It is five years since AudioQuest first launched its DragonFly portable headphone preamplifier and DAC. Now it has two upgraded models: The DragonFly Black and the higher-specification DragonFly Red. It’s the Red that we’re looking at here.

THE EQUIPMENT

The AudioQuest DragonFly Red is a tiny little thing, pretty much about the size of a USB stick, with a swelling at the end furthest from the plug. That swelling is to accommodate a 3.5mm socket for plugging in a line-level device or headphones. It is finished in a very classy-looking—almost iridescent—red gloss and decorated with a white dragonfly inset into the surface.

But it turns out that the white dragonfly is capable of showing different colours due to LED illumination behind it, with colour codes for the supported 44.1kHz, 48kHz, 88.2kHz and 96kHz sampling rates. That I like. Sometimes computer audio can be a bit tricky, and visual confirmation that your hardware is receiving the right signal—not something that has been resampled—is welcome. The DragonFly comes with an end cap to protect the USB plug when it’s not in use, plus a leather pouch for storing the device itself. Not a large leather pouch—overall the DragonFly Red measures on 19×12×60mm (WHD). AudioQuest’s DragonFly Red weighs 21 grams (which, although light, is almost eight thousand times heavier than a real dragonfly, which weighs around 0.00283495 grams).

Inside the DragonFly is an ESS Sabre ES9016 DAC, along with an ESS headphone amplifier. I was hoping to provide some details on the DAC, but ESS seems to have gotten rid of documentation on its older models from its website. There’s no guarantee that details on the latest versions, with various letter suffixes appended to ‘9016’, are the same. What is known, though, is that this is a full 32-bit DAC with very low noise and a highly effective digital volume control.

There is an ongoing debate amongst audiophiles about whether it’s best to adjust the volume output of a DAC by scaling the signal in the digital domain or leaving it ‘bit perfect’ and applying an analogue volume control. The main downside of the former is the potential to lose resolution, and thus increase the noise floor, especially with 16-bit material. But everything is converted to 32-bits in this DAC and it can do the scaling internally. Remember, 32-bits is not double the resolution of 16-bits; it’s more than 65,000 times the resolution of 16-bits. In order to generate a noise floor equivalent to that of regular CD resolution, the volume level would have to be turned down by more than 96dB from full scale... at which point you’d be extremely hard-pressed to hear the music at all, let alone any noise a further 90+ decibels down.

The DragonFly Red has one possible limitation: it won’t support anything above 96kHz, 24-bits of resolution... at least not natively. Thanks to its included support for Meridian’s MQA, higher resolutions are possible, although these typically come at the cost of reduced bit depth. Neither will the unit support Direct Stream Digital, the format so beloved by single-bit enthusiasts.

All that’s because the device conforms to USB Audio Class 1.0 standard, rather than the USB Audio Class 2.0 standard to which most high-end DACs conform. Class 2 came about to allow the use of audio streams beyond 24/96. The problem with it has been that it hasn’t been supported by Windows until, as it happens, earlier this year with the ‘Creators Update’ to Windows 10 (also known as version 1703). That means that while USB Audio Class 2.0 DACs could be plugged into a Mac, or indeed into many Android phones, with no further ado, to use one with Windows a device-specific driver has been required. AudioQuest seems to have decided that keeping things simple is a worthwhile trade-off.

If you are using Windows software that can feed the music directly through to the DAC using the WASAPI interface (e.g. Foobar 2000 or JRiver Media Centre), then you’ll run into problems if you try to play, say, 192kHz material. In those cases, just change the output from WASAPI to Direct Sound and let the software and Windows convert the output. You can set the output for the sound for Windows easily enough. Just type ‘Manage Audio Devices’ into the search box (bottom left side, next to the start button).
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Mini 4, using the USB camera adaptor kit on the Lightning port. With all three it worked very nicely at all four supported sample rates. (With the iPad I used the Onkyo HF player because standard players resample everything to 48kHz.)

In addition to a little loudspeaker use— that is, plugging the output into a line-level stereo input on my hi-fi system—I used three different sets of ear gear for most of my listening. For over ear, traditional head-

phones I used rather up-to-date Oppo PM-3 headphones (currently $599), Sennheiser Momentum In-Ear earphones (currently around $170) and a pair of Sennheiser HD 535 over-ear headphones.

The Oppo headphones are a closed-back planar magnetic design. Amongst their virtues are extended frequency response and a flat impedance curve of 26Ω, which is low-ish, but even with internal amplifier resistance they should impose no particular tonal signature on the sound. The Momentum earphones are fairly bright, lower-still in impedance (18Ω), and fairly sensitive.

A couple of months ago I discovered that one could still acquire replacement ear cups for old, quality Sennheiser headphones, so I replaced the perished ones on my twenty-year-old Sennheiser HD 535 open back headphones (they cost $320 back then) and started listening through them for the first time in many years. They have the virtue—in the context of testing headphone amplifiers—of having a moderately high (150Ω) impedance and a relatively low sensitivity. A phone or iPod is hard-pushed to provide truly satisfying loudness levels with these headphones.

I started my listening with the 535s and whipped them quickly from my ears as soon as the music started playing. I was using Foo-


bar2000 as the player software on a Windows computer and I’d forgotten to reduce the volume which I normally leave at maximum since I control volume with a pre-amp. Dragging it down to something reasonable, I was able to resume listening.

After some random listening, I settled down and took in Joe Jackson’s ‘Body and Soul’ using the PM-3 headphones. The opening cymbals on *Heart of Ice* were open and razor-sharp, yet with the air exhibited by nearly everything on this album (Jackson had been complaining about dry studio recordings, so a real world space was selected for this one). As the other instruments were introduced one by one, each layer remained readily identifiable, each with its own air, each completely comprehensible and full. A couple of the bass notes lacked some of their fundamentals, but that had nothing to do with the headphones, nor the DragonFly Red. That’s due to the challenges of recording in a more complicated acoustic space than a carefully designed studio. Later, *Not Here, Not Now* from the same album had the bass spot-on. The detail was superb. The sound of the action of Jackson’s piano in the opening strains of *Loisaida* wasn’t emphasised, but was there, quietly underpinning the real tones of the music.

A very satisfying level for this album was an indicated –13dB by Foobar. Which is to say, Foobar was willing to go up another 13 decibels… were I so willing, which I wasn’t. Pushing it a few more decibels with hard-


er music—to an indicated –4dB with Rage Against the Machine’s self titled debut—produced the interesting sensation of a com-


bined clean, undistorted, truly high fidelity performance, along with the buzz of aural overload. To be honest, I was sorely tempted to leave that going for several tracks for a truly transporting experience, but a sense of professional self-preservation forced me to disengage after sixty seconds, stop the music and remove the headphones.

But only for a moment… I replaced them with the Sennheiser HD 535 headphones and gave the same track a brief whirl, this time with the volume maxed out to take account of their lower sensitivity. Here I finally ran into a limitation: Insanely loud, yes, but the bass was a touch more recessed thanks to the headphones, the space around the music was about the same, but the gain didn’t quite allow the same sense of being overpowered to be achieved.

Aghh, a quick check with the Momentum In Ear earphones seemed appropriate while everything was fresh in my memory. The space was not as well-handled, a fine gauze slightly veiling it, but the bass was strong and very well-articulated. The same levels were not comfortably achieved, but it was nothing to do with the output from the DragonFly. At an indicated –10dB it was extremely loud (as I am writing this paragraph, I am listening at my accustomed loud level, which requires a volume control setting of –17dB!). But I couldn’t really go beyond that simply because the emphasis of some high frequency elements by those earphones made it sound very dangerous.

Again, an ear gear limitation, not the DragonFly.

Why, you may ask, Rage Against the Machine? Aside from sheer musical pleasure, this is hard, hard music which shouldn’t, but which does, have an amazing amount of space around each note and sound. Any muddiness in the system reproducing it and that space disappears, leaving a mess.

Speaking of space, I returned to music exhibiting this beautiful characteristic after an evening of rest (and recovery of the ears) and immersed myself in the old Sennheisers and the sole album from the Austin Benjamin...
ON TEST AudioQuest DragonFly Red Portable DAC/Headphone Amplifier

Trio, 2008’s ‘Amalgama’. This jazz work from a then-local Canberra outfit is well worth chasing down for not only the quality of the music, but also the way it reveals in sound itself. As I was listening, I felt a little like pinching myself. Should music sound this good, this precise, and whole and rounded, when being delivered by a three hundred dollar gizmo which would almost fit inside a matchbox?

What I’d felt was receding bass in the old headphones the previous night was now perfectly balanced bass, with great extension, especially in the opening overture. The kick drum was used sparingly—just three of the most gentle of taps, and it sounded as though an orchestral bass drum was being brushed, with a deep, filling resonance. On Honest Iago both the kick drum and the double-bass were full realised, and the percussion dancing around and above the piano was utterly coherent, even in the midst of the chaotic, busy midsection, shortly before the restoration of laconic order.

TEST RESULTS

The unit produced a very healthy, and very clean, 2.06 volts RMS into a 47kΩ load. That was at the full output volume—essentially, an unmodified digital stream from the computer to the DAC. There was the tiniest amount of clipping on the bottom of the waveforms when delivering full output into 295Ω. With a 0.7dB reduction in output the waveform cleaned-up. That left the output at 1.91 volts, or a respectable 12.4 milliwatts. That in turn mean an output some 11dB higher than the specification rating of headphones (assuming they’re rated at an SPL level for a one milli-watt input, as many are).

With a 15.9Ω load, clipping was far more severe, and necessitated dragging the input level down to 0.56 volts RMS for clean delivery. That meant 19.9 milliwatts, or 13dB above the sensitivity rating.

I submit that those levels will suffice for all headphones of a kind likely to be used with equipment at this price-point. It may be insufficient for some very exotic models, but owners of those will be aware of their peculiar requirements.

The frequency response was wide and smooth with 96kHz test signals, with a gentle roll-off rather than a sharp filter. It starts very slightly above 10kHz, with the output down by 0.1dB at 11kHz, almost 0.5dB down at 20kHz and 1dB down at 30kHz. At 40kHz output is down by only a touch over 2dB.

THD was just under 0.004% and IM-D+noise was 0.008% or 0.004% depending on whether the computer was running, respectively, on power or battery. That status made a big difference to stereo crosstalk as well: a more-than-adequate 82.9dB on power, and a startlingly good 107.3dB on battery. And noise. With the computer plugged in, the dBa noise level was a 16-bit-like –91.8dB. With the computer unplugged, it was an amazingly low –109.5dB.

The character of the noise was quite different, too. When running on battery, the noise was a flattish floor at –140dB from 20Hz to 40kHz. But with power, it was sloping downwards, starting up near –100dB at the bass end to join the battery-driven noise floor at –140dB near 40kHz (see Graph 3).

Perhaps I should have asked for a sample of the AudioQuest Jitterbug—a $79 USB noise filter—for testing as well. Meanwhile, with the all-important 44.1kHz, 16-bit signals, performance was similarly exemplary. Again at the top end there was that very slight, early roll off bringing the output down to around –0.4dB at 20kHz. The filter kicked in good and hard at 21kHz. The noise was an impressive –97.6dB, crosstalk at 98.6dB, THD at 0.004% and IMD plus noise at 0.005%.

CONCLUSION

Compact, great to look at, works with everything, sounds great, and can even drive higher-impedance, lower-sensitivity headphones. The AudioQuest DragonFly Red is a fine DAC/Headphone amp for anyone who doesn’t demand direct 192kHz or higher—or DSD—decoding.

Stephen Dawson

Should music sound this good, this precise, and whole and rounded, when being delivered by a three hundred dollar gizmo?

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- Excellent mini-headphone amp
- Excellent DAC performance
- Clear visual indication of signal sampling frequency
- Limited to maximum of 24/96