

Developing Character

Dave Hill Designs' Europa 1 Mic Preamplifier

By Dave Hill

The creation of a preamp (or any other piece of gear) that can be used in many different situations and that offers sonic “color” choices is not a task that gets taught in electronics school. In creating new gear that sounds unique, I find that it is best to come up with different ways of designing the circuits, not using the cookbook circuits that are commonly used. Designing flexibility into the gear helps make it work for a variety of sound styles. After all this is suppose to be creative industry where we create and record new and different songs, employing different sounds and make different kinds of equipment to do the recordings. In other words, not copying what someone else created—improving on an idea is ok, but never copy. How many generations of a copy of a copy of a copy of a copy of Rupert Neve’s work are there?

I began the design of the Europa 1 preamplifier long before I even decided to make the device. Four years ago I was building an experimental preamp that used relays for gain control and had 3 dB steps; a design that was never brought to market. Relays are expensive and large; to get finer gain resolution would have required an impractically large number of relays. My friends at THAT Corp showed me a part that they were developing that would allow 1 dB gain steps and asked me what I would like to see in this device. My requirements were that I be able to use their gain control device with my discrete preamp design. They separated the gain control and preamp into 2 different parts. By using one relay and the THAT 5171 part I was able to get 1 dB steps from 0 to 66 dB of gain with very good performance, and using THAT’s chip also proved cost effective.

When designing circuits to create different, unique sounds, it is time to throw out the common cut and paste methods; designing circuits to make distortions that are useful in recording, sounds that the ear likes, is a very different kind of design task. Add the facts that we do not understand hearing very well, and there is no “sounds good” measurement, and I find myself on a journey that has both good and bad surprises. This type of journey requires a large amount of time spent listening to the circuits while recording and mixing.

The Europa 1 preamplifier has three different coloring methods, even harmonics, odd harmonics, and speed. The even harmonic color generator is relatively straight forward, but, even harmonics, especially an octave above the fundamental, can be very hard to hear. Some people may not hear as much as 50% second harmonic distortion. The distortion characteristics that add color in most vintage electronic gear can be complex—harmonic distortion content varies with differing signal levels and input frequencies. It is difficult to create a circuit that has a particular sonically desirable harmonic content and is controllable. Developing such a circuit requires a lot of listening with a lot of different styles of material. Highly compressed test material does not work well for this; clean and open sources are best. And, evaluating a design in real session work is very important. When working as a recording engineer you are under fire to make the client happy, and you need to do that quickly (clients sometimes focus on cost when a session is not going well).



The design of even harmonics circuits can also cause a DC voltage shift which creates other issues related to headroom; the more second harmonic content, the greater the potential for headroom loss. Odd harmonics can be created by symmetrical clipping with diodes but that is a common method and may or may not work well. What I wanted to do was develop a circuit that is unique. It needed to do a soft compression that adds odd harmonics and needed to be adjustable. Once again, the circuit also needs to produce a different harmonic structure with different signal levels or else the sound will not be complex enough. With a large amount of fine tuning of the circuit, which must be done by ear, you can arrive at a finished design; there is no other way to get there. Very big surprises can happen in use, like finding that 10% distortion does not change the sound in ways that you would think. It may change transients and dynamics more than affecting the circuit in a way you might think of as color. It's easy to make a "warm" sound—add a little LF boost with a little HF cut and a circuit sounds warm—but that is not what a circuit design employing the deliberate creation of specific harmonics is about.

The speed control circuit is the strangest of all circuits. This is not a normal audio processing function. However, audio engineers do make sonic selections that are in practice based on amplifier speed by selecting between modern and vintage preamps during a session. Speed is slew rate, or the amplifier's ability to track the rate of change of an input signal. This is not a normal frequency response function. For example, at full signal level the -3db point could be 1kHz, but at -40 dbfs the -3db point could be 30kHz. This is a difficult function to create within a useful operating range. It is possible to end up with something that only works on a drum and gives you only one sound; that is too limited, the design needs to be flexible. My goal, achieved in the Europa 1, was to provide a useful, adjustable, range of speed related sonic effect.

Developing circuits that are truly unique and truly flexible and desirable is not a trivial task. Innovation is required in such a design, though at times it's hard to get the effort and creativity required for the full value of such innovation to be recognized and accepted. In pro audio, the proof is what you hear, and we're confident that the Europa 1 will deliver an absolutely unique range of sonic options. Until you get the chance to try one for yourself, you can listen to examples of the Europa 1's capabilities at our website.

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This was printed in Prosound News April 2011

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