



Lux91 MonoMax with P:USH Power

For DIY and assembled units

DIYHFS
3/1/2010

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Introduction and Brief Overview:

The chassis is a rigid extruded aluminum unit preassembled with aluminum front panel, power transformer, M6 laminations in the output transformers. The OPT are the soul of any tube amp and the latest generation is CNC wound for perfect lay, low capacitance and very wide power bandwidth. The large chassis and generous size dissipates heat evenly; it is normal for the chassis and power transformer cover to feel hot due to the efficiency of heat transfer from critical parts. The unit looks good as well. Dynamics are impressive, as is openness and soundstaging. Its performance belies its price many times over.

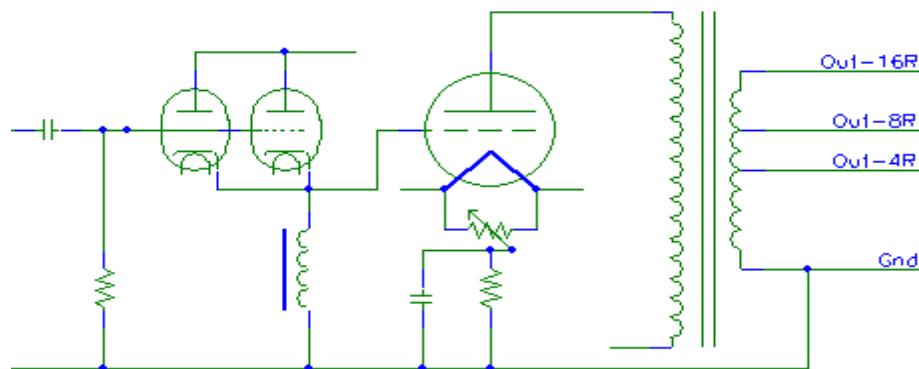
There are scads of 300B amps on the market. Why 'Lux'?

Objective - drive a DHT power tube:

choice #1: pentode. offers necessary single stage gain but high output Z. tendency for highs/lows to be bandwidth limited. Clipping: not nice. Sound is delicate, immediate and pleasant 'bouquet of tone'. Fast! and retrieves the finest details as it sweeps the sonic landscape. Can swing the necessary voltage but but don't ask it to lift heavy objects. the DHT needs more muscle.

choice #2: triode. gain-challenged, needs more than one stage. (Hi gain versions sound like solid state). Low output impedance, wide bandwidth, great slam and dynamics. can be used with a grid choke for greater perceived power. Muscular, but lacks the refinement and delicacy of the best pentodes; leaves behind some of the fine details.

choice #3: re-active interstage. pentode on the input. paralleled sections of a triode with a choke loaded cathode. direct couple to the grid of the DHT.



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the DHT gets what it likes: lots of swinging volts and iron fist control, even when driving the grid positive. **This is Lux.**

the pentode does what it does best: gives tons of voltage gain driving the undemanding load of the re-active tube interstage. The interstage is loaded only with the following grid and cathode choke so bandwidth approaches DC to light and is sonically neutral, no cap coupling to the DHT. The DHT thinks the choke of the interstage is it's very own grid choke. And we still have our pentode! Add to this: 5U4 tube rectification (tubes=tone)

more: WE connection on the 300B for more quiet, more dynamics

Result: tone and refinement of a pentode married with the slam and dynamics of a triode.

Lux91 MonoMax:

Monoblock chassis amplifier

choke loaded power supply AND film caps on the B+ rail to the power tube anode

2 x 5U4 tube rectifiers

2 x 310a pentode input (2 bigger pins to go into the big holes).

2 x 5687/cathode choke re-active direct coupled interstage (back 9 pins socket position)

2 x 300B Direct Heat Triode (2 bigger pins in the bigger holes)

This is it: LD MonoMax in Projekt monoblock chassis with FCUPS and filament supply standard. The added performance of the FCUPS is not subtle and is too good to not have.

The discerning eye will notice the inclusion of the 310a comes from our 91 circuit. This together with power supply enhancements is called the Lux Mono Max with P:USH power. It is the best sounding amplifier we have ever made, or heard.

So what's this P:USH Power business?

Power for Ultimate Signal Headroom! Because the FCUPS with its huge store of inductive energy and virtual battery mode is in a totally different league than banks of caps, resistors and even big chokes in their little puddle of inductance. You are about to hear it:- inductive energy store is totally better than capacitive energy. Like Iron Man beats Chickenman. The Lux MonoMax is the best amplifier we've ever made, or heard.

Specifications:

- * Power output, 300B: 16w x 2 RMS @ 1KHZ Class A
- * Frequency response: 12Hz to 47KHz (-3 dB@5W) (20hz to 20k -0.5db)
- * THD: <1% (5W@1KHz)
- * Signal to noise: 100dBA or better (0.4mv at the speaker outputs)
- * Input sensitivity and impedance: 1V, 100K * Output impedance: 4, 8ohm or 8, 16ohm
- * Power: 110/120/220/230/240V AC +- 10%, 50Wx2
- * Dimension (mm): 370(L) x 240(W) x 210(H) (not including/including transformer)
- * Weight: 13.5Kg per chassis = 27Kg
- * Shipping Weight: 32Kg per set of 2
- * Standard Tubes (priced separately): 300B x 2, 310a x 2, 5Z3PA x 2 or 274b, 300B
- * NEW: Power transformer is low output impedance EI type, custom made with imported cores.
- * Output transformer is larger imported core and 'perfect lay' windings.
- * Speaker outputs: 0, 4, 8ohm or 0, 8, 16ohms
- * Non-magnetic chassis

Start Up

Unpack tubes. Insert 5687 into the 9 pin socket. Inserts only one way

Insert 5U4 or equivalent (5Z3P etc) into 8 pin socket. Orient guide pin to match socket

Insert 310a into 6 pin socket. 2 bigger pins go into the bigger holes. Connect grid cap to top

Insert 300B. 2 big pins go into 2 big holes

Connect speakers Black is '0' and red are 4 and 8 ohms

Connect source to input RCA jack

Power on amplifiers. Takes 1 minute to stabilize voltages and pass signal.

Play music.

Detailed Overview and Features:

Lux91

Despite its unassuming exterior the Lux91 Mono Max is jam packed with unique technology and circuitry, to deliver what is one of the top performing 300B Single Ended Amplifiers in the market.

The unique circuit topology for the original Lux was developed by noted designer Thorsten Loesch as a way of combining the positive aspects of Pentode driver stages for DHT Amplifiers (such as the justly famous WE Type 91) with those of high transconductance Triode/Gridchoke driver stages. A mix of Pentode gainstage with a cathode follower had been done before. Pentode Mu-Followers had been done. Many other topologies had been done. None delivered the kind of magic that gave the best of Pentodes and triodes, with negative sonic characteristics avoided.

Pentode driver stages, while majoring in detail and immediacy at low levels, have high output impedance. This not only limits the ability to drive the input capacitance of the output triode, but they also are completely incapable of driving the output triode with any significant current, thus clipping very early and in a manner similar to solid state amplifiers. Result? Loss of articulation and dynamics at higher levels. On the other hand, high transconductance Triode driver stages have low impedance and can deliver substantial current, so they have a far more robust and macro dynamic sound characteristic. This is further boosted by using a choke or interstage transformer on the output tube grid.

Combining the delicacy, detail and immediacy of the Pentode with the sheer drive and "cojones" of the Triodes proved elusive over the years, until the breakthrough was made in the form of the Reactive Interstage – a clever implementation of the inductive and reactive elements of a tube and cathode choke.

Circuit:

The "eureka" moment came by making a special output tube grid choke also serve as an element in the cathode of the driver stage tube. The driver stage cathode now operates loaded only by the choke and output tube grid which offers a very high load impedance for music signals, not stressing the driver stage cathode. Of course, not just any old choke can be thrown in; careful design is needed to get all the conflicting parameters in balance.

The output Tube still sees a low DC resistance to ground, but more importantly, the drive impedance for music signals to the output tube grid will also be very low.

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As the output tube grid comes near the cathode voltage the tube grid starts progressively drawing more current. The 5687 reactive interstage used in the Lux and Lux91 plus can provide short term (peak) drive currents of as much as 70mA! So the driver circuit can handle a lot more input without collapsing.

As a positive side-effect, the Reactive Interstage circuit also increases the amount of power out from a given output triode. According to Western Electric's datasheet, when the 300B operates at 350V/80mA with a 3K load it produces just above 8 watt power, some of which will be lost in the output transformer. Using the Reactive Interstage circuit the same conditions allow 16 Watts in the Lux91. There is no sacrifice in quality however as the circuit is realised to extremely high standards, including a power supply using only film capacitors.

Modules:

For the Lux91 Mono Max we have taken full advantage of the various active modules in the catalogue of www.diyhifisupply.com to provide most exceptional performance.

Using the Active Bias System module allowed us to combine the Bushido circuit with operating the 300B output tube in fixed bias mode. Of course, fixed bias designs are reputed for poor reliability due to current runaway in output tubes and the need to frequently re-adjust the bias. The Active Bias System does away with any such concerns and provides the benefits of fixed bias with the ease of use and reliability of cathode bias (also called self bias).

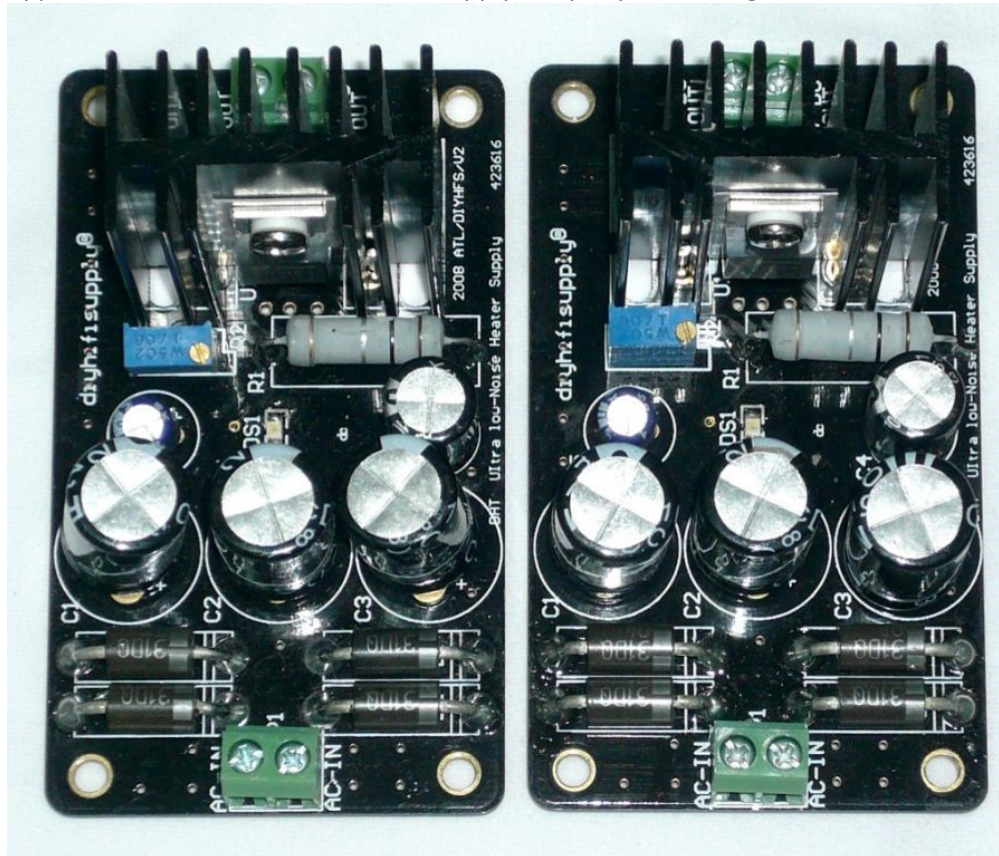


With tubes used in cathode bias the maximum power is somewhat restricted as this circuit reduces the output tubes operating current at the power goes up. With fixed bias there is no such problem. Additionally classic cathode bias places an extra resistor and large value capacitor in the output tubes signal circuit. The quality of both critically influences the sound quality. Removing them in fixed bias operation improves sound quality significantly.

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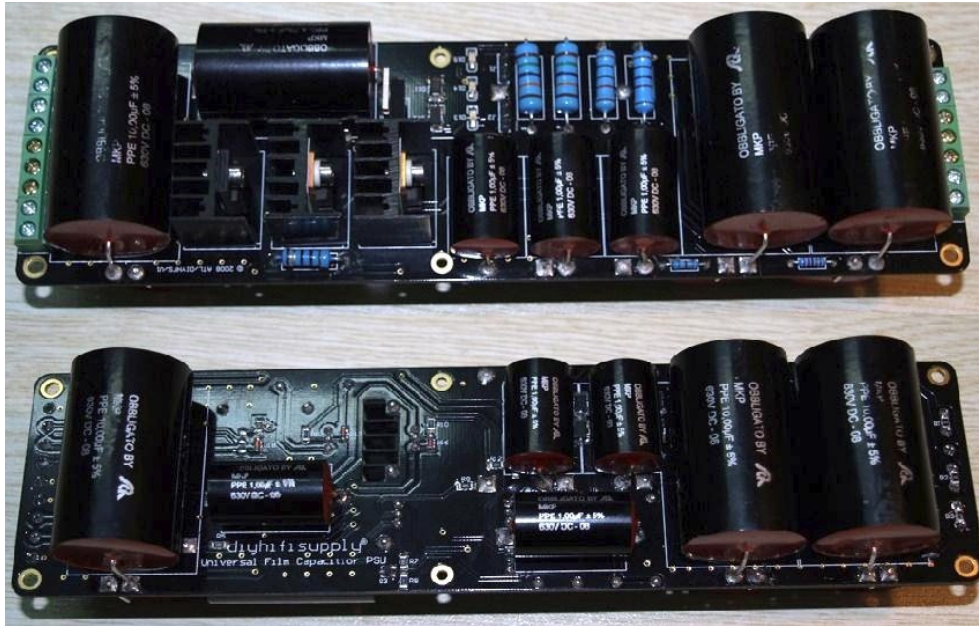
In the Lux91 Mono Max we have also slightly raised the anode voltage for the 300B to 400V from 350V and thus the anode dissipation from 28 Watt to 32 Watt. As a result of this and with the gains in power from the fixed bias operation the Lux91 Mono Max manages to provide 16 Watt (10% THD) from a single 300B, compared to the 8-9 Watt available from more conventional designs. This is further done without unduly stressing the output tube such as by running it at maximum ratings as is often the case with amplifiers designed to offer large output power from a given tube. The Lux91 Mono Max operates at 400V / 80mA / 32 Watt dissipation – well within the maximum operational limits given by WE for a 300B at 450V / 100mA / 40 Watt Dissipation. Also the use of the ABS and other circuits in the Lux "nails down" nominal operating points even as tubes age or different ones are tried..

The Lux91 also employs the Filament Supply module which not only produces very low noise, but operates as a so-called current source for music signals, meaning the Filament Supply provides a very high impedance at audio frequencies, similar to using a choke as noise filter. This kind of operation allows the same sound quality as powering the tube from a current source but combines it with the simple 'fit & forget' reliability and stability of traditional voltage based supplies. As added benefit, Filament Supply ramps up the voltage for the 300B filament very gently, reducing inrush current and stress on the output tubes.



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The final module card in the deck is played by the Film Capacitor Universal Power Supply (FCUPS). This was developed as an active alternative to very large value chokes and capacitors in the powersupply. It's operation is equivalent to having a massive 500H super low resistance filter choke and nearly 1000uF of film capacitor filter capacitance (without the size, weight and cost). While able to work as a completely stand alone system, in the Lux91 we add a tube rectifier and a further low DCR choke filter before the FCUPS for even better performance. In addition the power supply module also ensures a slow and gentle ramp-up of the output tube to the normal operating point, again treating the tubes as gently as possible.



Each of these elements serves to bring out the absolute best possible performance of the star of this show: the original WE91 310a gain stage:

WE91 – 310a the Lux Way

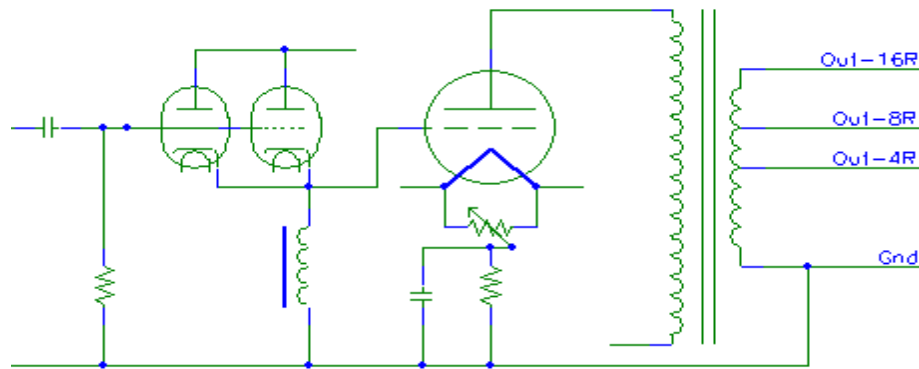
The Gainstage in the Lux Plus uses the exact circuit found in the mid 1930's Western Electrics Model 91 Amplifier featuring the 310A Pentode with its characteristic coke bottle shape and top mounted grid connection cap. Premium Obbligato film capacitors are used for the power supply decoupling and Japanese Kiwame resistors serve in the signal positions. In keeping with the 1930's original, even the cathode capacitor for the 310A is not a now common electrolytic type but a special grade Japanese made 22uF/35V film capacitor. All connections are hardwired with solid core silver wire sleeved in Teflon.

The only coupling capacitor in the whole amplifier is a 0.22uF Teflon & Tinfoil capacitor, selected for it's unique and unmatched sound quality.



Reactive Interstage

It is followed by the heart of the Lux91 circuit: the Reactive Interstage choke loaded 5687. This uses a Black Gate capacitor for the powersupply and connects directly to the 300B output tube.



The output tube in turn is connected to an output transformer wound by Silk Transformers, with a specially heat treated 0.014 in cold rolled grain oriented silicon steel (CR-GOSS) lamination and special winding techniques to offer the widest bandwidth.

The Finish



So from the high grade RCA socket on the input the signal passes through high quality Teflon insulated silverplated copper wire, the 310A Pentode, a PTFE & Tinfoil coupling capacitor, the 5687 follower, the 300B Triode and the output transformer -- and quite a bit of silver wire in-between -- for an ultra-pure signal path and the highest degree of resolution. Coupled to the massive dynamic range realized by the Reactive Interstage, the previously impossible is achieved: the marriage of beauty and strength, the proverbial iron fist in silk glove.

