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Bulletin 0806

Design Overview

Spectral Introduces the HDCD 'Long Filter' Decoding Technology

In the SDR-4000 CD Processor, Keith Johnson set out to redefine the performance of the 16 bit compact disc with the most advanced components and circuit topologies yet devised for CD reproduction. At the same time, a parallel effort by Keith Johnson and Michael 'Pflash' Pflaumer was launched to develop a very advanced digital playback filter based on the sophisticated Pacific Microsonics HDCD software.

Since its introduction in 1995 the original PMD-200 HDCD digital filter software has been the choice of high-end digital audio designers for their most ambitious processors and players. This was no accident. Digital designers in most high-end companies recognised the unrivaled performance of the PMD-200. Although conventional digital filter designs appear in every type of digital product today, custom digital audio filters are not designed every day, particularly to ultimate audio standards. The Microsonics discrete HDCD filter chip gave high-end designers the most powerful filter processor with the most sophisticated algorithms yet developed for 16 bit digital playback.

Now Spectral introduces the next generation of high-performance filters. The new HDCD 'Long Filter' technology takes digital playback to the next level with the fastest sampling and most filter poles ever assembled for digital audio playback. With new software designed to run on todays most powerful 32 bit processors, the Spectral 'Long Filter' utilizes floating-point math for higher accuracy and features the processing power of eight PMD-200s for vastly faster calculations.

The Spectral HDCD 'Long Filter' is Todays Most Advanced 16 Bit Decoding Software

The original HDCD filter correction strategy was designed by 'Pflash' Pflaumer around Keith Johnson's psycho acoustic models and implemented in the fastest processors of the mid-1990s. The vastly higher sampling rate and memory storage of the 'Long Filter' make possible a much more extended version of Keith Johnson's sonic model and more precise corrections. These advanced correction algorithms improve timing accuracy at all frequencies we hear. By anticipating time shift and producing an opposing response program, time dispersion is greatly corrected adding the third dimension to filter math that reveals more life, sparkle and dimensionality.

In a day and age of maturing digital audio technology, cost reduction and component integration, (think of todays premium sigma-delta type DAC chips with self-contained filter programs which lower costs and reduce chip counts) there is the unexamined belief that digital audio filter programs have attained a high degree of accuracy and refinement, especially in high-end and studio applications. The unfortunate truth is, virtually all digital audio products from mid-fi to the most expensive high-end luxury and prosound units all use most of the same commodity filter technology.

Since the digital audio chip industry has moved on to standardized, prepackaged filter programs, high-end component designers are left with few options but to hope for the best and assume these packaged filters are more than “good enough”.

The Spectral ‘Long Filter’ Makes Compact Disc a High-Resolution Medium

This is not the first time we have encountered the “perfect sound forever” assumptions in the attitudes of digital audio designers. After evaluating the performance of the most ambitious DAC/filter programs available under dynamic recording and playback conditions, Spectral engineers found filter sonics to be seriously compromised even for the most non-critical applications. Clearly, filter design compromises are holding back digital sound quality in most digital audio products. The Spectral HDCD ‘Long Filter’ is our solution for this vital link in the digital decoding chain and argueably the first significant step forward in high-performance digital audio filter design in over a decade. The Spectral HDCD ‘Long Filter’ makes the compact disc a high-resolution medium.