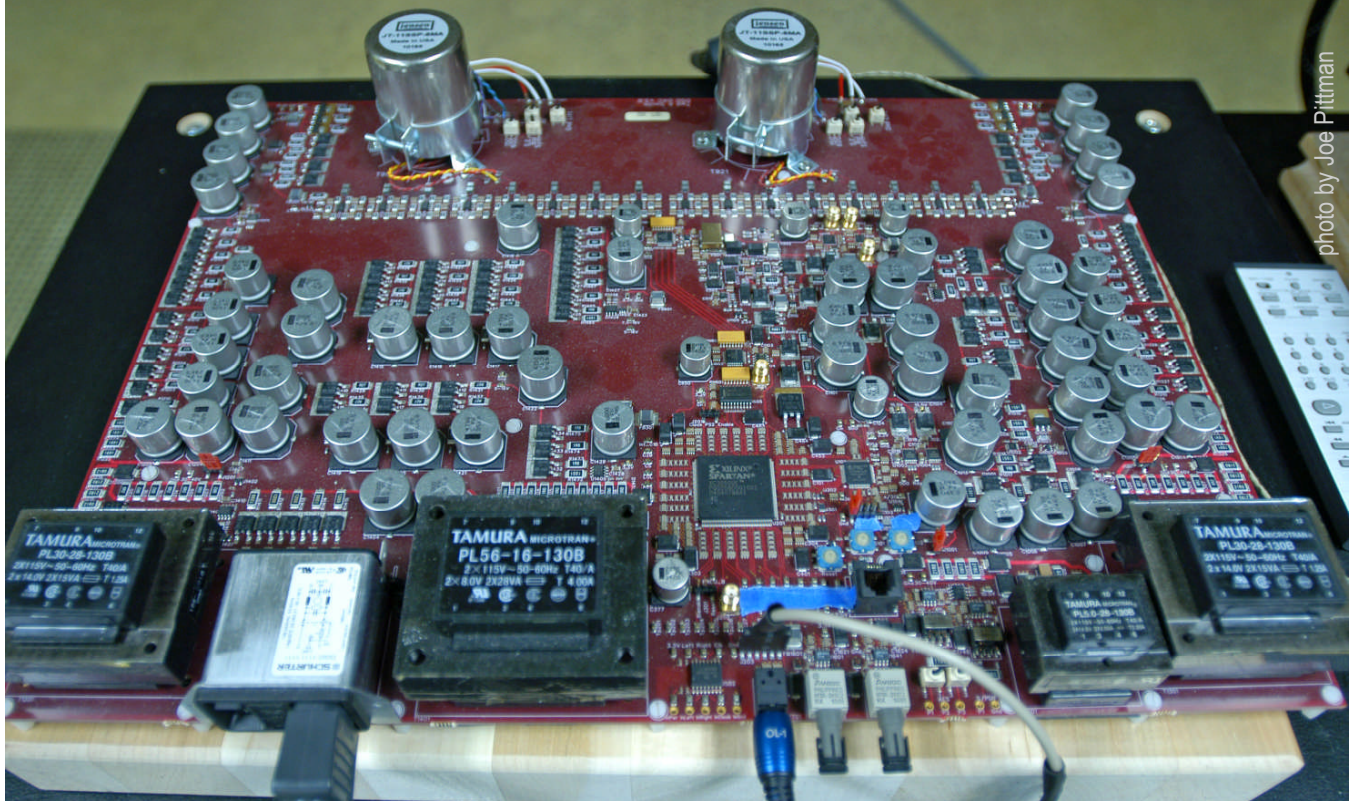


Ted Smith's DSD DAC



March 10th Meeting Recap by Ted Smith

A brief overview of my DAC: A few years ago I got the bug to build a DSD based DAC. I've always believed in DSD and since I have a software engineering background the possibility of "merely" low pass filtering the stream of bits in real hardware was very

appealing. I verified that this worked by soldering a resistor/cap/transformer/cap/resistor filter to the digital lines in a Sony DVP-S9000ES and it sounded good. The first two boards I built taught me the importance of robust clean power supplies. Also to avoid having to do a bunch more prototypes I

chose to integrate a FPGA (field programmable gate array). This is a chip full of digital hardware gates that is reconfigurable on the fly. This allowed me to transform changing of hardware into changing software: a more comfortable domain for me.

After having made the decision to use a FPGA I realized that I could easily add PCM inputs so I added TosLink, AES/EBU and S/PDIF receivers and assumed that I could convert the incoming bit streams to DSD: it was only software after all ☺

The DAC as you heard it was a cost no-object implementation to demonstrate my basic choices: if something didn't work I didn't want it to be because I "cheaped" out. The major issues I addressed with my design were: jitter, power supplies and quality digital up-sampling. The board is unwieldy both in size and cost:

Number of copper layers: 6

Board outline(s) extent: X = 455 MM; Y = 330 MM (18" x 13")

Number of parts: 1471

Number of pins: 5284 (258 through-hole, 5026 SMT)

Number of vias: 3205

Number of holes: 3463



Ted explains it all. There will be a quiz at the end of the lecture, so pay attention!

Jitter is, by definition, the deviation of a clock's actual edges from their theoretically perfect timing. Another way of thinking of jitter is that if a digital input to a DAC that has no errors sounds different with different sources, or loads on the computer, or different user interfaces on your computers, you have a jitter problem. I chose to take jitter very seriously so that I could work with essentially any device that could deliver the correct bits. To that end I use a very good crystal clock, I have separate power supplies for that clock, it's control, the digital circuitry, etc., I use extremely short critical path in the circuitry for that clock and I chose differential ECL logic to use that clock to align and time the bits just before they are filtered. I expect that I should be fairly jitter independent since I add approx 1/7th of a bit time jitter to all inputs, but then I filter the jitter down to approx 1/20th of a Hertz which in a perfect world would at worst sound like slow wander.

Of course there's always theory vs. practice: Many people have asked how jitter immune my system is. This is to be expected because there are many jitter "solutions" out there, many of

which claim entirely clean up jitter. On the other hand physics tells us that the best one can do is to low pass filter jitter and most of the jitter solutions out there have artificial constraints which preclude them from being as functional as their purveyors claim. I can't claim perfect independence from jitter but I can say that using off the shelf USB -> S/PDIF or TosLink converters sounds the same as using a tricked out transport with a highly tuned S/PDIF interface. I can say that I can't hear any difference when I use my computer to play a CD directly or to play the same bits from a hard disk (assuming the CD isn't scratched...). Nor does using WinAmp, foobar, JR River, etc. make any difference (assuming they are configured for "bit perfect" playback.) I've also used ASIO, kernel streaming, WASAPI with no differences. I can do anything on my computer (including ripping CDs and/or FPGA compiles) while I'm playing and there's no difference. (Truth be told, if I'm on the net I do get hiccups now and then. And also there were two hiccups at the PNWAS meeting that I hadn't experienced before, but none of these points to a jitter problem: they are computer configuration issues that a DAC has no control over.)

My DAC also isn't quite as power cord or power filtering immune as I'd like. It's better that much of my system but I still have a ways to go. Even though my DAC has a flat frequency and linear phase response from approx 7Hz to 21kHz, it sounds too recessed for my taste. I consider these to be the most important problems of my current design. I am in the middle of raising my flat freq response to approx 40kHz to see if that brings the soundstage forward and also I have to consider whether fiddling with the frequency response to artificially bring out more detail is something that more people like than not. Personally I prefer systems with no adjustment "knobs" (except for volume control obviously ☺)

Another source of description is the write up I did at the audio asylum: <http://www.audioasylum.com/forums/pcaudio/messages/8/80732.html>

-Ted

Ted Smith's Play List

Title	Artist/Composer	Album	FLAC File
Lucia		HDtracks 9624 Ultimate Download Experience	24/962
Misery		9624 Ultimate Download Experience	24/962
Le Valse Petit	Göran Wennerbrandt	Tiny Island	16/44.1
I Feel Lucky	Mary Chapin Carpenter	Doll And Other Favorites	16/44.1
Junior B	Yello	The Eye	16/44.1
Big Bad Girl		HDtracks 9624 Ultimate Download Experience	24/96
Violin Concerto in G major (KV 216) - Allegro	Wolfgang Amadeus Mozart	HDtracks 9624 Ultimate Download Experience	24/96
Violin concerto in D major - Allegro	Mozart	2L38	24/96
Concerto Fantastico - 1. Allegro Affetuoso	Ole Bull	2L67	24/96
Piano Sonata No.23 - Appassionata - 1. Allegro assai	Mari Kodama/Beethoven	Piano Sonatas Nos.21, 23 & 26\04	24/88.2
Krambupolka		2L68	24/96
Organ Improvisata		2L42	24/96
The Good, the Bad, and the Ugly	California Guitar Trio	Invitation	16/44.1
The Magnificent Seven	Erich Kunzel & Cincinnati Pops Orchestra	Round-Up	SACD > 24/88.22
Searchin' For My Baby	The Persuasions	Acappella	16/44.1
I Just Can't Work No Lonber	The Persuasions	Acappella	16/44.1
In The Ghetto	The Persuasions	A Cappella Dreams	16/44.1
Invitation To The Blues (Tom Waits)	Jennifer Warnes	The Well	SACD > 24/88.2
Air on a G String	Jacques Loussier Trio	The Best Of Play Bach	SACD > 24/88.2
Man In The Box	Alice in Chains	Greatest Hits	SACD > 24/88.2
Hey Nineteen	Steely Dan	Gaucho	SACD > 24/88.2
Ubi Caritas	Gaudeamus directed by Paul Halley	Sacred Feast	SACD > 24/88.2
Gymnopedie No. 1		Reference Recordings HRx-Downloads	24/176.4 > 24/88.2
Simple Symphony, Op. 4	Britten	2L50	24/176.4 > 24/96
Scheherazade Op. 35 The Sea and Sinbad's Ship	Fritz Reiner & Chicago Symphony Orchestra	Scheherazade & Song of the Nightingale	SACD > 24/88.2
Blue and Lonesome	Alison Krauss & Union Station	Down from the Mountain	16/44.1
Beat My Dog	Jay Leonhart	Salamander Pie	16/44.1
Knockin' Myself Out	Vivino Brothers	Vivino Brothers Blues Band	SACD > 24/88.2
Flight of the Cosmic Hippo	Béla Fleck & the Flecktones	Flight of the Cosmic Hippo	16/44.1
Hey Sexy Lady (feat. Brian & Tony Gold)	Shaggy	Lucky Lady	SACD > 24/88.2
Moonlight In Vermont	Louis Armstrong - Ella Fitzgerald	Ella and Louis	24/96 (HDtracks)
Sweet and Pungent	Duke Ellington & His Orchestra	Blues in Orbit	SACD > 24/88.2
Band on the Run	Paul McCartney / Wings	Band on the Run (Uncompressed)	24/96 (HDtracks)
Heart of Gold	Neil Young	Harvest	DVDA 24/192 > 24/96
What's New	Linda Ronstadt	Linda Ronstadt & The Nelson Riddle Orchestra	DVDA 24/192 > 24/96
A Kiss to Build a Dream On	Tony Bennett & k.d. lang	A Wonderful World	SACD > 24/88.2
Keith Don't Go (Ode to the Glimmer Twin)	Nils Lofgren	Acoustic Live	16/44.1

April Meeting Notice

Guest speaker Jules Bloomenthal will talk about Telarc's early digital recordings with the Soundstream recorder.

by Darin Forkenbrock

Jules Bloomenthal will bring one of the Soundstream recorders for us to see (only 18 were built). Following is from Wikipedia .

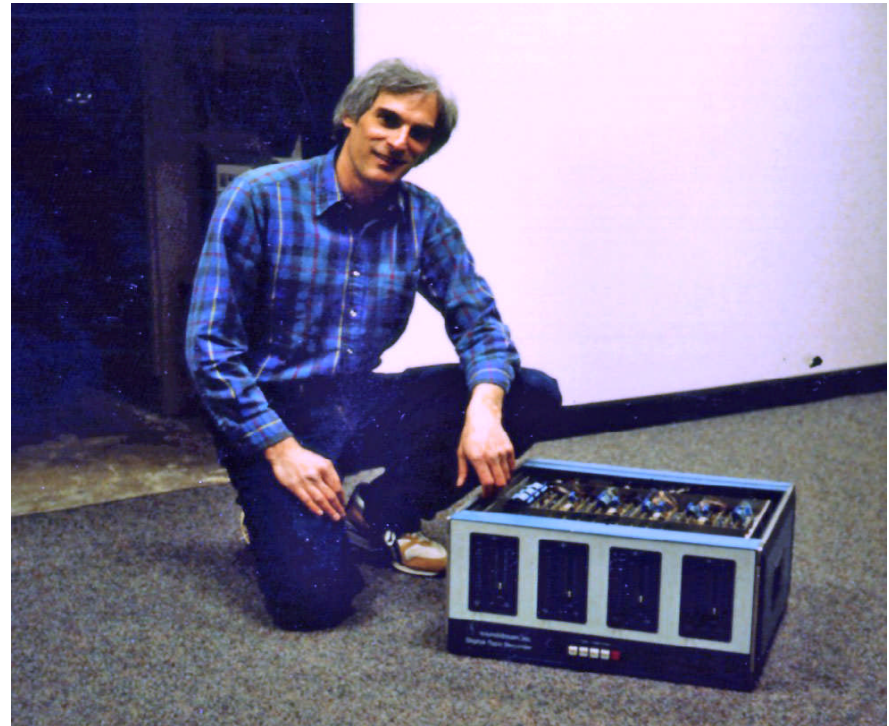
<http://en.wikipedia.org/wiki/Soundstream>

Soundstream

Soundstream Inc. was founded in 1975 in Salt Lake City, Utah by Dr. Thomas G. Stockham, Jr. It was the world's first audiophile digital audio recording company, providing commercial services for recording and computer-based editing.

The first digital recording of a symphony orchestra was made in 1976 by Soundstream's prototype 37kHz, 16-bit, two channel recorder. Also in 1976, Soundstream restored acoustic (pre-electronic) recordings of Enrico Caruso, by digitizing the recordings on a computer, and processing them using a technique called 'blind deconvolution'. Soundstream's first commercially released recording (popular music on the Orinda label) in 1978 was a month shy of the world's first digitally recorded commercial release. For the ensuing three years, 50% of all classical music recorded digitally used Soundstream equipment. Soundstream collaborated with Telarc for several years, producing legendary symphonic recordings; the earliest ones are chronicled in Renner. The care with which Telarc selected and used its microphones and audio console, combined with the Soundstream recorder, created a gold standard for audiophile recording.

Soundstream recordings made before the advent of the CD were released as high-quality vinyl LP albums. Despite analog playback, many of these releases were sufficiently impressive to gain an early acceptance for digital audio. In 1980, Digital Recording Corporation (DRC) acquired Soundstream. DRC attempted to develop a home digi-



Jules (in the mid-eighties) with one of the Soundstream recorders.

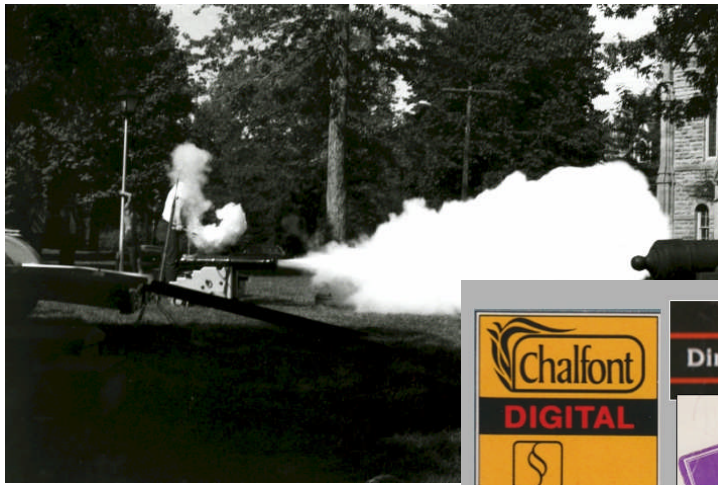
tal player that would use a photographically reproducible 'optical card' as opposed to the mechanically pressed CD. This effort was eclipsed by the rise of the CD, leading to the company's demise in 1985.

Soundstream Digital Tape Recorder

The Digital Tape Recorder was a portable four-channel digital audio processor containing the analog to digital converters, tape-data recovery and clock generation circuits, and the digital to analog converters. Unlike its competitors, Soundstream's analog circuitry was transformerless, permitting a frequency response to 0Hz (DC). External hardware (tape drive, editing system, and digital delay unit) connected to the DTR through connectors on the back panel.

Excerpt from Jan. 1980 Stereo Review article by David Ranada

"The digital part of the audio universe is starting out with a big bang - literally. With their cannons, bass drums and cymbal crashes, the twelve discs listed below will impress you with the most audibly apparent advantages of digital recording: wide dynamic range and very low noise. On closer listening, the discs will reveal the other main advantages of the digital process: frequency response that remains flat regardless of overall signal level, no audible wow or flutter, and no tape-modulation noise to color complex textures or muddy piano or organ tones. Moreover, these digital showpieces demonstrate two musical advantages lacking in the direct-to-disc format: they can be edited and spliced."



The cannon used for the recording (being ignited by legendary audio engineer Stan Ricker).

A montage from various LP albums that illustrates Soundstream worked with numerous companies, some of whom thought enough of Soundstream to include its name on the front of the album.



Garrick Ohlsson Solo Concert Review by John Stone

A few weeks ago, my wife and I paid our first visit to Meany Hall on the UW campus to hear a piano recital by Garrick Ohlsson. Mr. Ohlsson has had a phenomenal career, starting in 1970 when, at the age of 22, he won the Chopin International Piano Competition. In 1994 he was awarded the Avery Fisher Prize for outstanding achievement in classical music and in 2008 took home the Grammy for best solo instrumental performance for his recording of Beethoven piano sonatas.

The first half of the program was all Chopin, spanning a variety of forms which included Polonaise, Op. 44; Four Mazurkas, Op. 41; Allegro de Concert, Op. 46; Nocturne, Op. 48, No. 1; and Ballade in G Minor, Op. 23. Several of these works involve musical complexity that has to be seen and heard to be fully appreciated. Sitting on the keyboard

side of the piano in row 10 made this very easy.

The second half switched gears and showcased the Spanish composer Enrique Granados with excerpts from his piano suite Goyescas (The Gallants in Love): Los Requiémbros; El Fandango de Candil; Quejas o la Maja y el Ruisenor; and El Pelele. The overtly romantic, Spanish flavor of these selections contrasted nicely from the slightly cooler, classical Chopin.

Following a lengthy standing ovation at the end of the Granados, Mr. Ohlsson returned for two fabulous encore selections which included excerpts from Rachmaninoff's Prelude in C-sharp minor, and Debussy's Clare de Lune.

For those of you familiar with the acoustics of Meany Hall, this will come as no surprise, but the hall sound was

virtually perfect for a solo recital. Many of us use the sound of a solo piano to evaluate audio gear, and this recital was a wonderful way to update my aural memory on how a concert Steinway *REALLY* sounds. The sound is incredibly rich and nuanced, and not at all muddy or congested. Its not just the notes, it's the texture of the notes as interpreted by the artist.

Listening to a couple of the same Chopin selections on my home system the next day made me consider selling my entire system, taking up golf, and buying a lot more concert tickets. Thankfully, a little red wine, a well-recorded SACD (hi-rez rules), my wife snuggled next to me on the couch, and my pup at my feet, made me reconsider my position on recorded music.

- John Stone

Winston Ma's Reference System by Joe Pittman



Some of you may not be familiar with Winston, but he produces what many including myself consider the highest quality and best sounding CD's available. His CD's are distributed under the First Impression Music (FIM) and other labels.

His listening room was built not only for the enjoyment of music reproduction but also as a reference tool to hear the quality of the CD mastering and various stages of the production chain to optimize finished product quality. His system has constantly been upgraded over the years to stay ahead of the mastering/production process. If not, how could he continuously improve the product otherwise?

Winston has had many wonderful projects in recent years increasing the state-of-the-art in Red Book CD pro-

duction, including the K2HD mastering process.

I was recently invited by Winston to assist him in the set-up of his turntable, but more about that later. He initially demonstrated his latest mastering marvel which is called "UltraHD 32-Bit Mastering!" WOW, just when I thought he had squeezed every last drop of detectable resolution and musicality out of Red Book CD, his latest effort has eclipsed everything that he or anyone else has produced before. Part of the secret is the assembly of an all-star production team including Grammy Award winning engineers formerly with Telarc. The delay of the launch of the new CD's requires a pressing plant with sufficient quality for Winston's ultra high standards. Let's hope that these CD's make it to market. His test CD's were the best source I have ever heard (played on John Tucker's modified OPPO BDP-93).

But the reason I was at Winston's was to help set-up his La Luce turntable. He was asked by Proprius to produce digital copies of 12 titles from vinyl test pressings or first pressings. Due to age and condition issues with many of the original tapes, digital copies from vinyl have the potential of producing excellent sound quality. Some of the titles will include Contate Domino, Antiphone Blues and other legendary titles.

The pictures show the La Luce turntable with the awesome SPJ tonearm (also produced by the turntable designer). The arm literally has micrometer adjustment for every parameter that you can think of including azimuth adjustment, all on the fly. The arm has many unique features such as a unipivot bearing with a slide plate that acts as a knife edge pivot to eliminate side-to-side wobble and as a variable friction source for antiskate, amazing.



The La Luce turntable with SPJ arm would not be out of place in the worlds finest museums but it also happens to be one of the worlds best sounding too.

Separate arms can be swapped out and because of the precision design, each can be adjusted and keep the settings for fast comparisons. Two arms were set-up , one with his own FIM Ebony cartridge (as featured in his Jun Fukamachi CD) and the second with the legendary Kisiki Lapus Lazuli moving coil with precious stone body and solid diamond cantilever!

The phono preamp used to start the listening process is the solid copper chassis unit by NBS, weighing in at 65 pounds and \$35K. The preamp is a special unit made specifically for Winston

by John Tucker/Exemplar Audio. The tube amps are by Berning and all cabling is Exemplar active shield. The speakers are highly modified Avalon Sentinal's using the latest Stillpoints Ultra SS dampers and the racks are also by Stillpoints. The whole system is fed by the largest Equi=Tek balanced power transformer with 230V feeding the amps and 115V for everything else.

The room construction is awesome with a 4 foot thick floor, a room within a room construction with the interior room supported by the floor and the exterior walls completely decoupled. A

sloping ceiling going from 9 feet to 16 feet. And an HVAC system with precise control of temperature and humidity with rapid fresh air exchange all with a state-of-art noise floor of 5.5dB.

Winston will be looking at several analog to digital converters (ADC's) for the project. If I find out more about the project, I'll keep you posted.

It probably goes without saying that listening to music in Winston's room is an unforgettable experience. The result of many years of striving to produce the most realistic music outside the concert hall.

LED TVs what are they and what is the difference between LCD and LED Displays?

Liquid Crystal Display (LCD) technology dates back to the 1880s but was commercially applied to consumer products in the 70s, remember the old clock radios with the figure eight number light patterns. In short an LCD is effectively a fixed polarized filter and electronically charged polarized filter. By rotating a polarized filter on top of another polarized filter you can shut off the light. The difference between what is called an LED display and a LCD display is the backlighting: they both use LCD panels to control the light output. Most LCD displays used for video and computers are backlit with Cold Cathode Fluorescent Lamp (CCFL) and have a light diffusion system behind the LCD panel.

One of the issues bantered about is longevity, manufacturers don't really talk about this but the biggest cause of LCD failure is the power supply, it used to be sticky pixels. Another issue is Dynamic contrast. The biggest problem with LCDs isn't at the white end of the gray scale but the leak of light thru the polarizing filter so what is supposed to be black is grey. If the filter cuts out 95% of the light when closed and you increase the intensity by 20% the dynamic contrast will increase but the blacks will be even lighter grey so who really cares.

The color of light is more stable in LED compared to CCFL: this is true. An LED will measure almost the same color the day it was new as the day it dies, this is true if you disregard any wear in the electronics of the display.

Sony was first to introduce the RGB LED back lighting for LCD displays in the Qualia 005 display in 2004. The advantage to RGB is you can make a very intense white and control the color temperature very well compared to using a single white light. Sony also introduced the LED edge lighting in 2008 Bravia. In edge lighting all the LEDs around the edge are white and

there is a light dispersion system behind the LCD screen. These displays can be made very thin, under an inch. One thing that isn't debated is that LED backlighting uses less electricity than CCFL so there is less heat and no hum from the fluorescent light.

Set comparison, if it isn't calibrated you don't know what you have and how many adjustments are out on the set to begin with so you really can't compare the image. I recommend both LED and CCFL back lighting, so whatever you decide on with a little calibration, they should give you years of great viewing.

Oppo BDP95

I received the new oppo BDP-95 via Fed-Ex Saturday delivery the day after it was released for sale. After a few hours I got around to unpacking it to start the long process of burning it in. It has been a year and a half since I got my last Oppo the BDP83. When you open the box there is a full color insert of the product and underneath that the player stored in an "Oppo" labeled black bag with handles, suitable for transport. Inside the main shipping box is a smaller black box containing cables and remote control, the sizable manual also resided in the shipping box. If you thought the name sounds like some cheap product; your fears should be eliminated by the time you get the player plugged in.

Unlike the companies first Blu-Ray Player the -83 and the hot-rod -83SE; the -93 is not up-gradable to a -95. The -95 is 3/4" taller than the -93 to make room for balanced outputs and a set of single ended stereo outs. Probably most important the Toroidal transformer made by Rotel. The new -95 also sports the SABRE32 DACs for 7.1 and a separate for the dedicated stereo output and weights 6 pounds more than the -93.

A couple of other design features that make this an extremely useful product are Netflix & Blockbuster software so you can direct download rental mov-

ies and a USB Wi-Fi dongle allowing for wireless internet connection.

Possibly one of the best features is the eSATA (External Serial Advanced Technology Attachment) connector for hooking up external hard-drives. The eSATA connector is what really pushes this product into new territory. Via the plug on the back the Oppo you should be able to read and write music and video files. Potentially this is a music server, a video server, it has what should be good DACS in it and I forgot to mention that it also has a digital volume control. This unit can be plugged directly into an amplifier without an external pre-amp.

The one thing that is not included in the packaging of the new players is the Spears and Munsil calibration disc. This is the best set up disc and calibration test patterns I have ever used. It is too bad that the players no longer include this incredible tool; my guess is less than half the people who bought the-83 players used the disc so this is a way to cut cost. The reality is video calibration is not the player, it is the whole system, that means the display and or screen and ambient light in the room. The calibration disc is available for an additional \$25 and is shipped in the box so there aren't any additional shipping charges.

I haven't had the time to try all these different things out yet as the player is still burning in. I have watched a few movies and the image is stunning. I hope to play around with some of these things before the next meeting and will try to answer questions at that time.

Coming Attractions

April 3 Northwest Record and CD Show

10AM -5PM at the Seattle Center Fidalgo room, Cost is \$3 or \$2 with a can of food.

April 12 Eastside Jazz Club

Features the Ben Thomas Tango Jazz Group. See notice this issue for more information.

April 14 PNWAS Meeting

Guest speaker Jules Bloomenthal will talk about Telarc's early digital recordings with the Soundstream recorder.

May 12 PNWAS Meeting

Dan Schmale (aka Doc Bottlehead) is the guest speaker and will demonstrate his gear and Tape Project source.

June 9 PNWAS Meeting

Guest Speaker.

July 14 PNWAS Meeting

The Equipment Committee report and High Efficiency Loudspeakers.

August 11 PNWAS Meeting

Road Trip to Mike Lavigne's.

August 28 DIY MEET

Our semi-annual DIY meet on Saturday. Everyone is welcome!

September 8 PNWAS Meeting

TBD

October 13 PNWAS Meeting

It's dark outside, time for Jerry's annual HD Concert Video Fest.



October 14-16 RMAF 2011

Hi Ho Hi Ho it's off to Denver we go!

November 10 PNWAS Meeting

TBD

December 15 PNWAS Meeting

Annual Christmas music competition.

Local Music

Tuesday April 12th 2011 7:30pm

Features the Ben Thomas Tango Jazz Group

The Ariel Pocock's Trio last month was magnificent and enjoyed by a full house. Our next Concert you don't want to miss is on Tuesday April 12th 2011 7:30pm – Features the Ben Thomas Tango Jazz Group with Ben Thomas, vibes and bandoneon, Eric Likkel Clarinet, Alex Chadsey on the Steinway and Jeff Norwood on Bass. This exciting novel jazz group will be making its debut at the club and will be performing jazz versions of classic tango tunes by composers such as Troilo, & Piazzolla, plus some original tango-inspired music and jazz standards. Let's give this group a big Eastside Jazz Club welcome.

Venue for our concerts Sherman Clay 1000 Bellevue Way.

Tickets \$13 Adults, Students 18 and under \$8.

Bring your CD's for exchange, or buy from the box @\$5.

Enquiries: 425-828-9104 or 425-454-0633.

Tickets: \$13 Adults, Students 18 and under \$8.

Everyone is welcome. Please join us.

Best regards,

Cooksie Kramer

Contact Us:

Lionel Kramer

10135 NE 64th Str

Kirkland, WA 98033

lionel.kramer@comcast.net



Ben Thomas - bandoneon and vibraphone

Ben has his Doctorate of Musical Arts in percussion from the University of Washington in addition to degrees from Swarthmore College and the University of Michigan. As a long term dancer of salsa and tango, he has a desire to create music that engages both dancers and listeners. Though his primary instrument is the vibraphone, Ben has become infatuated with the bandoneon. In 2007, he went to the Academia Nacional del Tango in Buenos Aires and studied with several tango greats, including the master bandoneonist, Osvaldo Montes.

Visitors Welcome!

Meetings are held on the second Thursday of every month at 7:30pm at 4545 Island Crest Way, Mercer Island, WA 98040.

PNWAS Mission Statement

- ◆ To bring people with a common interest in music reproduced at its best, for their mutual edification and pleasure.
- ◆ To facilitate the exchange and dissemination of accurate data concerning audio equipment and musical recordings.
- ◆ To promote, sponsor, and cultivate the highest quality reproduction of music in the home.
- ◆ To encourage maintenance of high standards in the performance, recording and transmission of music.

PNWAS Objectives

1. Provide a forum for meeting other audio-philes and exchanging information on musical recordings and audio equipment.
2. Demonstrate and compare equipment and recordings.
3. Give members opportunities to become familiar with the techniques of audio manufacturing, testing, repair, recording, broadcasting, etc.
4. Explore related avenues as the member-

ship deems appropriate.

Club Website

www.audiosociety.org

E-mail

info@audiosociety.org

US Mail

Pacific Northwest Audio Society, PO Box 435, Mercer Island, WA 98040

Annual Dues

\$60 due each January. New members pay a prorated \$5 per month for remainder of year.

Executive Committee

President: John Stone

John.W.Stone4@boeing.com

Vice-President: Darin Forkenbrock

forkenbrock@gmail.com

Secretary/Treasurer: Willy Chang

chang98@comcast.net

Editor: Joe Pittman

joe@kosmic.us

Committee Chairs

Equipment: Terry Olson

CornyGuy@aol.com

Music: Vacant– Volunteers?

Refreshment: Vacant– Volunteers?

Editorial

Editorial submissions are welcome.

Content must be audio-related or of general interest to the club in plain text or Word document format without automation (macros and scripts). We reserve the right to edit for style, content, and length.

Editorial Deadline: two weeks before meeting date.

Publishing any editorial material is contingent upon the approval of the Executive Committee.

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