

## M10 PSU; Galahad – Signature

### AN INTRODUCTION FROM THE DESIGNER

Andy Grove, Designer in Chief for Audio Note (UK) explains some of the development process behind our new statement line stage: -

"I realised the core concept of the M10 power supply "Galahad" while I was doing some theoretical work on amplifier topologies. I was analysing compound amplifiers which are connected by bridge circuits, or in other ways, such that one amplifier will correct the output of the other by subtracting distortion from the output. QUAD "Current Dumping" is one such configuration of the many possible.

What I came to think was that, theoretically at least, one could build a simple circuit using a single valve which could completely reject not only all voltage fluctuations from the mains, but which would, to all intents and purposes, be entirely isolated from the mains in every way. Not only that but the output impedance of the supply would be fixed, even across the audio band, and all this would be achieved without high feedback or complex "engineer's ego trip" solutions with hundreds of active devices.

The way this would work, essentially, is that I would use a shunt valve to look ahead at the incoming fluctuations, and to pass a current such that the fluctuations are completely removed. This isn't possible with a feedback topology; for feedback to work there must necessarily be an error to correct. The circuit looks at the error at the output and tries to correct it; therefore there must be an error at the output.

The problem with the kind of setup I was looking at implementing was that they require extremely tight tolerances to work, and valves generally do not provide that, they age and there is sample-to-sample variation. This was the downfall of these schemes in the past – when the circuit drifted off balance then what you are left with is often worse than where you started.

What I realised is that by juggling the arrangement of resistors and the valve transconductance I could eliminate, or at least minimise, the effect of drift and ease up the effect of component tolerances, thereby creating a practical PSU topology.

The question might be asked, "Well, why not just use a conventional power supply?" The answers to that question are: -

- 1) All components inject colourations – even the best components.
- 2) PSU capacitors tend to damp musical dynamics.
- 3) A conventional PSU has an uneven impedance across the audio band.

I saw that the new Galahad configuration had the potential to bypass the above problems, and I knew within my heart or sixth sense that it would work and sound good. I'd had experience with lesser versions of it in the past, and they were very promising, and here I was looking at the ultimate configuration.

I created a working model of this power supply at Audio Note (UK), and we assembled a very high-end version of what was essentially an M8 preamp to be powered by it, and the results were really mind blowing.

At the same time I designed a special input transformer to received balanced signals, this transformer has exceptional noise rejection powers, yet has an equally exceptional bandwidth and very low distortion. Of course this component is also wound using silver wire and assembled using the highest quality laminations and materials.

The M10 uses the finest materials and components available, even down to the use of a special 'densified' wood circuit board material.

We know what happened when the M10 was released to market. What was intended to be just a special preamp for a few chosen customers became a phenomena in itself...

If we fast-forward to today, then we can discuss the M10 Signature. The concept is essentially the same, but I have further optimised the PSU by changing valves and utilising their characteristics.

In the M10 Standard, we have an EL34 as the shunt valve and a 6SL7 configured as a current reference, which in turn defines the output voltage. In the Signature I have substituted a 12E1 for the shunt, and a 6SJ7 as the current reference. The 12E1 is a Special Quality beam tetrode, similar in some ways to the KT88. It has considerably more power capacity than an EL34 so I can increase the shunt current. The fact that it's a beam tetrode lends a harder clarity to the sound, which requires some modification further down the line. I replaced the 6SL7 current source with one built around a 6SJ7, this was done so I could pass more current in the C.S., and because I could create a bootstrap circuit around it and feed a more accurate AC signal to the grid of the 12E1.

The preamp unit of the Signature is also upgraded, I redesigned the output transformers, this time using a much larger core of the same 55% nickel iron material C-Cores. This allowed me to increase the bandwidth and lower the distortion of the output transformer as compared to the original.

To further improve things I designed a new input transformer, again on a larger core. The results are the same as for the output transformer. However here I have used a double screen between primary and secondary to separate the grounds internal to the preamp and external to it.

These improvements to the transformers are akin to having larger windows on your house, more light is allowed inside so you can see more clearly.

The upgrades to the power supply and to the transformers made an incredible difference to the absolute clarity of the machine. However, we are not in the business of making lab instruments; The M10 is about musicality.

So, the next step was to tune the circuitry by ear, and for an audio component of this quality level that requires time, knowledge, good ears, patience – and a good system in which to insert the unit and listen to it.

In the end not too much was required to be done, the incredible clarity meant that I had to slightly rebalance the voicing of the preamp (I have a box of "magic components"! ). It took some time to get it exactly right, but the results were absolutely worth it.

Not only were we hearing into recordings to an unprecedented depth, but the sound had a beautiful organic tone, for example wooden instruments felt like they were wood, you could feel it inside yourself, not just hear it. Percussion was tidy, but not blunt, rigid and "square edged": Drums had a defined dynamic envelope and resonance.

What really left us with open mouths, and a tear in our eyes, was the representation of voices. It seemed that before, even with the M10 Standard, you heard a voice, but there is a thin veil between the sound of that voice and the communication with your soul. The Signature lifted that veil, and Ella was singing to each of us personally. We know what it means when you look at a pretty girl across the street, and then she turns and looks in your eye..."

*Andy Grove, Designer in Chief for Audio Note (UK), 2012.*