

Triode Dick's Page

TentLabs filament supply

...to apply with directly heated tubes



A pleasant surprise

A while ago I received a package with a pair of neat modules, with regards from Guido Tent, who runs the TentLabs Company. Guido is most known because of his well performing low jitter clocks, enabling to affordably upgrade your CD or DVD player. I myself am happily using 2 of them, one in my good old Marantz CD16, supplying a clean digital output for my external DAC, which also uses a TentLabs clock.

Guido's' activities are not restricted to digital only, he also likes vacuum tubes. Old and new technologies get along quite well.

Please note that the following article describes the use of directly heated tubes. Tubes like EL34, KT88, 27, D3a or ECC83 are INDIRECTLY heated - different, not necessarily worse and definitely easier to find.

I'll discuss an improved way of heating tubes of the "filament = cathode" type of tubes. A very fine example is the well-known 300b.

to Glow or to glow ?...



There is many ways to supply the required power to directly heated tubes, especially when discussing output tubes. When discussing pre amplifier tubes, mostly DC voltage is the only acceptable otherwise hum becomes a likely problem.

Most straightforward is to rectify and stabilise using popular 3-legged devices like 7805, or the adjustable counterpart LM317. In addition, one could add a current source, which I myself consider as a worthwhile upgrade.

You could also run the filament directly from a battery, eventually floret by again a current source. The latter more or less stabilises the output, which comes in handy as battery voltage decreases in time. However, when using my beloved BA tubes, this is no option, as they draw about 0,5A - you'll need beefy batteries and forgetting to charge them will spoil a day, without music, that is.

When discussing output tubes, it seems most attractive to supply these using pure AC, as they draw even more current. As they are located at the end of the chain, the hum becomes even less an issue. Unfortunately, not every power tube mates properly with the hum-bucking potentiometer, which normally should be able to cancel sufficiently, assumed it is balanced correctly. The result is still a tad too much hum, although tubes fed with 2,5V (like 2A3 or 45) seem to operate fine with AC when taking hum levels into account.

There is a bunch of people who are convinced of the sound quality of AC fed tubes, but the increased intermodulation distortion should be taken into account when judging such arrangements.

Quite recently I fed my own amps output with a roughly rectified DC voltage (bridge rectifier + big lytic). The remaining hum then can be cancelled very well, resulting in a quieter amplifier with less than 1 mV at the output terminals. If you ask me to choose, I prefer a quieter amp to an amp that "might" sound better (AC fed). Try it yourself one day, AC-heat the tubes: It seems quiet, but then switch off the amps (fully off, because when feeding heaters only, some hum may still appear at the output). At that moment, real silence enters the room, similar to switching off your PC - gee it's quiet in the room

That hum after all starting irritating, and the DC fed heaters even made me close the kitchen door, to exclude the fridge hummm contribution. After all I want to hear all "low level" details present in music.

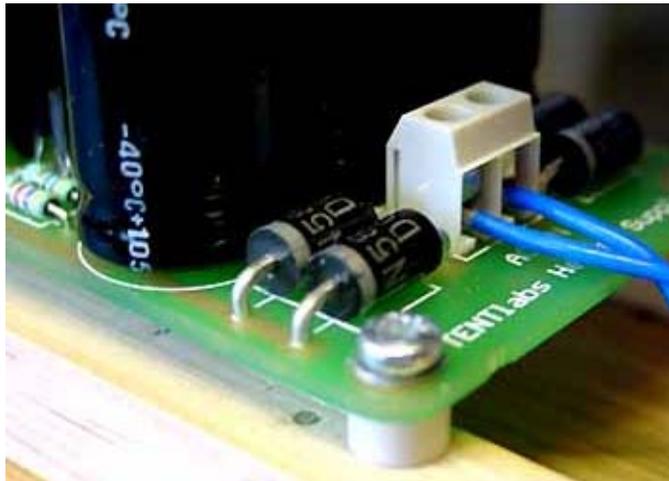
And now something completely...

Suddenly these TentLabs PCBs dropped in.... I couldn't resist, and mounted them only a day later, in my favourite amp. The power transformers already had a 6,3V tap available as I had some experiment in mind when ordering them a while ago.

The modules I received are specifically made to feed 300b and similar tubes. Other modules will follow, think of 2A3, 211 and what else more.....

Well, the units I mounted supply 5V and leave no room for adjustment. Not even needed, as when replacing my standard 300B (1,2A) my KR300BXLS (2,0A) the output voltage

remains wholly stable at 5.0V. This is the result of the design, which acts as a voltage source at 0Hz, but rapidly transforms into a current source with rising frequency. Like Guido explained, it is a combination of both. At DC the output resistance is virtually zero, but at 5Hz rapidly rises to some kilo-ohms, behaving like a current source.



As a result the output supply becomes very clean, as remaining 50Hz and 100Hz noise looks into a high impedance, compared with the relative low impedance of the filament itself - the music will remain clean. TentLabs challenges themselves with this new type of supply, will expectations come true?

Construction details...

The PCB looks neat! This clearly isn't hobby-like production, but a professional product, ready to concur the world. I note the use of Schottky Barrier diodes, 105 °C type electrolytic capacitors and a handful of small electronics. The power FET is mounted on a heat sink. All is laid out very compact, so finding a place to mount the module shouldn't be a problem. The only attention point is the required AC input voltage. This should be within a specified range, on hand to assure correct function of the circuit, on the other to make sure heat generation is limited. Which voltages you need depend on the tube types you use, application info can be found at www.TentLabs.com. More ins and outs can be found there, by the way.

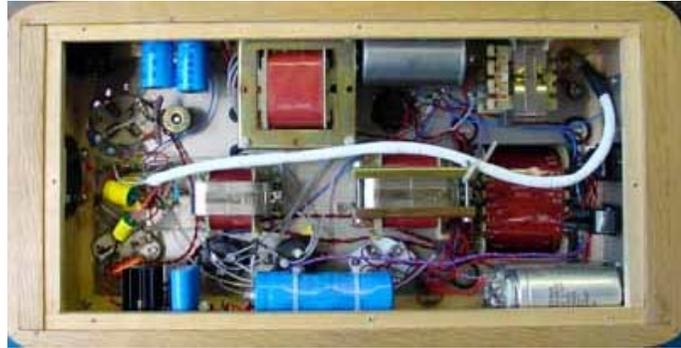
As my KR300BXL5 draws some more current, and the available voltage was limited to 6,3V, I added some decoupling capacitance to reduce the ripple. TentLabs currently has upgraded his production with increased decoupling capacitance to support heavier tube types. A pair of these found their way in my little Caesar amp and worked fine as expected



Considerations...

When connecting the modules, make sure not to spoil the fine aspects of these heaters. Do not connect external decoupling capacitors or hum-bucking potentiometers - none of these are required anymore. All

becomes very easy, AC at the input, DC at the output, straight to the output tube: you save some tens of euros as well as you do not need to buy heavy bridge rectifiers, electrolytics and wire wound potentiometers...



The module remains floating, its' output goes directly to the tube socket. It is up to you whether you connect the "+" or "-" side to ground (or cathode resistor in case of auto-bias). It is not yet very clear what is preferred, but ofcourse you can try it yourself and fix it afterwards.

Obviously, look for some place close to the output tube, as long wiring still may pollute the cathode.

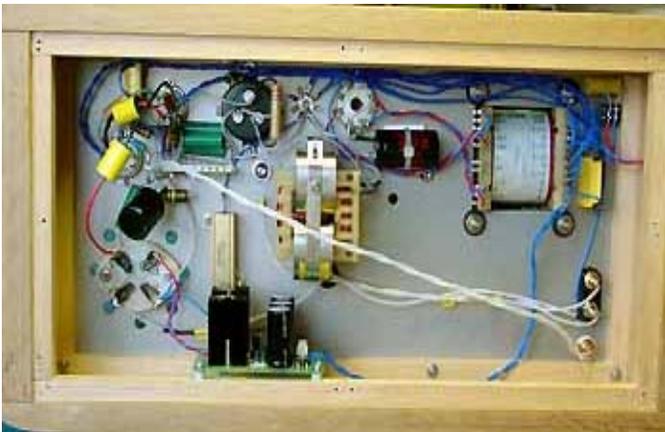
When powering up, another nice feature appears: The voltage across the heater develops smoothly to 5V. This reduces the stress on the filament - those who ever measured the AC inrush current know what I mean....

After the mounting has been done ...

It's a job quickly done. My first mono-block took 3 quarters of an hour, the second one was ready in less than 20 minutes. All obsolete components are detached. After power up, the hum level is very low - how was telling tube amps are humming?

The best however is yet to come, the amps now sound better than ever before, a big grin on my face and comfortably leaning back in the listening chair. Forget about the audiophile nonsense, this is more than a subtle upgrade. The amps were already very good, but have shown that the performance limit was not yet reached.....

What I hear, compared with my earlier applied DC heating, is increased articulation, an improved focus and clearance between instruments and soloists. The soundstage increased in depth. The original supply has a softer tone, you could call it dull - do I want that back? No way, not at all. And I was surprised by the result, especially compared with the small amount of work to be done...



A second amp in row followed, all just in time to have an extra tap added to the power supply transformer still to be made. To make a long story short, also here the TentLabs heaters gave similar results, which make the upgrade quite predictable! The new PCBs are very compact, and sound better as a bonus

Epilogue:

TentLabs promised improved sound quality in various areas, and their new heater circuit make it all come true.

At the time of writing this article, I didn't know the retail price yet. Now that is know, one may argue 129 euro (a pair, VAT included) is a lot of money, but I can only advise to mount these modules in your amps. You save some tens of euros on the traditional components needed. The remaining euros are an effective and musical investment to upgrade your 300b amplifier - Neat stuff Guido !

TentLabs notes

Currently, all voltages up to 12.6V are available. Maximum output current is limited to 5A, so a wide range of directly heated tubes, from small drivers to hefty outputs is supported. For currents above 2.5A the module is extended with a bigger heatsink.

All units are factory checked and adjusted, but have a fine adjustment for the output voltage, to compensate for small voltage losses across the wiring from module to tube socket (at 5A things like this go fast.....)

One module for each tube is required, each module needs its' separate transformer winding.

Either + or - can be connected to ground. Make sure both tubes are polarised the same. Take care when experimenting with polarity, especially in fixed bias circuits the tubes need re-biasing after changing.

An ultra low noise version will become available in May 2005 for use in line stages.

5 years of warrantee apply assumed build in according instructions. Happy listening !