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Ayre D-1 DVD Player

Audio Performance Review

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Ayre D-1 DVD Player

A discussion of the Ayre D-1 DVD-Video player can be approached in a number of ways: it can be considered as the world's most expensive progressive scan DVD-Video player, or as a bargain-priced contender for world's best CD player. It can be viewed as an ultra-high-end home theatre component or as a videophile DVD-Video player or as an audiophile-quality optical disc player or transport. Which ever way you look at it, the D-1 is an amazing product that breaks new ground in audio and video performance.

The D-1 is a high-end DVD-Video player that provides progressive scan video output along with bitstream digital audio output for home theatre sound from Dolby® Digital, Dolby Pro Logic®, and DTS® Digital Surround™ movie soundtracks. It also provides state-of-the-art analog audio output from CDs and high-resolution DVD-Video music discs. My task here is to review the sound quality of the product so I'll concentrate on the audio capabilities of the D-1 in this article.

A Home Theatre CD Player?

Like all DVD players, the Ayre D-1 plays CDs and high-resolution DVD-Video standard music discs. Unlike most DVD players, the D-1 provides outstanding audio performance from these PCM mediums and it also delivers better sound from encoded bitstream DVD movies. The D-1 raises the bar for traditional PCM audio performance from its analog outputs and resolves more information from its digital output for compressed bitstream formats, too.

I have used a lot of ink in recent issues to denigrate the performance of the compact disc and to point out the shortcomings of PCM digital audio in general. I've been raving about the performance potential of the new SACD and DVD-Audio recording formats and contrasting them to the lowly CD—an existing medium in which many of us have a substantial investment. With all that information in print, along comes a breakthrough product that redefines the capability of PCM digital playback. I may have to take a couple steps back as I re-evaluate the situation.



Did I say breakthrough? I don't often use that word because it's been offered up far too frequently in the popular press where everything seems to be a "breakthrough" to one writer or another. In the case of the Ayre D-1, however, I can't think of a better word to describe the audio performance of the product. This component offers sound quality that truly sets new standards for PCM digital playback. And, as a bonus, it also makes the best video pictures that I have ever seen in my home!

How does the Ayre D-1 achieve this sonic breakthrough? Does it use a sample rate conversion chip to offer "upsampling?" Does it use digital signal processing to simulate a higher sample rate and to dither-up an extended sample size with greater bit depth? No, it does neither of these things.

By applying innovative and unique engineering and devoting incredible attention to circuit details, Charles Hansen, designer of the D-1, has created a product that simply does a better job of retrieving and processing PCM digital data. It comes closer to providing theoretically perfect PCM performance than other players and it does it with no technological slight of hand.

The Basics

The Ayre D-1 uses a transport mechanism, fluorescent display, and MPEG decoder board made by Pioneer. Everything else is constructed from the ground up by Ayre. The D-1 chassis is made entirely from aluminum.

The optical pickup has two discrete laser diodes. One diode is a visible red device for reading DVDs, and the other is an infrared device for reading CDs and CD-Rs. The internal construction of the D-1 DVD-Video player is completely modular to facilitate upgrades.

The digital audio output is AES/EBU balanced on an XLR connector and there is a switch to turn the digital output off. The player sounds a little better from the analog outputs when the digital output is deactivated. Analog audio outputs are offered on balanced XLR connectors and single-ended RCA connectors. I did all my two-channel music listening from the balanced outputs in order to fully utilize the increased performance potential offered by the balanced, differential dual DAC configuration.

There is a switch on the back panel of the player marked "Listen/Measure" which selects different digital filter algorithms. The "Measure"

position provides greater accuracy in the frequency domain, and the “Listen” position provides greater accuracy in the time domain, according to designer Charlie Hansen. I preferred the sound with the switch in the Listen position for most music CDs. Some 96 kHz/24-bit musical selections seemed to sound better with the switch in the Measure position. The “Listen/Measure” switch has no effect on the digital bitstream output used for Dolby Digital or DTS Digital Surround material.

On-screen menus allow the audio outputs to be configured to match the capabilities of the digital controller or preamp being used. Dolby Digital can be output as a compressed 5.1 channel digital bitstream or as an uncompressed, PCM two-channel mixdown. Analog outputs always play the two-channel mixdown. This allows Dolby Digital material to be played through a multichannel surround sound system or through a two channel stereo system with or without an onboard digital-to-analog converter.

DTS signals are always disabled at the analog outputs but the digital output can be enabled or disabled. DTS Digital Surround material sounds like white noise when played through a device which can't decode DTS bitstreams, so you don't want to present a DTS-encoded signal to a system which can't decode DTS.

MPEG can be output as a compressed multichannel signal or as an uncompressed PCM two-channel mixdown. The analog outputs always play the two-channel mixdown from MPEG material.

High resolution 96 kHz digital data can be output at full sample rate or downsampled to 48 kHz for presentation to devices which can't accept a higher sample rate signal. Downsampling effects both the analog and digital outputs.

My reference CAL CL2500SSP digital controller accepts 96 kHz digital signals but 96 kHz/24-bit DVD-Video standard discs sounded better when I used the DACs in the Ayre player and put the balanced analog signals from the D-1 through the Audio Research Reference 2 preamp.

I used the CAL controller to process Dolby Digital and DTS Digital Surround 5.1-channel signals, from the digital output of the D-1, during my multichannel listening tests.

Inside Details

The Ayre D-1 is a two-chassis design with the high-current power supply components mounted in an isolated, separate enclosure.

The external power supply module uses inductor-input filtering, referred to as the Ayre Conditioner noise filter (patent pending). There are two separate power transformers: one for the audio circuitry and one for the video and digital circuitry. These transformers have six, isolated secondary windings which are further partitioned into ten separate power supplies. Power supply regulators utilize all discrete-component FET circuits with zero negative feedback.

The separate power supply chassis, which weighs more than most complete DVD players, is connected to the main chassis by two umbilical cords allowing complete ground isolation

between video and audio circuitry.

The audio circuitry inside the main chassis has its own shielded sub-enclosure. The audio ground is completely isolated from the main chassis ground and the video ground.

The Ayre-designed ultra-low jitter master clock is located on a custom circuit board made from special, low-noise material. It features “optimal loading” of the quartz crystal oscillator to provide the highest level of performance and the lowest phase noise. The audio DACs are mounted on a small daughter card which plugs directly into the clock board providing the shortest possible path between the master clock and the DACs.

There are two Burr-Brown PCM1704K select-quality, multi-bit DACs for each channel. These are 24-bit resolution devices capable of 8x oversampling at 96 kHz and 4x oversampling at 192 kHz. The DACs are utilized in a differential configuration.

The Burr-Brown DF1704 digital filter is mounted on the same PCB with the DAC chips. The DF1704 has two filter algorithms which are individually selected by the Measure/Listen switch on the rear panel of the D-1.

Most CD and DVD players, including ultra-high-end models which cost twice as much as the D-1, utilize simple integrated circuit op-amps for the analog stage following the digital to analog converters. Ayre uses a proprietary, all discrete component differential current-to-voltage converter. That's right. The D-1 has all-discrete circuitry from the DACs out.

The DC coupled, differential balanced current-to-voltage circuits utilize FET devices exclusively, and use no negative feedback.

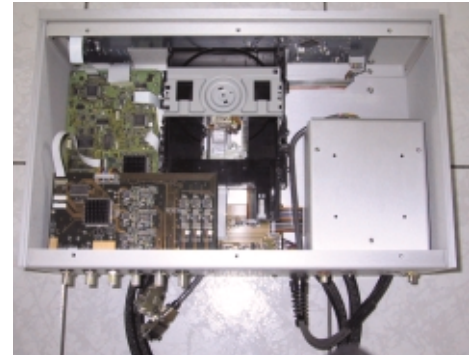
Designer Hansen feels that much of the incredible sonic improvement that the D-1 provides over other designs is due to these proprietary current-to-voltage converters. He believes that IC op-amps and negative feedback are two factors which have set limits on the performance of previous digital circuits. After hearing the D-1 I'm inclined to agree with him.

Data from the digital output is relocked by the ultra-low jitter master clock and fed through a pulse transformer with 160 MHz bandwidth and 1.8 ns rise time to completely isolate the digital audio output from other circuitry. The Ayre player provides better sounding bit stream data, too.

Sound

The Ayre DVD-Video player does not rely on technological gadgets or gizmos which add spice to the advertising copy for competing products but actually do little to improve audible performance. The D-1 performs all the usual functions of an optical disc player in a straightforward manner, yet it sounds better than any other disc player I've heard, regardless of price.

I plugged in the Ayre D-1 cold out of the box and put in a CD to see if everything was correctly connected. I wasn't fully prepared for what I heard—detail, resolution, depth of image and natural, musical sound that simply embarrassed my reference Wadia 860 CD player.



The sound from the Ayre player continued to improve for several days, getting smoother and providing an even more natural, satisfying listening experience.

I directly compared the sound of the Ayre to the upsampled digital sound from my reference DVD-Video player, the CAL CL2500 DVD. There was no contest at all when using the analog outputs of both players. The Ayre D-1 is in a completely different league.

The competition was closer when the Ayre and CAL DVD-Video players were compared using the digital outputs of each player in my home theatre system, but the Ayre still had a substantial edge. If the Ayre trounces the CAL for home theatre and beats the Wadia as a CD player, how would it compare to the Sony 9000ES DVD/SACD player, I wondered?

I have two copies of the Mark Levinson (the man) Red Rose sampler SACD disc. I put one disc in the Ayre D-1 which would play the red book CD layer, and one in the Sony 9000 which would play the SACD layer.

In all my previous comparisons between CD and SACD sound, the SACD has delivered a remarkably more open, detailed and natural musical presentation than the CD. With the CD in the Ayre D-1 and the SACD in the Sony 9000ES (which is not the best SACD player I've heard), the performance gap between CD and SACD narrowed. The SACD still sounded better to me but the difference was much less profound. I did CD versus SACD comparisons using other material from my collection where I have copies of the same recording on each format. While the Ayre player can't quite turn a CD into an SACD, it can dramatically improve the listening experience when a regular compact disc is the source. This player will bring new life to your CD music collection and add satisfaction to your CD music listening experience.

I have several 96 kHz/24-bit music recordings on DVD-Video standard discs from companies like Chesky, Classic Records and Pioneer. These recordings have no encryption, no watermarking, and no compression. The D-1 really made these discs come alive, and I was greatly impressed by the quality of the sound. Playing 96 kHz/24-bit DVD music discs through the Ayre D-1 provided what was undoubtedly the best PCM digital sound that I've ever heard, period. While I still preferred SACD, this experience proved that 96/24 LPCM can deliver remarkable



Ayre D-1 Power Supply Front And Rear Views

sound, too, with the right player.

I connected the D-1 player to the CAL controller for some multichannel listening and found the experience enlightening. I played DTS Digital Surround music recordings and Dolby Digital and DTS film soundtracks and was rewarded with great sound. Even compressed bitstream material, which bypasses much of the custom circuitry that I've been describing in this review, seemed to sound better from the Ayre player. In general, the sound seemed to be a little richer, smoother and slightly more detailed. Music benefitted a little more than movie soundtracks but substantial improvements were audible from both, when comparing the Ayre D-1 to any other DVD player I've used.

Conclusion

This new DVD-Video player from Ayre sets audio performance standards that exceed anything I've reviewed. It is simply the best CD player I've heard. It will improve the sound of your CD collection and make the listening experience far more musically satisfying.

The D-1 provides outstanding audio and video performance for home theatre, too. It can extract the very best possible sound from Dolby Digital and DTS Digital Surround soundtracks. Video pictures are the most natural and pleasing that I've seen.

The Ayre D-1 will play 96 kHz/24-bit DVD-Video standard disc with full resolution audio that provides the best PCM sound I've ever heard.

The D-1 doesn't play SACD discs or DVD-Audio discs. Upgrades are possible in the future but Ayre estimates that the price of a 6-channel DVD-Audio capable player, with equivalent audio quality, would be about double what the stereo D-1 costs.

Are there any other drawbacks to this fine product? I can find just one—it costs as much as an entry-level car. Unfortunately for us common folk, quality at this level doesn't come cheap. Is it worth the price? Well, that depends.

There is little doubt that you can get excellent video performance for a lot less but other products can't equal the natural picture quality provided by the Ayre D-1, in my opinion.

You'll have to pay a lot more for a CD player that can approach the audio performance of the Ayre D-1, and none that I've heard can equal the D-1 regardless of price. Compared to statement CD players, the D-1 seems like a bargain.

If you can afford the very best, the Ayre D-1 fills the bill today. It's hard for me to imagine that anything better will come along tomorrow. Even with its stratospheric price tag, I can recommend this product highly. I only wish that I had the wherewithal to own one. ■■

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Associated Equipment Used In This Review

Video:

Pioneer Elite CLD-99 LaserDisc player, California Audio Labs CL-2500 DVD-Video player, California Audio Labs CL-2500 VSW video switcher, Faroudja LD-200 line doubler, CineVision IDP950C CRT projector, Draper Silhouette Series V motorized screen (M1300 material). CinemaQuest RGB-3, S-3 and Video Pro video cables.

Audio:

Wadia 860 CD player, Linn Sondek LP-12 Cirkus turntable with Ekos tone arm and Arkiv cartridge, Linn Lingo power supply, Linn Linto phono preamp, Audio Research Reference 2 line stage preamp, California Audio Labs CL-2500 SSP digital controller, two Theta Dreadnaught four-channel amplifiers (four channels in vertical biamp configuration to drive front left and right speakers, four additional channels for center and surround speakers), Vandersteen 3A Signature speakers for front left and right channels, Vandersteen VCC-5 Reference center channel and Vandersteen VSM Signature surround speakers. Four Vandersteen 2W-Q subwoofers for main channels and either one Energy ES-18XL or one Mirage BPS-400 subwoofer for LFE channel only.

Other Components:

Four Richard Gray's Power Company™ 400s power line conditioners, Wireworld Electra III+ power cords, Straight Wire HTC power cords, Vantage Point Contours equipment racks and amplifier stands, AudioQuest Falcon and Apogee Wide Eye digital cables, AudioQuest Anaconda and Python interconnect cables, AudioQuest Volcano and SA-20 Hyperlitz speaker cables, Checkpoint sound alignment system, ASC Tube Traps.

A Conversation With Charles Hansen Of Ayre

Richard Hardesty, Widescreen Review:

This is obviously a "statement" digital component for Ayre. Why did you choose not to use the latest audio technologies like upsampling and DSP?

Charles Hansen, Ayre: This is a deceptively short question that requires a long answer! Regarding DSP, this simply allows one to make a custom digital filter instead of using the fixed design of an off-the-shelf filter. In the old days there was a lot of incentive to do this, as the off-the-shelf filters weren't all that good. However, the latest parts are really quite remarkable in their performance.

We are using the Burr-Brown DF1704 in the D-1. This part is truly superb, and features stop-band performance greater than -120 dB. It also has two sets of coefficients available that give different sonic results. One set is the traditional type that gives flat measured frequency response. The other set provides performance optimized for the time domain, much like the Wadia designs. These two filter responses are selected by a switch on the rear panel, labeled "Measure" and "Listen." We are extremely pleased with the performance of this filter.

The whole topic of "upsampling" is misleading at best. Basically, there is no such thing as "upsampling" in the sense that it has been presented. So-called "upsampling" is really the same thing as oversampling, which has been used in every CD player ever made except for the original Sony CDP-101 in the early '80s.

What is done in an "upsampler" is to put two digital filters in series. This is nothing new, as virtually all digital filters are a cascade of 2x stages. If you are starting with a less than state-of-the-art digital filter, you can get some performance gains by adding another filter in front of it. This results in a composite digital filter that has more computational horsepower than the original filter.

One could get exactly the same effect by using a single high-quality digital filter in the first place. But it is not some sort of "magic bullet" that will turn all of your existing CDs into high-resolution discs! You can read about this in more detail on both the Madrigal web site as well as ours.

WSR Hardesty: Ayre is the only manufacturer that I have encountered to utilize discrete component current-to-voltage circuitry. Does this really provide a sufficient sonic advantage over the usual IC op-amp devices to justify the substantial additional cost?

Hansen: There are a handful of other players that also use discrete current-to-voltage converters. Some of those even use discrete components for the rest of the analog circuitry, as our does. But these are extremely rare.

You also have to be careful on this issue, because a lot of DAC chips have voltage outputs. But this just means that there is an op-amp-based current-to-voltage converter inside the DAC chip. These will never provide the sonic performance that is possible from a current-output DAC feeding a good analog stage.

I think that one of the big problems is that digital products are designed by digital designers, and they aren't usually experts at analog design, so the analog section tends to get overlooked. If I had to single out the one aspect of digital design that had the greatest sonic impact, I would have to say it was the analog stage. I have found this to be even more important than the digital filter, the transport, the jitter performance, et cetera. These other areas are also critically important, but I don't think the "magic" will ever be there unless the analog stage is done properly.

WSR Hardesty: Your analog audio circuits use no negative feedback which is also unique in my experience. What sonic benefit does this provide?

Hansen: All of our products have zero-feedback analog circuits. We have found this to give the most natural and musical sonic presentation. We even go so far as to use discrete zero-feedback power supply regulators!

WSR Hardesty: The D-1 uses the "Ayre Conditioner" AC line filter, another unique feature. What does this accomplish?

Hansen: There is a high level of RF noise on the AC power lines that can get into your equipment and cause audible problems through rectification and modulation. In the past, we had used ferrite-based power line filters. These are effective at first, as they actually absorb RF energy and turn it into heat instead of trying to block it or shunt it to ground. However, over time they apparently become magnetized and have an adverse affect on the sound. In the end, you are better off without ferrites, but the "raw" AC isn't that

good either. So we developed the "Ayre Conditioner" that absorbs RF energy yet is completely non-magnetic. (We've got a patent pending on this invention.)

This RF filter is in parallel with the line so there is no restriction of current flow or musical dynamics. It is the only power line conditioner I've heard (including the "power regenerators") that only provides positive effects, instead of the tradeoffs normally found with these types of devices. We've even developed smaller versions that we use in the DC supply lines to keep the power in the D-1 as pure as possible.

WSR Hardesty: Your chassis are made from non-ferrous material. Do you feel that this added expense is justified by audible improvements in performance?

Hansen: Not only do non-ferrous parts avoid problems with magnetic hysteresis, or energy storage, they will also look good decades later! I'm sure you've seen old McIntosh amps where the chrome was pitted where the steel underneath corroded. They still sound great, but the looks aren't there anymore. We want our gear to sound great and look great for a lifetime, so we only use aluminum and stainless steel for our chassis parts and fasteners.

WSR Hardesty: You've gone to great lengths to isolate the grounds for analog and digital/video circuits. How does this effect sound quality and picture quality?

Hansen: This was a tough one to pull off, but it is the only way to get the best performance from an A/V system. We found this problem early on and we're the only ones to incorporate this isolation technology into our products.

The grounding problem is severe in A/V systems for two reasons. First, you've got an extremely complex array of equipment connected together with unbalanced connections, as that's all that is available for video signals. But the problem is really exacerbated because

almost all video displays use switching power supplies. Leakage currents from these supplies get into the chassis and then modulate both the audio and video signals via ground loops.

We're talking about 100 kHz square waves with harmonics out into the megahertz region, and this causes all kinds of problems. But when you isolate the different grounds, then these problems just go away. You're left with a pure signal for both audio and video, and once you experience the difference there is no going back. The entire experience is much more engaging, yet relaxing at the same time.

WSR Hardesty: Are any of the audio technologies also used in the video circuitry in the D-1? How does this improve picture quality?

Hansen: Well, you've got to remember that we're all using the same signal processor on both the audio and video signals, namely the human brain! So naturally it makes sense that there is a great deal of commonality between our different perceptual pathways.

With the D-1 we've applied the same approach to video that we developed in audio, and found that similar dividends are paid in terms of naturalness and "ease" of viewing. The video circuitry uses zero-feedback amplifiers and regulators, DC coupling, and premium "audiophile" grade parts, just as our audio circuitry does. We also pay a lot of attention to time-domain response, as we've found this to be absolutely critical on the video side, as well as the audio side of things.

The result is really a different viewing experience compared to other DVD players. I think the best way to describe it is that you become more involved in the characters and the plot when you watch a movie on the D-1. The effect is really quite mesmerizing.

WSR Hardesty: Thanks for taking the time to discuss these technical points with my Charlie. This has been very enlightening. ■■



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