

NuForce Icon HDP—Headphone Amp, DAC Converter, Preamp

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PHOTO 1: The front panel of the NuForce Icon HDP contains a volume control, input selector, and a 1/4" stereo headphone jack.

NuForce, an audio company based in California with manufacturing facilities in Taiwan, was founded in 2005 and has become a leader in audiophile-quality amplifiers based on proprietary switching technology. More recently, they have expanded into portable and desktop audio products, including the Icon HDP reviewed here (**Photo 1**). They also manufacture headphones, loudspeakers, a music server, CD player, preamp, multichannel amplifier, and cables. The Icon HDP combines a Digital-to-Analog converter, preamplifier, and headphone amp into one very small package, measuring 6 × 4½ × 1".

The Icon HDP has only two knobs—a volume control and a selector switch. The front panel has a tri-colored LED to indicate the selected input: blue for USB digital, white for S/PDIF digital, and red for the stereo analog inputs. There's no digital lock light, which can make troubleshooting a bit more difficult.

The 1/4" headphone jack is also located on the front, but all other connections are made on the rear panel, including the power supply, analog and digital inputs, and analog outputs (**Photo 2**). The analog output connectors are audiophile-quality gold-plated Teflon-insulated RCA jacks, but the analog inputs and S/PDIF digital input are PC-mount types.

NuForce also includes a dual-purpose 3.5mm stereo phone jack. The analog contacts are in parallel with the analog RCA connectors, for connection of portable music devices. You should never connect the RCA and 3.5mm inputs at the same time—it's one or the other. There's also

an S/PDIF optical receptor in the rear of the 3.5mm connector, for connection of a TOSLINK digital cable using the supplied adaptor. As with the analog connection, it's either TOSLINK optical or S/PDIF coax, not both at once.

The Toslink and S/PDIF inputs accept data streams up to 192kHz/24-bit. The highest sampling rate accepted by the USB-2 input is 96kHz. The Icon HDP is supplied with an outboard AC power supply, power cord, USB cable, 1/4" to 3.5mm headphone adapter, and a Toslink to 3.5mm optical adapter (**Photo 3**).

INTERNAL DETAILS

NuForce has packed a surprising amount of sophisticated circuitry into the Icon HDP's small enclosure. The HDP has two circuit boards—analogue and digital—with the digital board piggy-backed onto the larger analog board (**Photo 4**). The Icon HDP uses an AKM Semiconductor AK4113VF input receiver, which can switch up to six inputs, and includes a low-jitter PLL. The digital board is marked "96kHz 24-bit USB Codec" and contains proprietary NuForce chips for digital decoding and D/A conversion. The decoder chip feeds an I²S bus to the quad DAC chip, which operates in true differential mode for each stereo channel. NuForce notes that this same D/A converter chip is used in their flagship CDP-8 DAC.

Analog circuitry is based on National Semiconductor's LM49860 dual op amps. These high-performance chips are specifically designed for audio applications, with a slew rate of 20V/μs, input noise density of 2.7nV/√Hz, and THD of 0.00003% into 600Ω loads. I applaud

NuForce for avoiding the dated 5532, which is still found in products far more expensive than the Icon HDP.

The analog circuitry is DC-coupled except for a single film capacitor at each analog input. The headphone output is driven with NuForce's proprietary HPA10W01 headphone amplifier module. NuForce notes that the analog circuitry in the HDP is similar to that used in their high-end P-8S preamp. The volume control and selector switch are high-quality parts, better than I'd expect at this price.

The Icon HDP comes with an outboard desktop AC adapter made by Li Tone Electronics, a Taiwan-based company with manufacturing in mainland China. This 24W switching-mode power supply is the model LTE24E-S3-1, and is rated at 15V out at 1.6A. The Icon HDP probably doesn't draw anything close to 1.6A—my power supply was cool even after several hours of operation. I suspect that NuForce deliberately overrated the supply to prevent dynamic current limiting.

The DC power input on the Icon HDP appears well-filtered with both capacitors and a toroidal inductor. NuForce has separated the analog and digital supply regulation inside the HDP. The digital supply is regulated with a 5V, three-terminal regulator. The analog supply is isolated with NuForce's own "audio grade" NH15 DC-to-DC converter, which converts the single-polarity DC input into dual-polarity $\pm 12V$ rails for the analog circuitry.

NuForce has a series of spectral distortion measurements available for downloading on their website. These include 400Hz THD and 19kHz+20kHz IM measurements on the Icon HDP and 22 competing products, most costing many times more than the HDP. The Icon HDP stacks up extremely well against products made by—among others—Musical Fidelity, Perreux, Esoteric, Lexicon, and PS Audio—and, in many cases, the NuForce offers superior measured performance. The measurements speak well for NuForce's digital design expertise.

THE SOUND

For the ultimate listening test of the DAC/preamp combination, I connected the Icon HDP into my main stereo system, feeding the coax S/PDIF output from my NAD M55 player to the HDP,

and connecting the HDP's outputs directly to my Monarchy SE-100 Deluxe MK2 power amplifiers (which feed a pair of ACI Sapphire III/Sub-1 loudspeaker systems). The HDP replaced both my custom-built preamp and PS Audio Digital Link III D/A converter; a tall order to say the least!

My first reaction to the sound was how punchy and dynamic it was, especially for something so small, with necessarily basic internal power supplies. The bass was especially impressive—not as powerful in the nether regions as my reference DAC and preamp, but with surprising weight and impact nonetheless. Left-right imaging

was quite precise, if somewhat narrower than my reference, but front-to-back depth was rather vague. Inner detail was surprisingly good, lessened only by some roughness and graininess in the upper midrange and treble region.

Indeed, the biggest limitation in performance was the lack of ultimate smoothness and detail in the treble. Overall, however, the Icon HDP provided a surprisingly musical and pleasant listening experience. The evenings I spent with the HDP in my main system were both enjoyable and satisfying, and I was continually impressed by how well something so small and so affordable could perform.

As a headphone amplifier, the Icon



PHOTO 2: The rear panel of the HDP includes analog input and output jacks, USB, S/PDIF and optical digital inputs, and the power supply connector.

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REVIEW



"Audience's Au24e interconnects and speaker cables perform as well as any cables I've heard. What's more, they compare favorably with other reference-quality cables, not only as an overall package of strengths and weaknesses, but line by line, in any sort of audiophile accounting."
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HDP performed impressively with my AKG K701 headphones. The punchy, dynamic qualities of the HDP when used as a DAC/preamp are retained when driving headphones. Indeed, the HDP easily drove my AKGs, which have a nominal impedance of 62Ω, with no sense of strain whatsoever. NuForce's headphone amplifier module can provide much higher output current than unbuffered IC op-amp-based headphone amps, and will deliver 4.5V RMS into a 16Ω load before clipping (op-amp-based headphone amplifiers are usually comfortable driving loads of 40Ω or higher).

NuForce notes that the HDP can drive in-ear monitors (IEMs, sometimes called "ear buds"), which often have impedances as low as 16Ω. The one caveat is that low-Z, high-sensitivity IEMs may allow you to hear the HDP's noise floor. The HDP was optimized for higher-Z headphones, where this will normally not be a problem. I never heard the HDP's noise floor with my AKG K701s.

The sound field with my AKGs is spacious and detailed, and never becomes fatiguing even during lengthy listening sessions. If you need a headphone amplifier better than the HDP, you'll need to spend a great deal more. The HDP will provide a worthwhile upgrade over the built-in, op-amp-based headphone amplifiers typically included with integrated amplifiers, digital players, and personal computers.

COMPUTER APPLICATION

For many audiophiles, the Icon HDP will find a permanent home in a high-performance computer audio playback system, using the USB connection. Surely, the ultimate DAC/preamp for this application is the Benchmark DAC-1 USB, which Chuck Hansen and I reviewed in *aX* in January 2009. That reference-quality product quickly became an indispensable part of my computer-based digital audio editing system at work. But, its \$1295 price tag puts it out of the reach of many home computer/audio enthusiasts.

At \$459, the Icon HDP shouldn't be expected to offer the same level of transparency and refinement as the Benchmark, and it doesn't. What it does offer is a significant improvement over most computer sound cards. The Icon HDP easily outperforms the Creative Labs Audigy 2 that came with my Dell Dimension 4600 (running Windows XP Pro). In my home computer system, the Icon HDP feeds an Adcom GFA-5200 power amplifier and a pair of Madisound Speaker Components' Sledging loudspeakers.

I also like the ability to adjust the playback volume without using the Windows volume control, which is annoying because there's no way to make it sit on top of your application (the Sound Forge 10 Pro digital editor, in my case). Even if the volume control is open, you must



PHOTO 3: The Icon HDP is supplied with a USB cable, AC adapter, power cord, plus 1/4" to 3.5mm headphone adapter, and a Toslink to 3.5mm optical adapter.

first click on the task bar, and then drag the fader. Once you're back to editing, the volume control disappears. I find it much more convenient to adjust the playback volume on an outboard DAC/preamp¹.

I'm not fond of switching-mode power supplies in high-performance audio equipment, and I suspected that the switching AC adapter might be a limiting factor in the Icon HDP's performance. Indeed, NuForce's website notes an optional linear supply for the HDP, though it's not available as of this writing. NuForce's Jason Lin explained that the linear supply—still under development—will also include a 192kHz/24-bit USB to S/PDIF converter, to help isolate the HDP from noise generated inside the computer. The supply will also contain a custom-designed R-core transformer (a description of this type of transformer—ideal for audio applications—can be found on the website of its developer, Kitamura Kiden, <http://www.kitamura-kiden.co.jp/english/index.html>).

Many years ago, I described a 12V outboard supply that I designed for the Audio Alchemy Digital Transmission Interface, and later used with other outboard sample-rate converters/jitter suppressors used in my system². I modified one of these supplies to provide +15V to the Icon HDP. My own linear supply produced a wider and more precise soundstage, deeper bass, and a reduction in the grain and texture in the treble. Overall, the sonic presentation is richer and warmer with the linear supply. When NuForce's own linear supply becomes available, it should be a worthwhile upgrade.

CONCLUSION

The NuForce Icon HDP is a remarkable device, combining three fine products—DAC, preamp, and headphone amp—into one compact enclosure. The USB input makes it ideal for a computer audio installation, and the fine sonic qualities of the preamp and headphone amplifier will surely appeal to anyone in need of high performance in a small, affordable package. NuForce has several other items in their Icon line, including the ultra-compact uDAC-2 DAC/preamp/headphone amp priced at \$129. It's hard to imagine an audiophile who

couldn't find a use for one of these high-value products. Highly recommended!

REFERENCES

1. For a replacement Windows volume control that can sit on top of your application, I recommend Code Sector Software's Audio Sliders, www.codesector.com.

2. Galo, Gary A. "Ask TAA—DTI Update" *The Audio Amateur*, 4/1994, p. 40. For 15V DC output, simply change R2 to 10.5k and use a transformer with a 15V AC secondary. *ax*



PHOTO 4: The Icon HDP circuitry is housed on two circuit boards, with the smaller digital board piggybacked onto the main analog board. The volume control and selector switch are high-quality parts.

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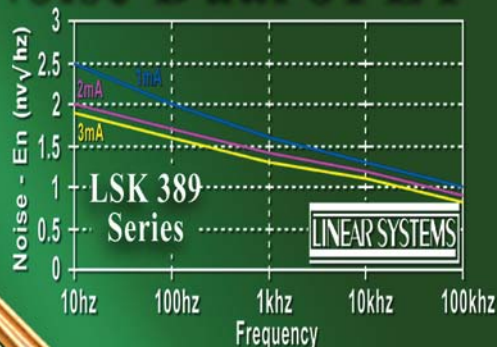


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