

AQUA - ACOUSTIC QUALITY FORMULA XHD DAC REVIEW



After having (owning) Aqua - Acoustic Quality Formula DAC in my system for almost a year I've instantly jumped on the wagon when they've announced the Xhd upgrade. The original Formula DAC has already proven itself across the time with the performance. The Formula also easily integrate into quite a few different systems.

Yes, the proper synergy is always needed in any high-end audio setup, but Formula has its own set of highly potent attributes, setting it apart from the usual "crowd".

THE FORMULA ONE!?

Indeed. The Formula DAC is a fully digital filter-less DAC. Aqua believes strongly, that this approach rivals by far the upsampling/oversampling DACs. As we all know, not all sonic attributes are hidden within measurements and as often proved, there is more to the story, that just numbers and digits when it comes to the sound quality and music's reproduction.

Emotional impact and emotional triggering phenomena go beyond sheer technicalities. Then again, without proper technical knowledge and execution, one cannot reach the certain plane of quality. Period!



The Aqua - Acoustic Quality way is different. They're focusing on the painstaking and fanatical attention to the details (sub-circuits). In the absence of digital filters or so-called compensation circuits, the parts and execution are essential for achieving the top tier digital playback. And Aqua team did their homework profoundly well.

Aqua - Acoustic Quality Formula Xhd DAC uses separate analog and digital power supplies. Top quality discrete BJT, Mosfet, J-Fet and ultra-fast diodes are used in a dense, but utmost optimum way in order to achieve state of the art performance.



Aqua implanted passive components to achieve reliability, longevity and best sonic quality. With the exception of six superior electrolytic capacitors, all other caps are Tantalum, solid-polymer OS-CON and double-metalized MKPs. The signal path itself is direct-coupled and in complete absence from the capacitors.



The two output stages (one single-ended, one transformer-coupled balanced) use discrete BJT and J-Fet with metal-film resistors, and all the electronics parts show an ultra-low RF noise.

An advanced ARM microcontroller manages the user interface on the front panel, the IR remote command and the communication port (serial, RS232 standard).

THE OPTOLOGIC R2R CONVERSION SYSTEM

Aqua believes that the more musical D/A conversion system is based on the circuit usually identified as "resistor ladder".

This technology has been substituted in the mass-market by the so-called sigma-delta converters. The sigma-delta converter is a near-completely digital circuit and for this reason, it can be integrated on silicon and produced at low-cost. A quality resistor ladder DAC instead uses a circuit based on a set of high precision discrete resistors: at least 2 resistor banks, one for each stereo channel.



The Formula DAC is the first in the aqua's production to show a proprietary D/A conversion system, that is named Optologic.

The signals sent to the resistor ladders are generated by a proprietary digital circuit, implemented inside an FPGA (Field Programmable Gate Array).



The Formula has a sign-magnitude converter structure, and this requires not two but four 24 bit resistors banks, each one made of very low tolerance discrete resistors. In order to separate the digital section from the sensitive analog circuits, galvanic and magnetic isolations are implemented between the FPGA and the four branches of the R2R ladder converter.

This creates complete isolation of all digital circuitry - including the clock - from the analog section, for a clean, noiseless ground plane. It also plays the main role in the differential management of the R2R ladders, achieving perfect symmetry between the counter-phase halves. The result is the highest tonal contrast and naturalness.

THE XHD UPGRADE

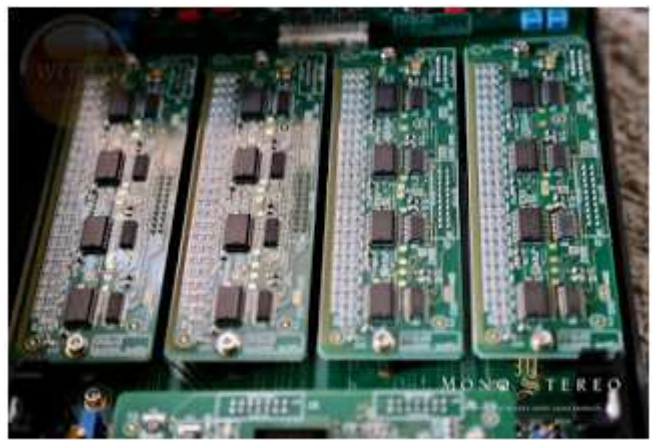
This particular update has required significant optimization of code for the main FPGA of R2R ladder DAC which was destined to significantly improve the sound quality.



Here are few of the highlights:

- *Proprietary hybrid 2-stage XMOS XCore XE216 + FPGA*
- *Fully-floating (isolated) USB decoding and clock generation by FPGA with proprietary code*
- *High quality, long life, low noise parts and modular design that distinguish aqua – acoustic quality equipment*
- *Sample rate in “Bit Perfect” up to 768 kHz PCM and quadrate DSD (DSD256)*
- *The latest version of customized XMOS X Core Driver on Windows OS (W7, W10)*
- *Native X Core Audio on Mac OS (Bit Perfect)*
- *USB Audio 2.0 operation on Linux (Bit Perfect)*

The new hybrid USB XMOS xCore 200 (dual-core) + FPGA circuitry enables the high-resolution file playback up to 768kHz PCM and up to DSD256 (Quad DSD)



Upgrading to xHD

For the original and existing owners the update for the Formula consists of the following hardware/firmware modifications and needs to be done in-house:

1. *new hybrid USB Board cod. A108 (high-resolution up to 768kHz PCM and DSD256 (Quad DSD))*
2. *hardware modification of board P1108 connected to USB board*
3. *new firmware of main FPGA (R2R ladder DAC) with optimization of the code*
4. *update of firmware of the main microcontroller STM32*

THE XHD IMPACT!

Aqua - Acoustic Quality Formula DAC has already established itself as a mighty performer in its original form, but this upgrade brings along quite a few important shifts in sonic realm. I'll dive into more submarine depths at the music section of the review, but let me try to capture the overall insights.



First and foremost I'll have to give a big thumb up for the modular construction of Formula DAC that allows the upgrade path. You won't believe how many emails are coming in lately, with people asking me what to do (or more exactly what to buy), as the digital progression clock ticks so rapidly, that could be counted in the monthly intervals.

The original Aqua - Acoustic Quality Formula DAC had already excelled with many attributes like transparency, soundstage depth, ability to deliver fast attacks and spot on timbre, tone and color rendition. So, what is the aural benefit of the beefed-up Formula DAC?



The Xhd upgrade brings quite a substantial step up in transparency and density, where both micro and macro details are forming a new experience. Have no worries, the "new" translates to positive. There are simply more pieces of information and cues coming through the digital veins of the updated Aqua Formula Xhd DAC.

One of the main factors on the reference level of digital (and analog) playback is the ability of any component to deliver the very sense of the energy of the real world drama. This is as crucial as it gets when it comes to the high-end audio front ends. Now-days, the DACs are very often acting as the very epicenter of contemporary high-end audio setup, so it's of utmost importance, that everything is as great as possible, at the very beginning of the music reproduction chain.

So, what are some of the insights, that makes Formula xhd so different and noteworthy? As usual, let me try to convey my thoughts, impressions, and conclusions through the music...

THE MUSIC

César Franck - Jean-Paul Imbert on the Cavallé-Coll organ of St Étienne

Very unique recording from Jake Purches of Vivid Audio. We can too often witness the heated discussions regarding the reference music selection. Even with the acoustical-live recordings, there are too many dependable characteristics to pin and claim the ultimate sonic success. At least with the recordings like César Franck, we're having a unique chance to experience and replicate a grander portion of reality.



The immediacy and sense of pure and unaltered energy of this recording is something to be heard and experienced. It challenges the very core of each and every DAC under the stress. This is also one of my favorite recent releases, that went instantly straightforward into the reference music selection for testing and evaluating the high-end audio gear.

Aqua Formula Xhd DAC smoothly passed the "César Franck test" and has exhibit extremely well the spatial pieces of information, creating a highly vivid holographic presentation without drawing attention to any particular sonic attributes, which is not only rare but surpassingly inspiring turn of the events. While the original Formula DAC could reach a certain accumulation of focus and anchor points, the xhd has exhibited a new level of information solidness. Way to go!

American chamber orchestra's *Alarm Will Sound - Acoustica* is a very special album from 2005. This record covers acoustic arrangements of Aphex Twin - Richard D. James legendary electronic-techno music. Richard is considered as electronic music prodigy and his compositions are something very different. Ethereal, outwardly and mesmerizing.



This particular album challenges any DAC or system for the particular dynamic impact and acoustical energy vibrancy. It's not easy by any means to render the Alarm Will Sound flow, that combines exuberant dynamics within acoustical music domain, especially well exhibited with the Blue Calx track. Here, the complete frequency spectrum needs to be portrayed with enough impact to put on display the real sonic collision and Formula xhd has provided an exemplary well-suited performance and frequency linear replay. There is a certain needed density to let all the "quark" like acoustical nodes to fully bloom and Aqua - Acoustic Quality acted beyond exceptions with the latest, upgraded xhd heart, providing the music's hallmark.

What about purism of simplicity? Well, there's no better record to pull out, than *Sam Cooke's - Night Beat*. This twelfth studio album was produced by Hugo & Luigi and released way back in 1963 by RCA Victor is still among the reference studio albums when it comes to the proper-reference level vocal quality. What appears to be a simple exercise of capturing basic human vocal became a timeless imprint of top-tier class performance.



On the *Lost and Lookin'* track Sam's vocal is joined by subtle double bass and ride metallic cymbal interplay with a lot of subtle things going on within the song's formation.

At the upper-echelon audio level each and everything matter. At this particular track, the hidden challenge lies within the firm deliverance of the vocal. With the lower level DACs, or with most of the sigma-delta DACs even this simple arrangement breaks apart the vocal's wholeness. As if the timbre and tone are somehow blurred. With the top tier, DACs Sam's vocal stays rich, deep and intense without stepping into

the vague realms.

While even some of the hefty priced DACs have the slight problems in this regard, Aqua - Acoustic Quality Formula xhd DAC has sketched Sam Cooke's vocal with the full flamboyancy, body scale, and richness. This alone grants Formula xhd a highly unique position and deserved recognition.

CONCLUSION

Cristian Anelli and the Aqua - Acoustic Quality team have already left quite an impact at the digital high-end audio market with their DACs and transports and now the Xhd "package" is not introducing just a small upgrade, but quite an evolutionary step up in the performance, that won't kill the bank balance for the current users, but will allow them to not only enjoy the new sonic possibilities of their beloved DAC, but also cherish and trust more a solid brand, that didn't forget about their customers. And as many of you know already, this is not exactly something, that all high-end audio manufacturers are excelling at.

It's well known, that I'm not the biggest fan of sigma-delta based DACs for many of the reasons. Ladder DACs have revived my interest in digital few years back and it was quite a shift for an analog guy who couldn't stand the digital for more than few minutes. Yes, as you've already deciphered Aqua - Acoustic Quality Formula Xhd DAC is acting on the very right side of the digital fence. Xhd DAC continues the potent Formula story with a sonic success, that leads Aqua into a well served digital audio future.





The Formula Xhd DAC encompass THE very attributes of 21st century high-end audio digital replay with the "set of skills", that were unthinkable few years back. I'm talking about sound quality without even entering the price point.

Acoustic Quality Formula Xhd DAC has now climbed up the ladder and reached the plane, where the sense of realism is more closely mimicking the real thing. Such, exhibited performance is usually reserved for the bigger and more expensive "players", so this alone makes a Formula Xhd DAC a serious contender at a "sensible" price.

For what it represents sonic-wise, for its modularity and upgradability and nonetheless for its given pricing (compared to the rivals), I'm happily giving out the Mono and Stereo Upper Echelon Product award.

Matej Isak

PRICE

- Retail price € 13.670,00 (including 22% VAT)
- Price of the upgrade from regular version: 1000 EUR

TECHNICAL

Digital to analog conversion type

Proprietary Optologic D/A conversion system

Pure R2R ladder - FPGA (Field Programmable Gate Arrays) based without digital filter

Supported Native Sample Rates

AQlink / I2S serial bus - USB PC Audio : 44.1kHz to 768kHz PCM up to 24 bits

DSD64, DSD256

Supports DSD via DoP on all inputs

DAC architecture

Multibit sign magnitude R2R ladder (upgradable)

Asynchronous USB (High Speed)

USB Audio Class 2 with Type B connector

Digital Receiver

PLL (phase locked loop) technology 128 or 256 FS internally selectable

AQlink (I2S bus)

LVC MOS level

Oversampling factor

1x

Digital inputs

- RJ45 AQlink (I2S serial bus) - PCM 24 bit / 768kHz - DSD64, DSD256 via DoP
- BNC coax (S/PDIF) 75 ohm - PCM 24 bit / 192kHz - DSD64 via DoP
- RCA coax (S/PDIF) 75 ohm - PCM 24 bit / 192kHz - DSD64 via DoP
- AES/EBU balanced 110 ohm - PCM 24 bit / 192kHz - DSD64 via DoP
- USB port - PCM 24 bit / 768kHz - DSD64, DSD256 via DoP

Modular input:

- AES/EBU balanced 110 Ohm - 24 bit / 192kHz - DSD64
- RCA coax (S/PDIF) 75 Ohm - 24 bit / 192kHz - DSD64
- AT&T (ST Fiber) - 24 bit / 192kHz - DSD64
- Optical TOSLINK - 24 bit / 96kHz

Analogue Outputs

UNBAL 2 RCA Output 2.4 V RMS

BALANCED (passive transformer's symmetrical) 2 XLR Output : 3.8V RMS

Output Impedance

10 ohm RCA - 600 ohm XLR

Load Impedance

10 kohm (min.) RCA - 600 ohm XLR

Frequency Response

20Hz to 22kHz +0.5dB/-0.5dB

Phase Response

Linear phase

THD + N

<0 -10db="" 1khz="" i="">

Main processor

STM-ARM microcontroller

Controls

9 Button on front panel, IR Remote, Isolated RS-232 D-SUB 9-pin connector

Front Panel

Power, phase invert, mute, input switch, RC5 remote sensor

Power Consumption

100-115V / 220-240V; 50 or 60Hz - 58VA

Dimensions

(W x D x H) 450 x 370 x 100 mm

Weight

9 kg

Front finish

Satin Alu Silver or Satin Black

Case finish

Grey Nextel powder coated

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