
Subject: Re: Initial review of ASUSA (Antique Sound USA) K2003 SET amp
Posted by [Thermionic](#) on Fri, 21 May 2004 03:26:57 GMT

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It depends on the power supply topology. In a capacitor-resistor-capacitor or capacitor-inductor-capacitor filter, SS diodes will exhibit less voltage and current "sag" under high load transients (such as sharp/loud bass notes) than tube rectifiers. Overall, the solid state diodes yield a "harder" sound, and will also generally produce tighter bass definition in Class AB operation amps. Class A operation amps do not exhibit enough plate current draw increase on loud/bassy transients for them to make much of a difference. With Class AB operation push-pull amps, the increase in current draw may be quite dramatic. However, even modern high speed diodes do not produce DC that's as clean as a tube rectifier. Solid state diodes produce a sharp high frequency spike with all sorts of harmonics as they switch. You can liken a FRED diode to a MOSFET. Better than the "Plain Jane" model, but it still ain't no tube. Vacuum tube diodes just switch softer, bar none. Another problem is that the capacitor input topologies used on 99% of tube amps produce DC with a residual AC waveform component that is a sine wave on the top, and a triangle wave on the bottom. The triangle wave produces many harmonics at the sharp point of the waveform as it switches from descending to ascending voltage. SS diodes with a C-R-C filter not only can and may indeed may have very low residual ripple, but it's often as gunked up with hash as can be. Yes, the filter caps nuke a lot of it by forming a low pass filter, but aluminum electrolytic caps introduce trash of their own. Add an LED-based constant current source and you've got the electrical equivalent of a toxic waste dump. The common C-R-C filter also suffers from voltage drop on spikes in plate current draw more than any other supply topology. The voltage drop across the resistor increases with current draw according to Ohm's Law. The tubes get starved the most right at the spot where they need the most juice! A C-L-C filter also suffers from it but at a lesser degree, due to the often high DC resistance of the small chokes used as the L filter. When the power supply recovers after such a load passes, it "overshoots" the nominal intended voltage and "rings" with oscillations on the way back down to the nominal stable operating point. It creates all kinds of harmonics in addition to the voltage/current instability when this happens. It causes the sound to lose the intended sharp focus and definition. A tube rectifier with a choke input power supply and metallized polypropylene, Cerafine, or Black Gate caps is the ultimate power supply for a tube amp, especially a Class AB push-pull. A well designed choke input power supply has excellent regulation, far in excess of any other PS topology. The residual AC component is a pure sine wave, with no harmonics, and the above caps don't add their own say so to the mix, besides being much faster, less resistive, and more efficient than aluminum electrolytics. When bypassed with small value film and foil caps, they're unbeatable, IMO. The choke input supply also provides a constant current source for both your power and preamp tubes. It also reduces the necessary conduction angle of your power iron and rectifier tube, so both are stressed less and run cooler. Rectifier tube life is extended by a choke input. Also, a choke input supply greatly reduces overshoot and ringing. A choke input is not without drawbacks. Electrically, it's pretty awesome. In practice, it has it's physical problems. It requires a quite higher than normal power transformer secondary voltage, a low DC resistance choke capable of handling the current draw of the entire amplifier, and dealing with the enormous size, weight, and expense of such a choke. Most often, a choke input really done right requires a choke larger than the power transformer!Thermionic