An access hole towards the right of the front provide screwdriver adjustment of the DC output voltage from about 17-30 Volts, The Power supply comes factory set at 24 volts.

***Front Panel DC power switch*** A small switch at the left end of the front provide power to the rear DC coaxial Power Jack. An LED next to the rear mounted DC Power Jack indicate a DC cable has been inserted.