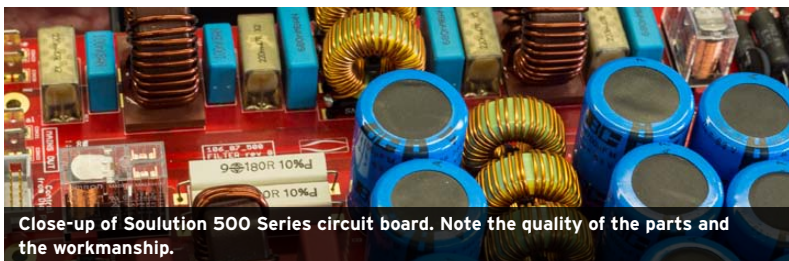


EQUIPMENT REVIEW - Soullution 500 Series Electronics



Close-up of Soullution 500 Series circuit board. Note the quality of the parts and the workmanship.



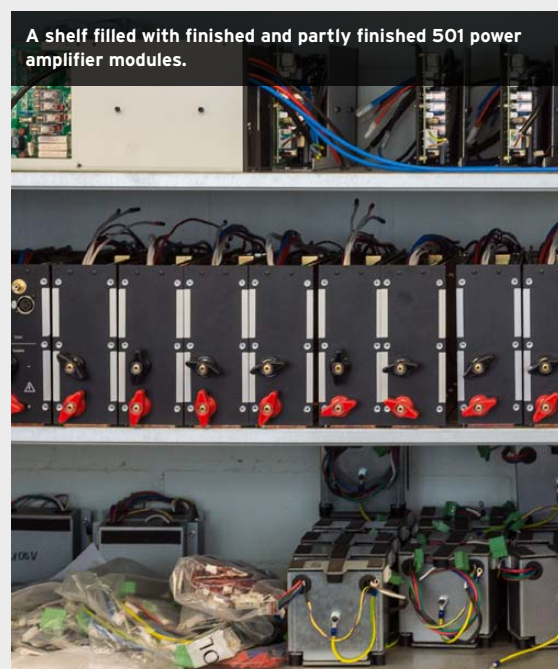
Chief Engineer Bonne Ditmar at his office desk.



Circuit boards awaiting further assembly fill the parts shelves.



A circuit board is tested. This is a small section of the Soullution's elaborate test bench.



A shelf filled with finished and partly finished 501 power amplifier modules.

Building The Soullution 500 Electronics

About a year ago I visited Soullution in Dulliken, Switzerland—a little town outside of Zurich—to see the first 500 Series electronics being built. Soullution shares a building with and is a subsidiary of Spemot AG, producer of extremely high-precision, high-tech electronic devices and electric motors used in automotive and other applications.

The bottom floor of the Spemot factory houses Soullution's parts, testing, assembly, shipping, design, and accounting departments. The Soullution facility is also equipped with a pair of Magico M5s and Q5s for listening tests and a complete lab bench. Soullution's chief engineer, Bonne Ditmar, is largely responsible for the design of the 500 Series and the new 700 Series electronics, both of which now incorporate switch-mode power supplies.

In Dulliken the boards are assembled into finished products by the team of Matthias Duso and Manfred Hasler.



Matthias Duso and Manfred Hasler are in charge of assembly of Soullution electronics.



Hasler assembles the control mechanism on the faceplate of a 501 monoblock.



Boxed Soullution products awaiting shipment.

EQUIPMENT REVIEW - Soulution 500 Series Electronics

An Interview with Cyrill Hammer, CEO, Soulution

First, tell us about the new switching power supplies in the 501 amps and the 520 preamp. Who thought them up? How do they work? What do you think they add to the Soulution sound? Are there any downsides?

Switched-mode power-supply technology was part of Soulution's development work from the very beginning. However back in 2000, when we started the Soulution project, there was no switched-mode power-supply module available that could match all technical requirements for a high-end audio amplifier and that would have been reliable in the long run. The technology was widespread and well established for "low" power applications only. Therefore we based the designs of the 700 mono amplifier and the 710 stereo amplifier on linear power supplies with big toroidal transformers and focused in the succeeding years on pushing the performance of this technology to its best level.

However in the past 10 years switched-mode power-supply technology did advance considerably. Especially the power ratings and the switching frequencies increased dramatically. Therefore we reconsidered using them for the Series 5 power amplifiers.

The switched-mode power-supply module of the 501 mono has two regulation stages. A power-factor correction (PFC) and a power-switching pulse-width-modulation (PWM) control, both operating at 70kHz. We use a dual-phase interleaved PFC circuit with feedback. This reduces the total harmonic distortion (THD) induced "backwards" into the input current of the power supply, which is absolutely key in order to minimize "pollution" of the mains with high-frequency noise that could be picked up by other audio devices.

The main advantage of the switched-mode power supplies is the fact that the output voltage is perfectly regulated and remains stable irrespective of the amplifier load. The PWM control, which keeps the output voltage stable, works with soft

waveforms for excellent audio behavior and a fast feedback loop for best performance. A lot of development effort went into the design of the power supply's output stage, which was jointly developed by Soulution and the manufacturer of the power-supply modules. In addition the design of the output filter was fine-tuned to the PWM control protocol. The result is a double-regulated, high-current switched-mode power supply with specifications that cannot be exceeded by any conventional linear power supply. We are convinced that our switched-mode power-supply technology marks a breakthrough in power-supply design for high-end audio products.

The new power-supply technology provides better control over the loudspeakers. This gets very obvious for massive bass impulses. As the bass fundamental is more stable and consequently more precise, the soundstage gets wider and deeper. Overall the amplifier seems to stay "relaxed" even with very complex and demanding music signals.

In the past switched-mode power-supply units have been used for many audio products mainly in order to reduce the space requirements or to reduce the costs, while compromising on performance of the power supply and in the end of the amplifier. In our experience a high-end switched-mode power supply has about the same size and the same or even higher cost than a conventional linear power supply.

The Soulution switched-mode power supply does not have any drawback in our opinion. On the contrary it has many advantages over linear designs!

Second, your previous amps and preamps have used negative feedback in an ultra-fast (ultra-wideband) circuit to lower distortion to vanishing levels. Are the 500s also doing this same thing? If so (and power supplies aside), in what ways do

the 500 Series circuits differ from those of the 700 Series electronics?

Yes, the Series 5 amplifiers do follow the design principles that are similar to those of their bigger counterparts. The voltage amplifier does work with lowest propagation delays (the best conditions for applying negative feedback wherever needed). However, the design of the Series 5 voltage amplifier is less complex. The current stage of the Series 5 amplifier has just five transistors per side (NPN/PNP) whereas the Series 7 amplifier has seven transistors per side. Therefore the current rating of the 501 mono amplifier and 530 integrated amplifier is limited to 45 ampere (where the 700/710 are capable of 60 ampere).

Like the Series 7 amplifiers the 501 and 530 do have a global negative feedback loop. As the Series 5 amplifiers are very precise in the first place, the amount of feedback required in this loop is very low or close to nonexistent. We apply less than 0.1 dB of negative feedback. The stability of the fully controlled switched-mode power supply unit of the Series 5 amplifiers helps to further reduce this value. Very good tube amplifier designs, with low feedback, usually have more than 10dB in the global feedback loop (100 times more!).

Third, though only rated at 125W into 8 ohms (250W into 4 ohms), the 501 mono amps have unusually good dynamic linearity, by which I mean that they continue to get stronger and more powerful without changing their sonic signature or plateauing, right up until the very point where their protection circuits shut them down. Is this owed to their new power supplies? Or to other factors as well?

This is owed to the new power supply technology! Amplifiers give their power supplies a very hard time. The ideal power supply should be as powerful, precise, and fast as the amplifier itself. Big transformers have high voltage drops between low

current delivery and full load. The supply voltage of a 700 amplifier can easily drop by 10% at full load. This leads to lower power output especially for transients. Fluctuations in the mains supply will affect the output voltage as well. Apart from the sonic advantages of having stable power conditions, it also allows us to reduce the required headroom for safe operation of the amplifier. Less headroom in the power supply means less heat dissipation. The chassis of the 501 mono amplifier is much smaller than the one of the 710 for instance. However both amplifiers have about the same power rating.

Fourth, the phonostage that is built into the 520 is a considerably better than the add-on phonostages usually built into preamps. Tell us about it. Is it the same basic ultra-wideband design as that of the phonostage found in the 720? What are the differences between the two phonostages, in sonics and build?

The basic design of the 520 phonostage is the same as for the 720. It is as well an ultra-wideband design using four amplification stages, but the filter functions have been reallocated. The first stage is purely linear and just amplifies the small signal from the cartridge. The second and third stages do the RIAA filtering whereas the fourth stage drives the switchable subsonic filter. The sound gets more natural with this design. However, the power supply section for the phonostage of the 520 is less complex and less powerful than the one for the 720. Therefore the 720 phonostage is still the reference design, though the 520 gets very, very close.