AWA Universal Preamp Power Supply

This is a project for hobbyists who have experience working with dangerous voltages and are aware of the necessary procedures and precautions. If you haven't worked with high voltage before, get some help from someone who has!

This power supply PCB has provision for four regulated outputs, two each for heater and plate supplies. Low-profile power transformers are used for their low magnetic leakage and low primary-to-secondary capacitance, which will minimize noise. With proper choice of components, the assembled height can be less than 1.5" including mounting standoffs. The power supply is designed to match up with the AWA Universal MM Preamp PCB, but can be used for other purposes, as described later. As it's a modular design, parts in unneeded sections can be left unpopulated. The parts list shows alternate parts for different heater and B+ ratings.

AC input should be protected with a ½ amp fuse with 12VA transformers, or ¾A if the larger transformers are used (half these values if wired for 230VAC).

Heater Supplies

The two heater power supplies are each 12.6 VDC @ 0.3A (or 0.6A with larger 24 VA transformer) or can be set up for 6.3 VDC @ 0.5A (each 1.0A with 24VA transformer). 12.6 VDC works out best for heaters, with the lowest circuit losses. If any 6.3V tubes are used, many 12V tubes have center-tapped heaters, allowing operation on 6.3V. The regulators should be mounted on heatsinks if heater current exceeds 0.3A – the suggested heatsinks are good for about 4 watts maximum - less if the PCB is mounted in a hot area or with poor ventilation. One side of the heater supplies should be connected to AC ground (at a single point) to minimize common mode noise. One of the heater supplies can be biased with a fraction of the B+ voltage to maintain heater-to-cathode voltage within limits for a cathode follower or mu stage. Since this resistor divider also serves as a bleeder, a separate bleeder resistor should be added (unreg B+ to minus) if this feature is not used.

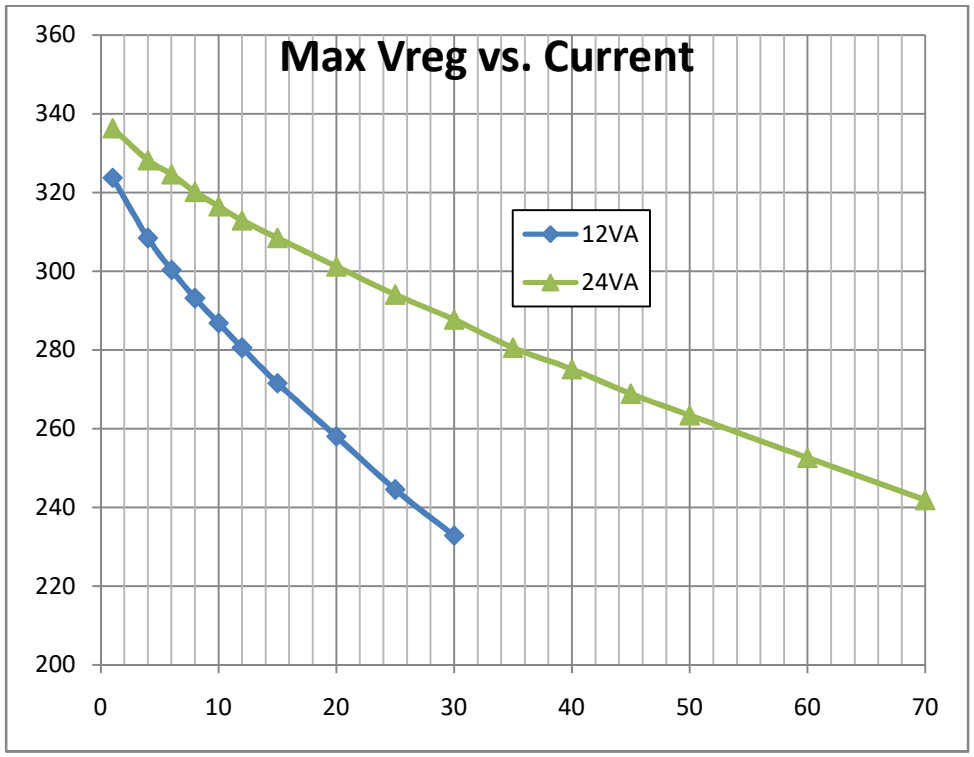
Plate Supplies

Two regulated B+ supplies can be 5 mA each, or 5 mA and 20 mA with a 12 VA transformer. A larger transformer can increase the latter output to as much as 70 mA. Maximum regulated voltage will depend on maximum load current; a chart below shows this for two different transformer sizes. The LR8 high-voltage regulator can supply about 5 mA – a clip-on heatsink will not increase this significantly. One of the supplies has a pass transistor added to increase the current capacity, which will be limited by the transformer (or at lower voltages, the 4 watt heatsink rating). The 5 mA output also has an additional R-C filter section for the lowest possible noise for the lowest-level stage. For those circuits with a direct-coupled cathode follower, it will be best to use the same supply to the gain and follower stages. Although it would be possible to connect right and left channels to separate regulators, this is unnecessary – each regulator has an output impedance of less than 10 Ohms (channel-to-channel coupling perhaps -100 dB).

Other Applications

With the largest (24 or 30 VA) plate supply transformer, this supply could be used for a complete preamp, a small power amplifier, or for a bench power supply. There is an unregulated output terminal as well. Since these may require more heater power than the regulators can supply, a dual 6.3 VAC 2A transformer could be used with AC wired directly to heater output (omitting rectifier or regulator). A 6.3 VAC transformer can't provide much output with a regulator set for 6.3VDC – but could be used for lower voltages. Other heater transformer voltages can be used, but are only available with two secondaries of the same voltage – so it won't be practical to have two widely different voltages. Heater supplies can be isolated from ground if required, though grounding is generally best for lowest noise.

The chart below shows the maximum available voltage with two transformer sizes (12VA and 24VA rating), based on 117VAC input with regulation maintained at -10% line. This is about 40V less than unregulated voltage. So for example, with the 12VA transformer, the output could be set to 260V or lower at 20 mA total load. Setting it higher may result in regulator dropout if AC line voltage drops.



The minimum voltage setting is about 200V with the values in the parts list; current should be limited at lower voltage settings to stay within the regulator's rating. Dissipation in a regulator is (Vin-Vout) * Iout – should be kept below 4 watts. If an infrared thermometer is available, check that device case temperature doesn't exceed 100 deg C.