

audioXpress

Advancing the Evolution of Audio Technology

JULY 2013
US \$9.00/Canada \$10.00

Horn-Loaded Tweeter



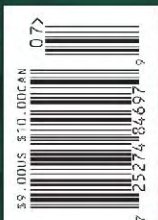
- **Microspeaker Audio Devices Rise to HD-Voice Challenge**

DAC Review



PLUS

- Build an External Phonograph Preamplifier to Play Vinyl
- How to Use High-Fidelity Output Transformers
- Oscilloscope Techniques for Audio Equipment Tests
- New Products: Programmable Speaker Protection, a Space-Saving Subwoofer, Ultra-Lightweight Headphones, and More



Parasound's New Zdac

Reviewer praises Zdac's overall performance

Parasound Zdac

Parasound Products, Inc.
2250 McKinnon Ave.
San Francisco, CA 94124
(415) 397-7100
www.parasound.com
sales@parasound.com

Price: \$475

Many *audioXpress* readers are already familiar with Parasound, an American audio company located in San Francisco, CA. Parasound has earned a reputation in high-end audio circles for offering products with excellent performance and reliability at fair prices. Its product line covers most of the spectrum, as far as cost is concerned.

The premium Halo line features several preamplifiers and power amplifiers designed by John Curl, one of the world's most respected high-end audio designers. The company's latest Halo line offering is the CD 1 compact disc player—a joint design effort with the Danish audio firm Holm Acoustics (www.holmacoustics.com). The design represents a radical departure from the conventional method of retrieving data from an optical disc. The CD 1 uses a CD-ROM drive and an Intel ITX computer to read a disc at high speed, buffering the data until an error-free retrieval has been achieved. (Holm Acoustics sells its own CD 1 player, which appears to use the same technology but has a completely different cosmetic design.)

Parasound's NewClassic line features four mid-priced power amplifiers and a matching preamplifier. The Z-series is its ultra-compact line of components, which includes a phono preamplifier, an FM/AM tuner, a two-channel zone preamplifier, and a matching power amplifier. I use a Zamp v.3 with my computer audio setup in my office and a NewClassic 2125 power amplifier in my production



Photo 1: The Parasound Zdac's front panel shows the AC power switch, headphone volume control and jack, input display, and input selector switch (a). A silver version, without rack mounting ears, is also available. The Zdac's rear panel contains balanced and unbalanced analog outputs, Toslink optical, S/PDIF coaxial, and USB digital inputs, along with an IEC power connector (b). (Photo courtesy of Parasound)

studio at The Crane School of Music, SUNY Potsdam. Both products provide excellent performance and reliability.

THE Zdac

The Zdac is Parasound's latest Z-series offering and its first digital-to-analog conversion (DAC) product in about 13 years (see **Photo 1**). Like the Wyred-4Sound μ DAC and the NuForce Icon HDP (which I reviewed in *audioXpress* February 2013 and April 2011, respectively), the Zdac includes a USB input, making it ideal for computer audio applications. But unlike those portable units, the Zdac is intended for more permanent installations (e.g., shelf or rack mounting).

The Zdac's USB input is designed to take advantage of a unique Windows 7 feature. The Windows volume control also changes the Zdac's analog outputs. With Windows XP and the Mac OS, the volume control only affects the volume internally. It cannot control an external DAC.

If a USB DAC is connected directly to a power amplifier, you will have little control over the playback level and will probably find the playback volume excessive, even with the Windows volume

control operated at a low range. You will need a preamplifier or passive analog volume control between the DAC and your power amplifier. With Windows 7, the Zdac can be directly connected to a power amplifier, eliminating the need for a preamplifier. The Windows 7's ability to control the Zdac's output level gives you full control over the playback level.

Unlike the NuForce Icon HDP and the more expensive Benchmark DAC-1 (which Chuck Hansen and I reviewed in *audioXpress* January 2009), the Zdac's main outputs are not affected by the front panel volume control. The volume control only affects the headphone level. No driver is needed for the Windows or Mac OS X OSes. Your computer should automatically recognize the Zdac when it's powered up and connected to a USB port. The unit also includes S/PDIF coaxial and Toslink optical digital inputs plus unbalanced RCA and balanced XLR outputs.

VOLUME CONTROL

Parasound's Bob MacDonald gave me a Zdac datasheet, which offers the following caveat regarding the use of Windows 7's OS to control volume: "For

Zdac MANUFACTURER SPECIFICATIONS LIST

| | |
|---|---|
| Channel balance: <0.05 dB, 20 Hz–20 kHz | AC power requirement: 10 W 110–130 VAC 60 Hz 220–240 VAC 50 Hz Voltage is selected on the chassis bottom |
| Channel separation: >95 dB, 20 Hz–20 kHz | |
| DAC: Analog Devices AD1853 | |
| Frequency response: 20 Hz–20 kHz, ± 0.2 dB | Audio output level: Unbalanced: $2.1 V_{RMS}$ Balanced: $4.2 V_{RMS}$ |
| Sample rate converter: Analog Devices AD1895 | |
| Signal-to-noise ratio (SNR): 110 dB, A-weighted | Dimensions: Width: 9.5"–241 mm (black); 8.5"–220 mm (silver) Depth: 10"–254 mm Height, with feet is 2"–51 mm; without feet is 1.75"–45 mm |
| Supports incoming digital word lengths: 16–24 bit | |
| Supports incoming digital sampling frequencies: Optical and Coaxial: 8, 11.025, 16, 32, 44.1, 48, 88.2, 96, 176.4, and 192 kHz | Output impedance: Line out: 160 Ω , balanced or unbalanced Headphone out: 40 Ω |
| THD + Noise: <0.015% | Rack mount accessory (black Zdac only): Side-by-side mounting (SBS) bracket: purchased separately Zblank: Panel extender, purchased separately (Silver Zdacs cannot be rack mounted) |
| Upsampling frequency: 422 kHz/24 bit (all inputs) | |
| USB: 44.1, 48, 88.2, and 96 kHz | Weight: Net 5 lb (2.3 kg); shipping 8 lb (3.7 kg) |
| USB streaming controller: Texas Instruments TAS1020B | |

the absolute best sound, we recommend setting all computer volume controls to their maximum and using an analog preamp to adjust volume. Using the volume control built into your computer's operating system can reduce sound quality. This is because a computer's volume control typically reduces the overall resolution of the audio signal because it is using fewer bits to represent the original signal. For customers who prefer the simplicity (and cost savings) of using a Zdac straight into a power amp without an analog preamp, they can still use the volume control of their computer. This will come at the cost of a slight sound quality reduction. In this case, it would be best to turn the gain on the amp down a bit so that the computer's volume is operated higher on the scale. For example it would be better to start with your computer's volume closer to 70% than 30%."

I find the Windows volume control a nuisance, especially since it doesn't sit on top of your application. You have to click on it in the system tray and then adjust it. When I'm doing digital audio editing, I find it much easier to just reach over and adjust a conventional volume control, which is why the NuForce and Benchmark DACs remain essential parts of my digital editing systems at home and work.

RELOCKING AND UPSAMPLING

Like the CD 1 I mentioned earlier, the Zdac's design was accomplished in collaboration with Holm Acoustics. The Zdac's digital front-end is an AKM Semiconductor AK4113 audio receiver. The AK4113 includes six digital inputs, eliminating the need for external input switching. The low-jitter analog phase-locked loop (PLL) will accept inputs sampling frequencies from 8 to 216 kHz. The Zdac also contains an Analog Devices AD1895 sample rate converter and the AD1853 DAC.

Holms Acoustics also chose the AD1853 DAC for its CD 1 CD player. Parasound notes that all inputs in the Zdac are relocked and upsampled to 422 kHz. This requires some clarification, since the AD1895 can't upsample to frequencies higher than 192 kHz.

Parasound is referring to the combination of the AD1895's upsampling and the oversampling that takes place in the AD1853. MacDonald said: "To get the widest bandwidth on the AD1895 in master mode (self-generating I²S from master-clock on output), a 27-MHz crystal is used. 27 MHz is the highest allowed master clock on the AD1895. The word clock on the output of the AD1895 is 1/256th of the master-clock so the outgoing sample rate is 105.46875 kHz. The AD1853 is then up-sampling by

a factor of four so the AD1853 output sample-rate is 421.875 kHz (422 kHz)."

Parasound has not implemented the Red Book de-emphasis specification in the Zdac (verified using my De-Emphasis

FURUTECH

PURE TRANSMISSION

DIY

Furutech bulk cables & parts make the best sounding audio cables at realistic price points! Try some!



Alpha S-14 Single-crystal copper speaker cable



FP-201(R) pure OFC spade lugs w/rhodium plating

The Gear Shop at TheMusic.com
800 457 2577 x 22
<http://www.themusic.com/gear>

Test CD, *audioXpress* February 2009). This is strange since the AK4113 input receiver and the AD1853 DAC support Red Book de-emphasis. This will only affect a small number of very early CDs, mostly discs manufactured by Denon in Japan in the 1980s.

The USB input employs a Texas Instruments (TI) TAS1020B USB streaming controller, which is compatible with the USB 1.1 specification and supports standard sampling frequencies up to 96 kHz. The datasheet mentioned earlier also contains some additional details about the USB technology used in the Zdac. Although the TAS1020B has become an industry standard for USB audio applications, Holm Acoustics found "significant shortcomings in TI's internal software, which results in greater jitter on its digital output." The datasheet goes on to state: "In a typical USB DAC the jitter at the TAS1020B output causes the AD1895 sample rate converter to trigger its polyphase filter coefficient generator. Altering the coefficients generates uncertainty in the numerical accuracy on the digital data output of the AD1895, even though the output clock is dead-stable. So the end effect is like jitter on the

analog output of the AD1853 DAC IC. The result: impaired sound quality."

The note explains that "Holm discovered undocumented parts of the TAS1020B and replaced TI's own software with proprietary software, which greatly reduces jitter on the TAS1020B digital output. This is accomplished through numerical optimization of its phase-locked loop (PLL), providing a superior basis for maximizing the synergy of the AD1895 and AD1853 to further reduce USB timing errors. This means the AD1895 plus AD1853 duo needs to do less 'work' in bringing down the jitter."

A pair of TI's LME49740 quad op-amps are in close proximity to the AD1853 DAC chip on the main PC board. Since the AD1853 has differential current outputs, it's reasonable to assume that the 49740 is used for differential current-to-voltage (I/V) conversion and analog filtering. The LME49740 is one of the high-performance audio chips that became part of the TI product line when the company acquired National Semiconductor. The specifications on this op-amp include a 20-V/ μ S slew rate, a 55-MHz gain-bandwidth product, a 2.5-nV/ \sqrt Hz

voltage noise, and a 0.00003% THD.

Two sections of this chip, in each channel, appear to directly drive the balanced outputs. The small analog output board has a LME49720, a dual op-amp with the same specifications as the 49740. This chip feeds the unbalanced RCA outputs. The entire analog signal path is DC-coupled, and Parasound has ensured that DC offsets are well controlled.

I measured an exceptionally low 0.2-mVDC at each of the unbalanced RCA outputs. The headphone amplifier is a TI TPA6120A2, an integrated circuit based on current-feedback technology with a 1,300-V/ μ s slew rate. This device can deliver 80 mW into a 600- Ω load with only 0.00014% THD. The signal-to-noise ratio (SNR) is 120 dB, making it suitable for 24-bit digital applications. This chip has differential inputs, enabling it to take full advantage of the fully-balanced I/V conversion and analog filtering provided by the LME49740.

LINEAR POWER SUPPLY

A linear power supply powers all of the Zdac's circuitry, and includes

Be more than a subscriber, be an **audioXpress** author!

Contact C. J. Abate today to discuss the DIY audio projects you've been working on and your article could be featured in an upcoming issue of **audioXpress**.

**Get published.
Get paid.**

Email editorial@audioxpress.com for details.

audioXpress

MEET MR. CROSSOVER: SIEGFRIED
Tube, Solid State, Loudspeaker Technology
40 AX Digital pages include Audio New
BUILD T
POWER
CAPTURING TRANSISTOR CURVES

When in Acceleration Velocity Excursion

06
84697 0

a hefty toroidal power transformer (see **Photo 2**). Separate regulation has been employed for the ± 9 -V analog supplies, and the 5- and 3.3-V digital supplies. Since portability was not an issue, Parasound was able to avoid the switching wall-wart supplies used with most portable USB DACs, including the NuForce Icon HDP and the Wyred4Sound μ DAC. The Zdac is supplied with an 18-AWG International Electrotechnical Commission (IEC)-style power cord, but this DAC is refined enough to warrant replacing it with a heavier gauge cable. I used a 2-m D.H. Labs Red Wave AC power cord, a

PERFORMANCE

The Zdac is sonically the best of the three under-\$500 USB DACs I've reviewed so far. Sonically, Parasound has clearly set its sights on more expensive, fixed-installation DACs rather than portable products, and its efforts have paid sonic dividends.

The most striking aspect of its performance is the large soundstage, which is both wider and deeper than its portable competitors. The Zdac also offers a neutral tonal balance, with a smooth, nonfatiguing treble.

In my review of the Benchmark DAC1 USB, I praised its exceptional inner detail and spacious soundstage, but I also noted a slight tendency toward brightness in the tonal balance. Although the Zdac doesn't quite match the Benchmark with regard to detail or soundstage size, it was nonetheless very impressive in these areas. I found the Zdac's tonal balance free of the Benchmark's treble brightness. Like the Benchmark, the Zdac aims at sonic accuracy rather than euphonic coloration, but it's a bit warmer and less analytical than the Benchmark. The bass region is extended and well-controlled, undoubtedly helped by Parasound's conservative linear power supply and DC coupling.

Although many buyers will employ the Zdac in computer or music server applications using its USB input, I think external D/A converters remain a popular way to upgrade the performance of stand-alone CD and multi-format players. I found that, sonically, the Zdac outperformed my NAD M55 player, offering superior detail, resolution, and soundstaging compared to the M55 as a stand-alone unit. But in these areas, it fell a bit short of my OPPO BDP-95 Universal Blu-ray player's performance (reviewed in *audioXpress* January 2012) and the BDP-105 that

I'm currently evaluating. The OPPO players offer stand-alone performance that surpasses much of the competition in their price categories. However, I would expect the Zdac to improve the performance of many other digital players in the \$500-\$1,500 price range.

In my Benchmark review, I also noted the processor's state-of-the-art jitter rejection. It seemed to eliminate the differences in the "sound" of various transports, differences that have been audible on every other D/A converter I've used. The Zdac did not quite equal the Benchmark in this regard.

Comparing the OPPO BDP-105 and my NAD M55 used as transports with an S/PDIF connection to the Zdac, the OPPO sounded smoother in the treble and delivered a larger soundstage than the NAD. But, the differences were not dramatic, and the NAD M55 still performed very well with the Zdac. The headphone amplifier is dynamic and punchy, and had no difficulty driving my AKG K701 headphones, which have a 62- Ω impedance rating. As implemented in the Zdac, the TI headphone

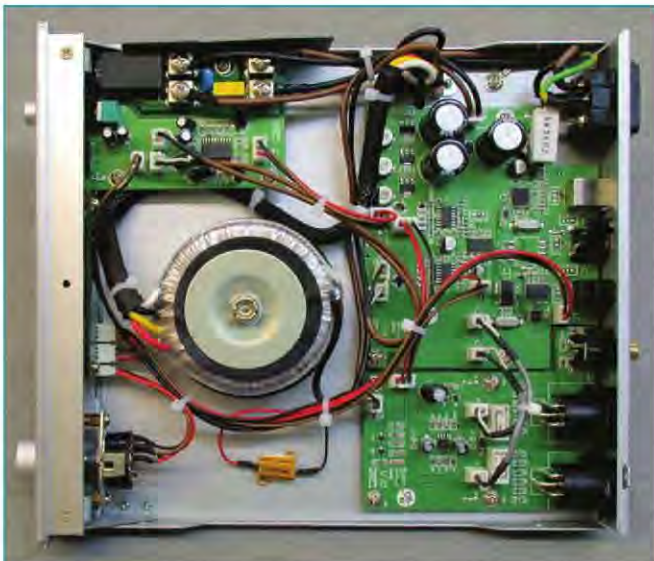


Photo 2: A large toroidal power transformer is at the heart the Zdac's linear power supply. The main PC board in the upper right contains all digital input circuitry—an Analog Devices's AD1895 sample rate converter and AD1853 DAC chip, analog op-amps, and a linear DC-supply regulation. The headphone amplifier board is in the upper left.

10-AWG double-shielded cable fitted with Wattgate gold-plated AC connectors (www.silversonic.com). This is admittedly overkill, but it did yield superb results. A cost-effective solution would be the Pangea AC-14, regular or signature version (www.audioadvisor.com), or D.H. Labs Power Plus bulk cable fitted with Marinco connectors from Parts Express (www.parts-express.com). Admittedly, I am rather skeptical regarding some of the claims made for exotic high-end AC power cords. But high-performance audio equipment will normally benefit from replacing 18-AWG cords with heavier-gauge wire and shielded cords can be beneficial, especially on digital equipment.

*Ready, willing
and*
AVEL



*offering an extensive
range of ready-to-go
toroidal transformers
to please the ear, but won't
take you for a ride.*

AVEL Lindberg Inc.
47 South End Plaza
New Milford, CT 06776
tel: 860-355-4711
fax: 860-354-8597
sales@avellindberg.com
www.avellindberg.com

amplifier chip is clean, detailed, and spacious.

THE BOTTOM LINE

The three under-\$500 DACs reviewed in *audioXpress* each fill an important niche. The NuForce Icon HDP and Wyred4Sound μ DAC offer fine performance in portable units that will fit inside many laptop computer cases. The NuForce contains a headphone amplifier plus a preamplifier and volume control, making it ideal where an analog level control is needed.

Sonically, I found Wyred4Sound μ DAC even better than the NuForce unit. It will be an obvious choice where portability is needed but an analog volume control and headphone jack are not. (Wyred4Sound has recently introduced the μ DAC-HD, which includes a headphone amp, but the level must be set using the Windows volume control.) At \$399, the μ DAC is also the most affordable of the three.

From a purely sonic standpoint, the Parasound Zdac is free of the performance compromises that are inevitable

where portability is required. In my view, it is clearly the winner. If I could change one thing in the Zdac, I would prefer that the volume control would affect the main outputs and not just the headphone amplifier. This would eliminate the need for a preamplifier between the Zdac and the power amp, and it would make it a low-cost, fully functional alternative to the Benchmark DAC-1 USB.

The Parasound Zdac is an excellent product. I think it has raised the bar for affordable digital-to-analog converters. *ax*

SOURCES

K701 Headphones

AKG | <http://us.akg.com>

AK4113 Audio receiver

AKM Semiconductor, Inc. | www.akm.com

AD1895 Sample rate converter and AD1853 DAC

Analog Devices, Inc. | www.analog.com

DAC-1

Benchmark Media Systems, Inc. |

www.benchmarkmedia.com

CD 1 player

Holm Acoustics | www.holmacoustics.com

Intel ITX computer

Intel Corp. | www.intel.com

M55 digital disc player

NAD Electronics | <http://nadelectronics.com>

Icon HDP

NuForce | www.nuforce.com

BDP-95 Universal Blu-ray player and BDP-105 Blu-ray player

OPPO Digital, Inc. | www.oppodigital.com

Z-series components

Parasound | www.parasound.com

TAS1020B USB streaming controller, LME49740 quad op-amp, and TPA6120A2 headphone amplifier

Texas Instruments, Inc. | www.ti.com

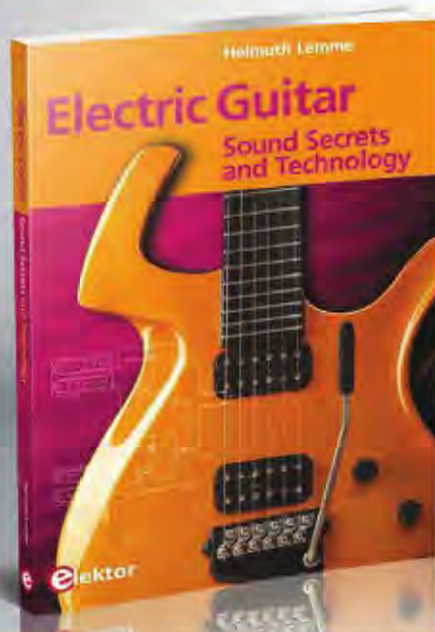
μ DAC and μ DAC-HD

Wyred4Sound | www.wyred4sound.com

Electric Guitar

Sound Secrets and technology

BEST-SELLER



What would today's rock and pop music be without electric lead and bass guitars? These instruments have been setting the tone for more than sixty years. Their underlying sound is determined largely by their electrical components. But, how do they actually work? This book answers many questions simply, in an easily-understandable manner. For the interested musician (and others), this book unveils, in a simple and well-grounded way, what have, until now, been regarded as manufacturer secrets. The examination explores deep within the guitar, including pickups and electrical environment, so that guitar electronics are no longer considered highly secret. With a few deft interventions, many instruments can be rendered more versatile and made to sound a lot better – in the most cost-effective manner.

287 pages • ISBN 978-1-907920-13-4 • \$47.60

 **elektor**

Further information and ordering at www.elektor.com/electricguitar