

NuForce Icon

WES PHILLIPS

INTEGRATED AMPLIFIER WITH USB INPUT

DESCRIPTION Miniature integrated amplifier with USB DAC, line-level output (for subwoofer) on 3.5mm stereo jack, and headphone output. Inputs: RCA, 3.5mm stereo, analog; USB, (1.1, 2.0 compatible). USB DAC: USB 1.1, 2.0-compatible. USB native bit rate: 16-bit/32–48kHz. Digital signal/noise ratio: 98dB. Speaker outputs: RJ45 connectors with 15µm-thick gold plating to gold-plated banana plug (speaker cables provided). Maximum headphone output into 32 ohms: 31.25mW. THD: <0.03%, 20Hz–20kHz. Frequency response: 20Hz–20kHz, <–1dB. Maximum output power (10.8dBW): 12Wpc. "Peak" power: 15Wpc. THD+N: 0.05%, 1kHz, 2W into 4 ohms, 0.06%, 1kHz, 2W into 8 ohms. Power bandwidth : 26Hz–50kHz, –1dB, 1W into 4 ohms. Signal/noise ratio: 84dB ref. 7W into 8 ohms. Power adapter: 12–14V, 25W, 100–240VAC worldwide voltages.

DIMENSIONS 6" (155mm) W by 1" (25mm) H by 4.5" (115mm) D. Weights: 1 lb (0.45kg) net, 5 lbs (2.3kg) shipping.

SERIAL NUMBER OF UNIT REVIEWED 0053.

PRICE \$249. Approximate number of dealers: 50. Warranty: 30 days, satisfaction or money back; 3 years parts & labor.

MANUFACTURER NuForce, Inc., 356 South Abbott Ave., Milpitas, CA 95035. Tel: (408) 627-7859. Fax: (408) 262-6877. Web: www.nuforce-icon.com.



NuForce Icon integrated amplifier

In a world of me-too products, NuForce distinguishes itself from all those other components whose names begin with *i* by actually using a capital *I*. Actually, that statement is unkind, even unfair—unlike the myriads of products designed to capitalize on the Apple iPod's current sexiness, the NuForce Icon isn't designed to be portable (although NuForce does offer an Icon Mobile). What the Icon unquestionably *is* is a fine little piece of audio engineering, which most of those other *i* components are not.

And "little" this 12Wpc, class-D amp most definitely is: 6" by 4.5" by 1". That's barely enough space for three inputs, preamp and headphone outputs, and speaker terminals. In fact, it *isn't* enough space—NuForce works around that by using RJ45 terminals for the speaker connections, 3.5mm stereo jacks for line input 1, the pre-out and the front-panel headphone jack, and an external 15V DC power supply. A single pair of RCAs completes the line-level input features. The other input isn't perzackly line-level, it's a mini USB jack.

Yup, the Icon is an integrated amp with a DAC inside. And that headphone jack on the front panel has its own discrete op-amp.

The Icon's slender point-of-sale packaging includes a silicone stand for vertical mounting, the power supply, a USB cable, a mouse pad for horizontal placement, and a pair of RJ45-to-banana speaker cables—all for \$249.

I can't explain

The heart of the Icon is NuForce's proprietary class-D analog switching IC. Despite the cramped interior of this li'l wonder, its circuit board is packed with NuForce-branded components, including a hefty capacitor labeled "AUDIO-GRADE." The USB digital-to-analog conversion is handled by a

Burr-Brown PCM2706 chip, a 16-bit delta-sigma stereo DAC (signal/noise and dynamic range of 98dB) capable of handling sampling rates of 32, 44.1, and 48kHz.

Inside and out, the Icon's layout and fit'n'finish are the best I've seen yet from NuForce, and exemplary for such an inexpensive component. The front panel's two controls—volume/power and source select—felt smooth and sturdy. I never felt as if NuForce had merely gone through the motions. And the extruded aluminum case is impressively well turned out, and available in silver, red, black, or blue.

I just don't know what to do with myself

NuForce obviously thought of the Icon as a desktop system. They include 1m speaker cables and that USB input, which strongly implies that they saw it as a good fit for computers—plus there's the 12Wpc output, which suggests near-field listening rather than room-filling sound. Yet there's been a lot of buzz on the interwebs about the Icon being a giant-killer, especially when paired with high-efficiency loudspeakers. With that in mind, I auditioned the Icon in three settings: on my desktop, driving a pair of Axiom QS8 speakers, using my G5 Mac

MEASUREMENTS

I measured the NuForce Icon using Audio Precision's top-of-the-line SYS2722 system (see the January 2008 "As We See It" and www.ap.com), an Audio Precision System One Dual Domain, and the Miller Audio Research Jitter Analyzer.

Looking first at the Icon's performance as an amplifier, it offered a low maximum voltage gain of 22.6dB into 8 ohms from its speaker outputs, 6dB from its line-output jack. The line and headphone outputs preserved absolute polarity (ie, were non-inverting), while the speaker

outputs inverted polarity. The input impedance was a reasonably high 46k ohms at 1kHz, dropping slightly at the frequency extremes. The line jack's output impedance was a usefully low 200 ohms in the midrange and 75 ohms at 20kHz, but rose to a very high 20k ohms at 20Hz. If the NuForce is used as a preamplifier, the power amplifier needs to have an input impedance of at least 100k ohms if the lows are not to be prematurely rolled off. The headphone jack offered a maximum gain of 15.1 dB and an output impedance of 48 ohms across the audioband, which will make the Icon more suitable for use with high-impedance headphones like the Sennheisers rather than the low-impedance Grados and the Phiaton MS400.

The Icon's output impedance at the speaker jacks was a fairly low 0.13 ohm at low and midrange frequencies, rising inconsequentially to 0.14 ohm at 20kHz. As a result, the modification of the amplifier's frequency response by the usual Ohm's Law interaction between this source impedance and the impedance of our standard simulated loudspeaker remained within tight ± 0.1 dB limits (fig.1, black trace). This graph indicates that the -3 dB points lie at 15Hz and 96kHz, which correlates with the excellent 10kHz squarewave response (fig.2), but also that an ultrasonic peak develops quite strongly into 8 ohms (blue and red traces), less so into 4 ohms (cyan, magenta), and not at all into 2 ohms (green). (This resonance results in some ringing that can be seen overlaying the squarewave.) The

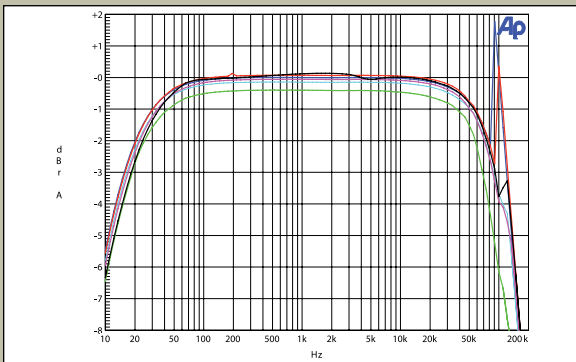


Fig.1 NuForce Icon, frequency response at 2.83V into: 8 ohms (left channel blue, right red), 4 ohms (left cyan, right magenta), 2 ohms (green), and simulated loudspeaker load (black). (1dB/vertical div.)

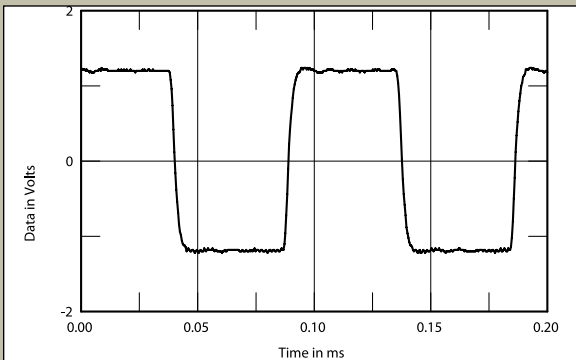


Fig.2 NuForce Icon, small-signal 10kHz squarewave into 8 ohms.

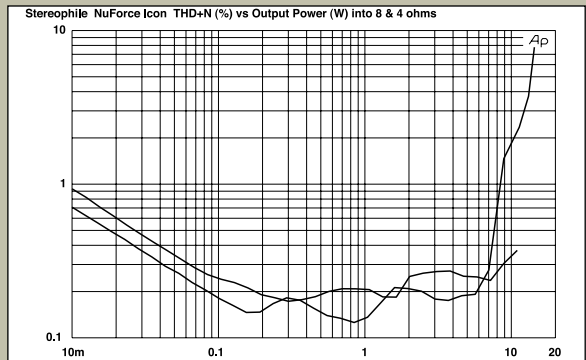


Fig.3 NuForce Icon, distortion (%) vs 1kHz continuous output power into (from bottom to top at 100mW): 8 ohms, 4 ohms.

Pro computer's ALC library as a source; in my small listening room, driving Usher Be-718 speakers with the Simaudio Moon Evolution SuperNova CD player; and in my home theater, with a Bel Canto e.One CD player and a pair of Definitive Technology Mythos STS speakers.

If you intend to set the Icon up in a room, you may well want longer speaker cables than the 1m lengths NuForce provides. They also sell, for \$29.95/pair, 2m runs terminated to the same gold-plated RJ45 and bananas as the included set. If you have a wire crimper and feel like rolling your own, there's a pin diagram on the Icon's webpage. In both of the rooms

in which I auditioned the Icon, the 1m cables worked, if just barely—I had to place the amp on the floor between the speakers. A longer run would have been nice, but the lack of a remote control is another suggestion that the Icon was intended for desktop or nearfield use—the fact that it *can* be press-ganged into other duties is mostly gravy.

Because the Icon is class-D, it runs cool enough that you could leave it on 24/7 with only the mildest of twinges to your energy profligacy. (The power supply continues to run even when the Icon is turned off; the only way to cool that usage hotspot is to unplug it.)

I didn't know what time it was

I began by using the Icon as a desktop system. Given its tininess and the absence of any heat buildup, you can put it just about anywhere—although I, a chronic desk-clutterer, did keep losing it under pieces of paper. I connected it to my Mac's USB output, chose "Audio USB DAC" in the Mac's system preferences, and we were off and running.

The Icon sure didn't sound puny. My Axiom QS8 speakers had lots of low-end sock and created an extremely solid center fill, even with a large flat-screen monitor between them. When I compared the Icon's USB DAC to the

measurements, continued

HF response also rolls off a little earlier into 2 ohms than it does into 4 and 8 ohms. This peak is due to the internal low-pass filter used on the amplifier's output to reduce the level of radio-frequency switching noise that results from the class-D output stage. Even so, I measured 55mV of noise with a center frequency of 595kHz present at the speaker terminals with no input signal present.

This noise compromises the wideband, unweighted signal/noise ratio to just 36.7dB (ref. 2.83V into 8 ohms). This improved to 70.7dB when the measurement bandwidth was restricted to the audio range, and to 76.5dB when an A-weighting filter was switched in circuit. The Icon is a little noisier than usual for a power amplifier, and I note that the NuForce website recommends against using a loudspeaker with a sensitivity greater than 92dB because the background noise will become audible within 2–3' of the tweeter. Because of the contaminating effect of this ultrasonic noise, I measured the Icon's distortion and channel separation using the Audio Precision passive low-pass filter. The channel separation (not shown) was good, at 74dB (R–L) and 83dB (L–R) at 1kHz and below, these figures decreasing by 15dB at 20kHz.

Fig.3 shows how the THD+noise percentage in the Icon's output varies with output power. The traces slope down below 200mW or so, indicating that distortion lies beneath the background noise at these low powers. But

the distortion remains between 0.1% and 0.2% at higher powers, which is higher than is suggested by the 0.06% specification. Into 8 ohms, the amplifier reaches 1% THD, our usual definition of clipping, at 8.5W (9.3dBW), and doesn't reach its specified maximum output power of 12Wpc (10.8dBW) until just below 3% THD. The 4 ohm trace in this graph stops just above 10W, when the amplifier's protection circuit kicked in. Reducing the signal level allowed the amplifier to turn itself back on again. Clearly, the Icon is not intended to be used with low-impedance

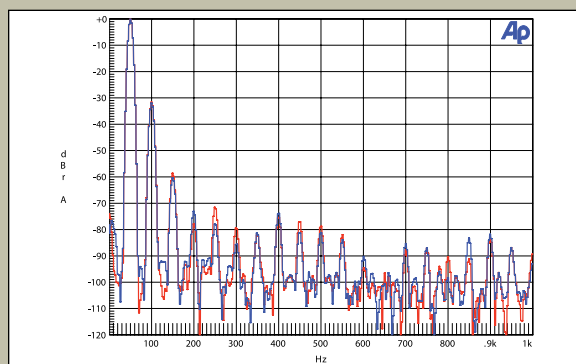


Fig.5 NuForce Icon, spectrum of 50Hz sine wave, DC–1kHz, at 6.2W into 4 ohms (linear frequency scale).

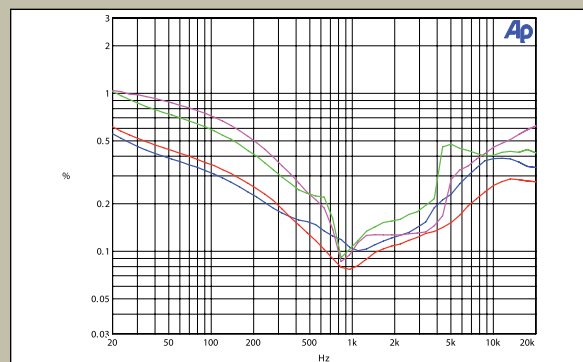


Fig.4 NuForce Icon, THD+N (%) vs frequency at 2.83V into: 8 ohms (left channel blue, right red), 4 ohms (left green, right magenta).

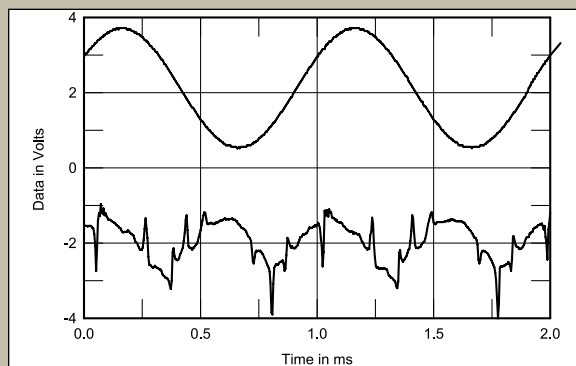


Fig.6 NuForce Icon, 1kHz waveform at 2W into 8 ohms (top), 0.26% THD+N; distortion and noise waveform with fundamental notched out (bottom, not to scale).

computer's optical S/PDIF output fed to a Musical Fidelity XDAC^{V3} which in turn was connected to the Icon's analog line-in, there were audible differences, but not to any distracting degree.

"Trampled Rose," from Robert Plant and Alison Krauss's *Raising Sand* (ALC file, Rounder 619075; CD, Rounder 9075) sounded *slightly* sharper through the USB DAC, which made it marginally more detailed. The XDAC^{V3}'s timbrally richer miasma (which fits with producer T Bone Burnett's *modus operandi*) made the banjo and mandolin stand out more from the murk. The

USB input had the individual instruments standing out more discretely from one another—an effect somewhat enhanced by slightly less *oomph* in the big bass drum. Point to the XDAC^{V3}.

giving Paul Desmond's tart alto saxophone an immediacy that was quite engaging. Ditto Hall's tastefully assertive bite. However, the XDAC^{V3} gave the session greater depth and air.

ALTHOUGH I THOUGHT THE XDAC^{V3} WAS BETTER, I LIKED THE ICON USB DAC. A LOT.

On "Concierto de Aranjuez," from Jim Hall's *Concierto* (CD, CTI/Mobile Fidelity Sound Lab UDCD 2012), the Icon did a fine job of sorting out the textures of the spare arrangement,

Both DACs performed well enough that repeated listening to this track was a pleasure, not a chore. Although I thought the XDAC^{V3} was better, I liked the Icon. A lot.

measurements, continued

speakers, which is why I didn't test its maximum power into 2 ohms. (It turned off at continuous levels above a couple of watts into 2 ohms.)

Fig.4 plots the THD+N percentage against frequency at 2.83V, an output level equivalent to 1W into 8 ohms (blue and red traces) and 2W into 4 ohms (green, magenta). The lowest distortion can be seen to occur in the upper midrange, with increases both above and below that region. The rise in THD at low frequencies is particularly pronounced into 4 ohms, reaching 1% at 20Hz, which spectral analysis revealed to be due to a large amount of second-harmonic distortion (fig.5). The THD waveform at higher frequencies (fig.6) also has second-harmonic content, but with higher-frequency spikes apparent. Looking at the waveform on a 20MHz analog 'scope indicated that every positive waveform peak was accompanied by a small burst of switching noise, while spectral analysis (fig.7) revealed a regular series of higher-order harmonics as well. The Icon's reduced linearity at high frequencies results in quite high levels of intermodulation distortion when the amplifier is used to drive an equal mix of 19 and 20kHz tones at about half-power into 4 ohms (fig.8). The 8 ohm performance (not shown) was actually a little worse.

I assessed the performance of the NuForce Icon's D/A section by driving the amplifier's USB input with my Macintosh Powerbook and examining the analog output signal at the line-out jack. The Burr-Brown DAC used in the Icon is a 16-bit delta-sigma chip with an integral digital

low-pass filter and headphone output, capable of operating up to a sample rate of 48kHz.¹ It offers low linearity error down to -90dB or so (fig.9) and a fairly clean noise floor, though some second-harmonic distortion can be seen with a dithered 1kHz tone at -90dBFS (fig.10). However, the waveform of an undithered sinewave at exactly -90.31dBFS, which should comprise three well-defined DC voltage levels, was obscured by HF noise (fig.11).

The problem with using USB to get audio data out of a computer to feed to an external DAC is that it is not

¹ This chip is very similar to the PCM2705 used in the Apple Airport Express and Wadia 170 iTransport, but lacks that chip's USB-to-S/PDIF converter.

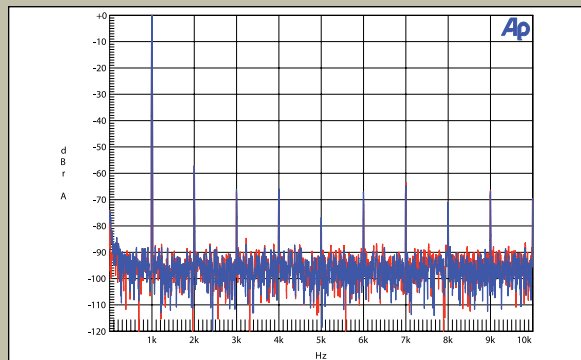


Fig.7 NuForce Icon, spectrum of 1kHz sine wave, DC-10kHz, at 6.2W into 4 ohms (linear frequency scale).

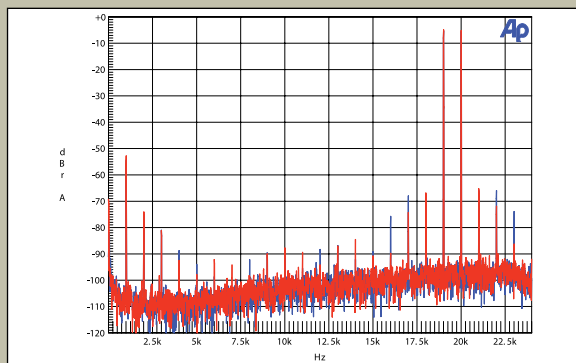


Fig.8 NuForce Icon, HF intermodulation spectrum, DC-24kHz, 19+20kHz at 3W peak into 4 ohms (linear frequency scale).

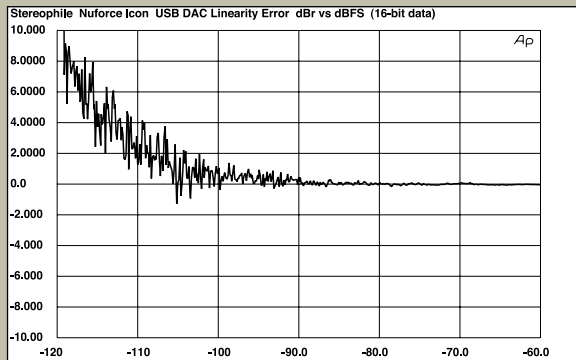


Fig.9 NuForce Icon, USB data input, linearity error.

Sheesh, the 1m length of Kimber Kable KCAG connecting the XDAC^{V3} to the Icon cost more than the NuForce itself. The l'il gizmo was punching *woady* above its weight class here.

My friend Jeff Wong suggested I place a Shakti Electromagnetic Stabilizer atop the Icon, and it did tone down, very slightly, some of that excessive detail. I know—that way lies madness. This is a \$249 amplifier. An audiophile tweak here and an audiophile tweak there, and sooner or later you've got a \$1000 amp—and who doubts that a \$1000 integrated can sound pretty good? On the other hand, tweaking can be fun, so if

that's what floats your boat, tweak away. Contrariwise, you can't polish a turd, but you certainly can polish the Icon.

AN AUDIOPHILE TWEAK HERE AND AN AUDIOPHILE TWEAK THERE, AND SOONER OR LATER **YOU'VE GOT A \$1000 AMP.**

If you work in an office or an environment where you can't always be broad-

casting your music, the Icon's headphone amp was pretty good. It was the slightest bit harder, and had less air than, say, Ray Samuel's \$350 Emmeline The Hornet. I can live with that, especially when I compare its performance to the bulk of the mass-market headphone amplifiers that I recently profiled for a consumer publication—90% of them added grit and not-insignificant amounts of noise as they boosted the signal. The Icon is a quiet, competent headphone amp.

I can't stand up for falling down
In the absence of any truly high-sensitivity bookshelf loudspeakers around the

measurements, continued

optimized for uninterrupted streaming. The host PC has operating-system housekeeping chores to attend to, and while the sample rate of the output data, averaged over a longish period, will indeed be 44.1kHz or 48kHz, there will be short-term fluctuations. The Icon's Burr-Brown PCM2706 recovers the audio clock from the USB data packets and uses on-chip analog phase-locked loops to reduce the effects of word-clock jitter. Even so, using the Miller Jitter Analyzer to examine the Icon's analog line-stage output while I fed it the diagnostic signal from my Power-Book gave a high 1.83 nanoseconds of word-clock jitter.

Looking at the spectrum of the analog output signal (fig.12), the noise floor is about 8dB higher than I have measured with the best 16-bit playback systems, and features a large number of discrete noise spikes (blue numeric markers). Jitter sidebands are either data-related (red markers), which are fairly low in level, or of unknown origin (purple markers). Of these, the highest in level lie at $\pm 10.3\text{Hz}$ (purple "1"), $\pm 135\text{Hz}$ (purple "8"), and $\pm 714\text{Hz}$ (purple "19"). There is also some spectral spreading of the central peak evident, due to random low-frequency timing fluctuations. It is difficult to predict the effect this behavior will have on the DAC's sound quality, but I would have expected Wes Phillips to have found bigger audible differences between the Icon and the Musical Fidelity X-DAC^{V3}, which has excellent rejection

of jitter via its S/PDIF input (see www.stereophile.com/digitalprocessors/1204mf/index2.html).

It is easy to be overcritical of an amplifier that costs as little as the NuForce Icon, especially as it includes a digital data input and a headphone output. For what you pay, the engineering compromises managed by its design team seem well arranged for a desktop amplifier. However, I would not recommend it for use in an audiophile's primary system.

—John Atkinson

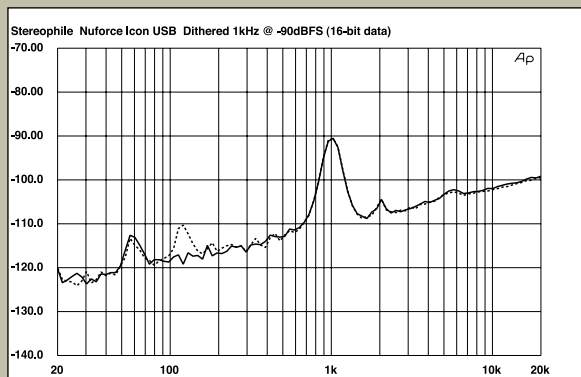


Fig.10 NuForce Icon, USB data input, 1/3-octave spectrum with noise and spurs of dithered 1kHz tone at -90dBFS with 16-bit CD data (right channel dashed).

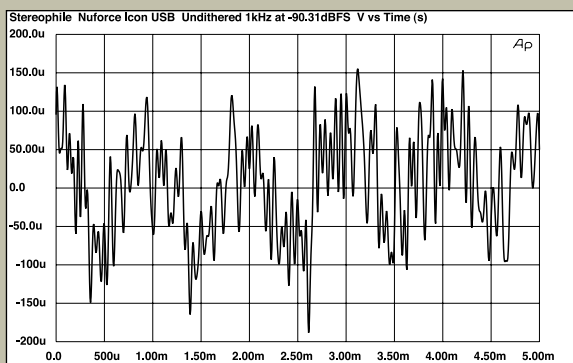


Fig.11 NuForce Icon, USB data input, waveform of undithered 1kHz sine wave at -90.31dBFS, 16-bit data.

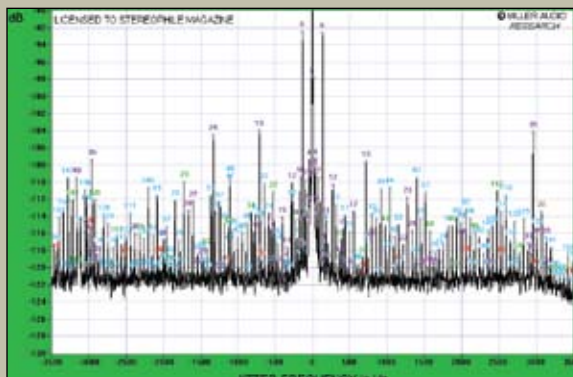


Fig.12 NuForce Icon, USB data input, high-resolution jitter spectrum of analog output signal, 11.025kHz at -6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz, 16-bit data. Center frequency of trace, 11.025kHz; frequency range, $\pm 3.5\text{kHz}$.

house, I used the Usher Be-718s (see my review in the May 2008 *Stereophile*, or at www.stereophile.com/standloudspeakers/508ush) because they were easier to drive than Dynaudio Special Twenty-Fives (June 2005, www.stereophile.com/standloudspeakers/605dynaudio).

Let's just say that, like Dr. Johnson's dancing dog, it was impressive that they could do it at all. I don't mean that the Icon sounded terrible, but it was a stupid party trick. If you own inefficient speakers, don't buy the Icon and expect to rock out. If you have an Icon, don't buy inefficient speakers.

And no, the Icon didn't epically distort, but it couldn't muster much in the way of depth or, more important, dynamic contrast on such tracks as "A Walk in the Rain," from the Marvin Sewell Group's *The Worker's Dance* (CD, Llewes 7124). "Rain" is filled with textures and detail—from soft accordion sighs to percussive details and Jerome Harris's lonesome bass wails—and they simply weren't alive through the demanding Ushers.

If you said that I chose the wrong speakers, you'd be correct. But I'd been hearing some outrageous claims about the Icon, and while many of them are indeed true, you have to choose horses for courses for it to amaze.

I can't win

So I lugged (ha!) the Icon into my larger, home-theater room and set it down between the 91.5dB-sensitive Definitive Technology Mythos STS SuperTower speakers (see my August 2008 review at www.stereophile.com/floorloudspeakers/808dt). Pairing a 6"-wide amp to a pair of 48"-tall towers may look like an epic fail, but remember that >90dB sensitivity—and that each Mythos has its own powered subwoofer.

I cued organist Cameron Carpenter's performance of J.S. Bach's "Evolutionary" Toccata and Fugue in d, BWV 565 (CD, Telarc CD-80711). Omigawd! The Mythoses simply roared—the furiously pedaled bass made my home theater's paneling buzz. Man, the Icon really rocked the DefTechs.

Then I settled down and listened again to "A Walk in the Rain," this time at a rational loudness. The sound was full-bodied and timbrally rich, yet I was now aware that the Icon was somewhat noisy with high-efficiency loudspeakers. It turns out that this is a known issue at NuForce. They don't recommend using the Icon with speak-



The Icon, its power supply, and its accessories fit into a tote-sized case.

ers above 92dB sensitivity, because the \$249 integrated has more switching noise than their top-end amplifiers. They do make a solution for them what wants to pair it with hi-eff speakers, though. For \$149, the Icon owner

DAC, and it's styled and built to a fare-thee-well. Who cares if it doesn't drive \$3000/pair audiophile speakers better than the high-priced gewgaws? Not me—and I'm picky.

I don't think NuForce designed the

AT \$249, THE NUFORCE ICON IS AN AMAZING LITTLE INTEGRATED AMPLIFIER WITH USB DAC, AND IT'S STYLED AND BUILT TO A FARE-THEE-WELL.

can purchase an RJ45CX-F filter that will roll off the noise above 40kHz. Of course, that turns the \$249 Icon into a \$398, 12Wpc integrated amp, thus complicating the value issue.

I surrender, dear

Don't believe the hype. You don't *have* to hype the NuForce Icon—it is what it was designed to be, and it's all of that *and* a bag of chips. At \$249, it's an amazing little integrated amplifier with USB

Icon for people who have \$3000 speakers or are comfortable buying them. The Icon is a "Now I get it" product for people who think good-sounding audio is expensive and silly. The Icon is good-sounding and *not* silly. It's the kind of amp that someone who spent \$250 on an iPod could listen to and want—and afford. I loved its performance on my desktop, and I could see it as the heart of an entirely satisfying dorm-room or guest-room system. Heck, pair it with a pair of, say, Paradigm Atom v.5s (see my September 2007 review, www.stereophile.com/standloudspeakers/907para) and you'll have a \$500 combination that will make your jaw drop. Often.

And that's just considering the Icon as an integrated amplifier. Add to that impressive performance a very satisfactory headphone amp *and* its very nice USB DAC, and it's hard to think of the Icon as anything other than a stone bargain. Its solid build and great styling are just icing on the cake.

I think I now know why the Icon has a capital *I* and the other iPod-inspired products don't: It *deserves* it. ■

ASSOCIATED EQUIPMENT

- DIGITAL SOURCES** Apple Macintosh pro G5 computer; Simaudio Moon Evolution SuperNova, Bel Canto e.One CD players; Musical Fidelity XDAC^{v3} D/A converter.
- LOUDSPEAKERS** Axiom QS8, Definitive Technology Mythos STS SuperTower, Usher Be-718.
- HEADPHONES** Phiaton Moderna MS 400, Shure ES 530.
- CABLES** Interconnect: Kimber Kable KCAG. Speaker: NuForce RJ45 1m.

—Wes Phillips