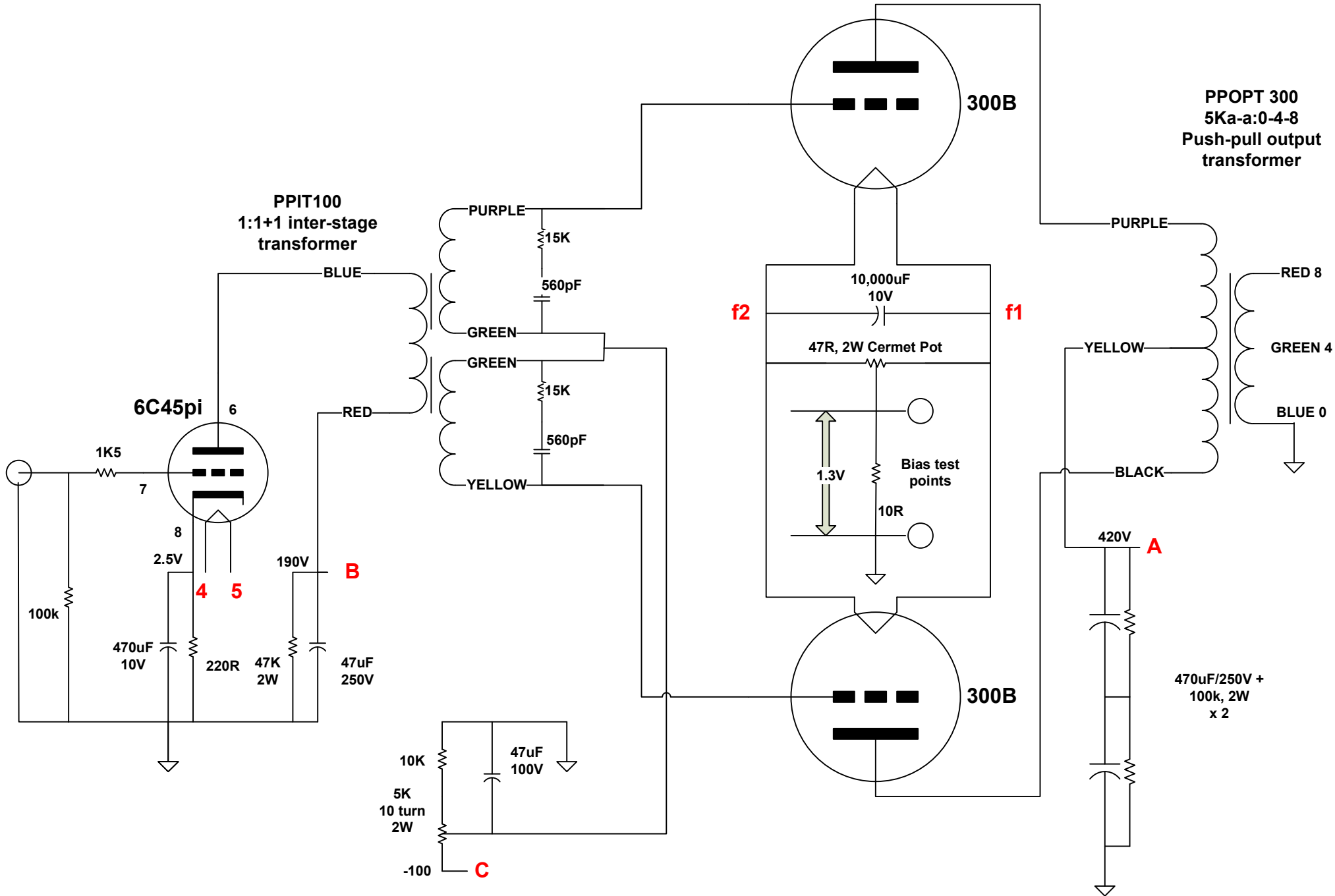
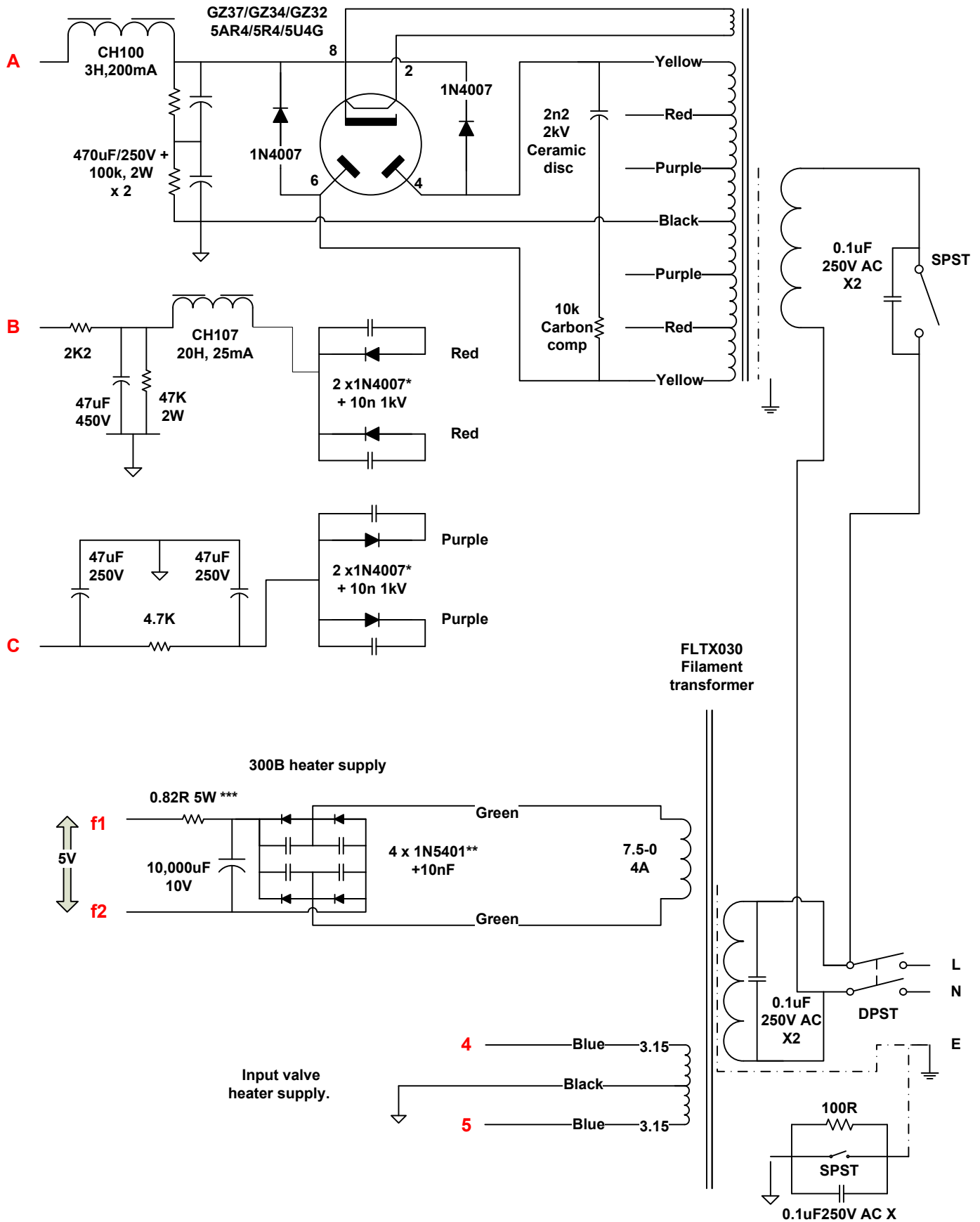


PP002 Push-Pull 300B mono-block amplifier.





* 1000V soft recovery types can be substituted

** hexfreds or soft recovery diodes can be substituted. Schottky types can also be substituted but an increased resistor value will be required.

*** If an external PSU is used, this resistor value will need to be adjusted to achieve 5V on the 300B filament

TENT labs filament supplies can also be used directly with this filament transformer. If an external supply is used, place the TENT supply in the audio chassis.

PP002 Design Notes.

PP002 is a push-pull 300B design and is transformer coupled. Despite the fashion for all things single-ended, push-pull 300B amps are also very musical and are often more versatile than SE's. Push-pulls are more load tolerant, have better bass dynamics, go louder and are capable of playing a wider range of musical styles.

Audio Circuit description:

6C45pi

A Russian 6C45pi combines input and driver duties and drives a pair of 300B's via an inter-stage transformer. One of the so called 'super triodes' the 6C45pi has very high transconductance which makes it an ideal transformer driver and its high gain makes it possible to construct a 2 stage amplifier with reasonable sensitivity. The high transconductance means a grid stopper is essential to prevent oscillation and a quick look at the data sheet shows there are multiple grid and cathode connections. Some designers advocate connecting all the grid connections and cathode connections together whilst others advocate separate grid stoppers and cathode resistors (plus by-pass capacitors) to each connection. The simple scheme shown in the diagram gives excellent sonics but the keen experimenter might want to try out different grid and cathode wiring schemes. Whichever scheme is eventually chosen the lead length of the resistor-valve base connections should be kept as short as possible and direct mounting of the resistor to the valve base pins is advised.

Inter-stage transformer

Using the driver transformer allows excursions into Class A2 positive grid which will increase power output on peaks. This amp should provide 20W/channel in Class A but there is a lot more available if a blind eye is turned to distortion. A Zobel network is required across the secondary of the driver transformer to tame resonances and improve the frequency response.

Gain and Feedback

This is a low gain design needing approx 1V RMS to generate full power output and should ideally be partnered with an active pre-amplifier. It has no negative feedback and the non-ideal behaviour of the inter-stage transformer precludes its application.

Biasing

The 300B's are operated in fixed bias which is more efficient than cathode bias and also gives tighter bass. There is only one bias supply for each pair of 300B's meaning only a single adjustment is required but this does mean that matched pairs of 300B's must be used.

Heaters

A separate filament transformer is provided and each pair of 300B's are DC heated from a single resistor-capacitor supply. There is no need for individual heater supplies in a fixed bias design as both cathodes are at the same potential. Each diode in the DC heater circuit is 'snubbed' with a small value capacitor. Higher quality diodes can be substituted such as hexfreds or soft/fast recovery types can be substituted.

The output from the filament transformer is specified to allow the use of a TENT labs filament supply, something we endorse highly.

The input/driver valve is AC heated.

Power Supply

Driver supply H.T. and bias supply.

The HT and bias supplies use solid state rectification for reasons of ruggedness and longevity. The diodes in the heater, bias and input/driver HT supply are by-passed with snubbing capacitors to kill switching noise. It is remarkable how smooth solid state diodes can sound when these measures are taken. To avoid the large voltage drop required in the power supply from the 400V output stage to the 200V input/driver stage, and the attendant large hot resistor, a separate supply is provided to the input stage. This supply uses choke input filtering for good regulation and noise suppression. A 10 turn pot is recommended for the bias supply to make accurate adjustment possible.

Output stage H.T.

The output stage supply is unusual as it uses a valve rectifier in parallel with solid state diodes to combine the low impedance and high current capability of solid state with the good sounds of valves. This allows a relatively large input capacitor to be used (not possible with a valve rectifier) which is good for regulation and therefore bass performance. If the arrangement looks unusual it is, and there are no doubt sceptics that will doubt it's efficacy, but it does sound like a valve rectifier with good bass. It is possible to run without the valve rectifier to save on costs in which case some more snubbing caps will be a good idea. A low DCR choke is used for good regulation and noise filtering.

The separate filament transformer allows the filaments to be warmed before the HT is applied as using a valve rectifier in this configuration does not give a slow start. 10-15 seconds is recommended before turning on the HT.