



At the Heart of the D2Audio[®] SoundSuite[™] Immersive Listening Experience

Delivering Premium Audio in a High Definition World



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D2Audio has a long history dealing with high quality audio processing and amplification. The earliest customers of D2Audio technology were AVR platform suppliers Harman Kardon and Marantz. For these ultra-high performance solutions, D2Audio developed a number of audio enhancements to bring digital Class-D amplifier performance into the same high quality realm as traditional analog Class-A/B amplifiers. D2Audio focused on the consumer listening experience in developing these techniques, and believes that we have achieved an unmatched level of fidelity and realism from Class-D audio amplifiers. The outstanding performance levels are made possible through the use of the Intelligent Digital Amplifier™ based on the Digital Audio Engine™ (DAE) family of PWM controllers. These advanced controllers include a powerful on-chip Digital Signal Processor (DSP) that is used extensively for Class-D enhancements, as well as to implement the D2Audio® SoundSuite™ immersive audio enhancement algorithms essential for engaging media playback.






The D2Audio® SoundSuite™ algorithms are a family of immersive audio enhancements that run on the DAE family of PWM controllers. These algorithms are based on psycho-acoustic techniques designed to affect the brain's perception of audio. There are physical limits to the range of sound and the quality of sound coming from Digital TV (DTV) speakers and enclosures. These limits are due largely to the fact that small speaker drivers are used in an effort to conform to consumer DTV styling preferences. Only through psycho-acoustic corrections and enhancements can these speaker limitations be overcome to deliver an immersive audio experience, matching the beautiful video of today's displays.

The specific D2Audio SoundSuite algorithms are described below. They have been designed to address inherent small speaker issues dictated by flat panel televisions (FPTV) designs. Prior to applying the immersive processing, D2Audio performs an advanced speaker/enclosure tuning analysis and invokes a custom tuning correction to greatly enhance the fidelity and realism of the speaker's sound quality. Using the corrected audio as a foundation allows the immersive power of D2Audio SoundSuite to markedly enhance the audio experience. Please see the "D2Audio Speaker Tuning White Paper" for additional information on the nature of speaker anomalies and the required DSP corrections.



- **D2Audio® DeepBASS™** is a psycho-acoustic low-frequency enhancement effect, which increases the apparent bass frequency response in systems where larger speakers and subwoofers are not possible. It takes the original low frequency content of any audio content and artificially generates the supportive frequencies that can be faithfully reproduced by the smaller speakers. When these higher supportive frequencies are present, the lower frequencies that are not reproduced seem apparent to the ear. Different from other "bass enhancement" techniques, the D2Audio DeepBASS utilizes the full power of a real DSP system to create the supportive harmonic structure in a much more controlled and regulated manner. This technique leads to less perceived distortion and a smoother low-end frequency response. Product designers will have access to key control parameters to customize/optimize this audio effect. Although any of these controls can be passed to the end user control, it is recommended that only "effect level" be provided in the end user GUI control.



- **D2Audio® WideSound™** is a 2-channel stereo “spatialization” effect. In applications where it is not possible to physically separate 2-channel or stereo speakers to create a more spacious stereo image, D2Audio WideSound generates a much broader and more spacious sound stage. Different from other spatial techniques, D2Audio WideSound utilizes the full power of a true DSP to create a very smooth image distribution with much more breadth of control and much broader separation. D2Audio WideSound enables smaller, compact stereo products (i.e. digital televisions, docking stations, mini-stereo’s etc.) with an ability to enhance the listening experience by creating a much larger and more expansive sound stage. Product designers will have access to the key control parameters to customize/optimize this audio effect. Although any of these controls can be passed to the end user control, it is recommended that only “effect level” be provided in the end user GUI control. 
- **D2Audio® AudioAlign™** is a 2-channel or stereo vertical audio alignment technique. It is used to better align the audio image with the placement of the video display. Different from other audio placement techniques, D2Audio AudioAlign provides for ultimate control over the audio content dependence of this type of Audio alignment by allowing high-resolution control over the algorithm parameters. D2Audio AudioAlign enables smaller 2-channel or stereo audio/video products (i.e. FPTV’s, Plasma Panels, and LCD Panels) with a much improved capability to align the audio and video content for a much more pleasing entertainment experience. Product designers will have access to key control parameters to customize/optimize this audio effect. Although any of these can be passed to the end user control, it is recommended that only “effect level” be provided in the end user GUI control. 
- **D2Audio® DigitalEQ™** provides the User the opportunity to select the best possible equalization for the system, depending on whether it is being used to listen to audio, watch TV, listen to the radio or watch an exciting movie. Configuration EQ provides the same flexibility of optimizing the experience, regardless of whether the audio source is located in the corner, against the wall or on a table in the middle of the room. D2Audio DigitalEQ enables smaller 2 channel stereo products (i.e. televisions, docking stations, mini-stereo’s, etc.) with the ability to provide the optimal listening experience without the impact of the increased cost of expensive loudspeakers and cabinets. The full utilization of the D2Audio DSP allows the User to simply select the appropriate EQ for the Program Material or for the physical location of the audio product. The “Preset” selection is enhanced through the availability of a “Custom” EQ setting that can be optimized by the user to create personalized listening experiences. 
- **Other D2Audio SoundSuite Features** are available ranging from consumer visible D2Audio ClearVoice™ to strengthen the dialog common in movies, to sophisticated automatic speaker tuning using D2Audio® HILO™. These and other D2Audio SoundSuite algorithms have been developed to address real world issues, and to bring small speaker playback into a new high quality realm rivaling full home theater systems. 




In addition to the powerful DSP based algorithms, D2Audio has developed a complete engineering tools set to allow access to the various DSP control parameters. This flexible graphic interface allows designers to directly affect the sound and performance of the system. Other control approaches require complex register reads and writes, but the **D2Audio® Canvas II™** control software employs a simple drop-and-drag interface with several built-in protections and numerous advanced features that support real-time control of DSP settings. Adjusting audio settings often requires that the settings be adjusted while content is playing. D2Audio recognizes that a seamless system where filter coefficients must be adjusted in a smooth continuous way is essential to avoid audible anomalies that would detract from the tuning efforts. Once this very intuitive process achieves an ideal setting its parameters can be locked in and frozen as a fixed function setting, or it can be used as a baseline upon which consumers can make their own adjustments for their personalized perfect sound. Easy integration with On-Screen Displays (OSD) is afforded by the self generated scripts and the simple register interface that simplifies communication with the DSP.

Look to the full range of D2Audio SoundSuite immersive processing algorithms to address the inherent issues surrounding small speaker anomalies and limitations. The full range of immersive processing and psycho-acoustic algorithms are layered on top of sophisticated speaker tuning that delivers realistic audio from the small diameter drivers that are required to meet consumer styling preferences. The D2Audio SoundSuite algorithms are specially designed to run on the DAE-3 family of solutions for Digital TVs. The combination is unmatched for cost effective high quality digital TV sound processing.