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Bulletin 0115

Design Overview

The DMC-30SV "Super Veloce" Reference Preamplifier

After years of painstaking research and development and exhaustive listening trials the Spectral DMC-30SV "Super Veloce" Reference Preamplifier is now here. The new DMC-30SV succeeds the classic DMC-30SS reference preamplifier, for eight years our most popular product and one of the most highly regarded audio components in the high-end audio industry. Developed over the course of three years, the DMC-30SV is our fourth generation of the DMC-30 family which music enthusiasts worldwide have come to regard as the gold standard in state-of-the-art performance and top value. The DMC-30SV utilizes new Spectral exclusive technologies and componentry to raise the bar in signal control and amplification to a new level of precision and musical realism.

Since the establishment of our company in the 1970s and the introduction of our very first audio component, high performance preamplifier design has occupied the highest engineering priority at Spectral. Our special focus on high-end preamplifier development over the years is based on the major design challenges which

low-level amplifier and control circuitry can represent. At these critical signal levels minute amplifier distortions and signal control colorations are passed on and magnified by power amplifiers to dominate the sonic signature of the best audio systems. Spectral engineers have spent the last four decades pursuing ideal performance and signal transparency in audio preamplifiers to realize ultimate fidelity in high-end music systems.

The Super Veloce Preamplifier

In the DMC-30SV Reference Preamplifier, Spectral engineers evolve the renowned DMC-30 topology with our most advanced amplification circuits to date. Utilizing recent breakthrough understanding in high-speed transistor behavior, new semiconductor designs exclusive to Spectral address historic limitations in amplifier linearity and banish low-level distortion products to previously unattainable levels. These devices and a new family of exotic custom made passive components are utilized in a new generation of high-speed, wide-band input stage and high-level line sections with unprecedented results.

Thermal Memory and Super Transistors

For years Spectral engineers have investigated the fleeting signal memory distortions found in certain semiconductor devices known as "thermal tails". These elusive non-linearities occur at high speeds in transistors during switching as junction behavior changes as a function of heating and cooling. This change in semiconductor switching behavior affects amplifier circuit linearity until the device recovers from transient heating. This "thermal memory" distortion has long been a recognized phenomena in high tech amplifiers circuits for RF and microwave but is ignored by conventional audio engineers. In high resolution audio amplifiers, however, we find these small

transistor distortions problematic as they compromise signal linearity and transient settling. Having isolated and observed these distortions in our own high-level driver circuits, Spectral engineers first addressed their elimination in our reference standard amplifier designs. Solving these subtle distortions which blur transient waveforms requires uniquely precise test and measurement systems and specific semiconductor designs which do not change their linearity under transient signal conditions. The results of this development are the finest performing amplifier circuits we have designed. Now our goal in the DMC-30SV is to successfully apply the benefits of this new semiconductor technology to the challenges of low-level amplification for the first time.

The SHHA Generation 3 Analog Line Modules

Just as the preamplifier is the essential heart of the finest music systems, the 'Spectral High-speed Hybrid Amplifier line module is the essential heart of our high resolution preamplifiers. For this reason, the modular architecture of Spectral preamps has been developed to accommodate the design evolution of our SHHA technology with convenience and ease. Now the new SHHA G3 line module takes our wideband, fast-settling discrete circuitry to a new level of refinement and signal resolution. Spectral engineers have continued to optimize the dense surface-mount Fet topology of the SHHA module with new ultra premium custom semiconductor devices, exotic custom passive components and new circuit refinements.

The input cascode of the SHHA G3 module utilizes our own proprietary Fet technology. These new dual J-Fet devices developed for Spectral, provide higher gain with ultra-fast transient settling. In addition, Teflon SMT precision film capacitors provide ultimate signal transparency in critical circuit locations. Custom ultra low value polystyrene film capacitors and Teflon film trimmers adjust each module for ideal transient response and wideband stability. These and other advances in the SHHA G3 module assure uncompromising sonics and extended reliability. Musical results include higher resolution, greater dynamics and improved

harmonic structure. Vastly improved imaging and focus have resulted from the elimination of transistor thermal-tail distortions.

The Missing Link

With the widespread use of integrated circuit op-amp topologies in current high-end digital processors and digital source components, the role of the preamplifier to optimize the component interface has never been more critical to final system performance. Today's digital converters have a challenging task delivering precision conversions of music files and downloads while also driving complex cables and low-impedance input loads utilizing rudimentary analog circuits and basic power supplies. Without the benefits of discrete, high-bias analog amplifiers, digital processors struggle to provide optimal drive and load isolation when faced with the full dynamics of high-resolution recordings. In addition to these output drive limitations, IC based digital processors require balanced output operation to avoid higher distortion levels which occur when used single-ended. It is also important to recognize that digital audio processors are not equipped to perform the role of preamplifier in high-end audio component systems. Power amplifiers require robust drive capabilities from the best discrete class A preamplifier line sections to avoid impedance mismatching, current limiting and cable reflection problems associated with low bias IC op-amp output sections.

The Model 304 Balanced Input Amplifier

To address the shortcomings inherent in the output sections of today's high-end digital processors, Spectral engineers have developed the model 304 balanced input amplifier. The model 304 is a discrete, high-speed class A unity gain buffer operating on unusually high voltage rails. This fully push-pull topology is derived from our innovative SDR-4000 I/V balanced amplifier and features superior performance to any IC buffer. The model 304 is design optimized as a discrete buffer amplifier unlike conventional IC input buffers. Custom discrete buffers are a rarity in audio today but still are found in the best ultra-premium recording consoles. Although difficult to design and hugely

expensive compared to op-amps, the optimized discrete input buffer is the only uncompromised solution for interfacing digital audio components and amplifiers.

Spectral engineers have taken the discrete input buffer to the next level in the 304 balanced input amplifier. Custom matched J-fet transistors are employed in the cascode front-end. Built to Spectral specifications for low gain applications, the handbuilt devices lower crossover distortion, noise and improve common mode rejection. Bandwidth, slew rate and distortion are all vastly superior to conventional buffers. The speed and resolution of the 304 balanced input buffer are exemplary and perfectly compliment the superlative performance of the new G3 line section of the DMC-30SV.

The Result: Instantaneous Accuracy

In the DMC-30SV reference preamplifier, Spectral brings together some of the most accurate and sophisticated circuits yet developed for music reproduction. Through painstaking research and development, new active input stages and line-level output stages employ next generation instrumentation technology, which addresses historic distortion problems in solid-state semiconductor design, with heroic results. Amplifier topologies in the DMC-30SV are the fastest and deepest settling that we have developed. Premium passive component technologies used in critical locations are of unsurpassed quality. Today, no other preamplifiers have the ultra-fast signal response and the instantaneous signal extinction achieved in the DMC-30SV. This “instantaneous accuracy” sets the stage for remarkably transparent, articulate and vividly immersive sonics.

The DMC-30SV Reference Preamplifier - At the Leading Edge

We are pleased to see more and more music enthusiasts are coming to understand that no music system can be any better than the performance of its preamplifier. There is growing sophistication in regards to absolute performance and price. At a time when ultra high price preamplifiers are routinely introduced at several times the cost of Spectral, the thoughtful music enthusiast is left to wonder exactly what benefits these lofty prices buy? We believe the sophisticated customer will find

the answer in the uncompromising DMC-30SV. Few preamplifiers at any price can boast the designer credentials and unrivaled component quality of the DMC-30SV. Edge-of-the-art amplifier technology and advanced custom component design are utilized throughout the DMC-30SV to a degree rarely seen in stratospheric components. This is because Spectral engineers have identified those key components that most determine instrument stability and sonic transparency and have invested aggressively. When careful investment in superior circuit performance and signal path components becomes the design priority over elaborate metalwork sculpture, state-of-the-art clarity and signal resolution can be achieved with affordability.

Compare our new DMC-30SV reference preamplifier against the most costly and ambitious high-end preamps in the industry. We are confident you will discover the important musical difference superior engineering experience and design innovation make.