

# DS Audio DS-W1

Decades after its spiritual predecessor appeared, DS Audio's DS-W1 cartridge looks at the grooves on your LPs and declares, 'Let there be light!' Prepare for illumination

Review: **Ken Kessler** Lab: **Paul Miller**

If I had to characterise my first exposure to DS Audio's DS-W1 cartridge with one word, it would be 'disconcerting'. Few products appear that boast a genuinely radical approach to a mature technology, such that I was reminded of the original Apogee, the Final 'laser' turntable and this cartridge's spiritual precedents, more of which anon. An optical pick-up using an LED as a light source? No wonder it costs £6250.

By today's standards, this is a median price for a loony tunes, boutique cartridge. You can drop three times that, if you don't mind spending £10 every time you play an LP, when one considers the cost of a new stylus after, say 1000 hours. Suffice it to say, the price of the DS-W1 also includes its own dedicated phono amplifier because it doesn't feed an MM or MC input, so – in this era of primarily line-level preamplifiers – think of the £6250 as cartridge-plus-phono amp.

## THE CYLON PICK-UP

There is, of course, another reason why you have to combine the DS-W1 with its own energiser/equaliser: the optical system needs a power source. Lo and behold, once you've installed the cartridge, connected your turntable to the outboard box and fed its output into a line input on your preamp, switching it on also activates a red light at the front edge of the cartridge.

Like PM, I too was instantly reminded of the Cylons in *Battlestar Galactica* as well as the obvious hi-fi rival: the equally-illuminated cartridges from Soundsmith. Those with long memories and a penchant for obscure cartridges might recall the DS-W1's grand-pappy, DS Audio CEO, Tetsuaki Aoyagi [see boxout, p55],

**RIGHT:** This shot clearly shows DS Audio's rigid boron cantilever emerging from its compliant mount inside the body of the cartridge. There are no coils or magnets inside!

recounted the events leading up to the creation of a cartridge that has set tongues a'wagging among analogue flag-wavers, citing specifically the model that triggered what is a modern re-boot that benefits from four decades' worth of technological advances.

Says Aoyagi, 'Digital Stream Corp is an R&D company in laser optic technology [among its many accomplishments is the development of the optical mouse with Microsoft] so it is natural for me to search for new applications. When I saw the Toshiba optical cartridge at Dr Yamada's home, I thought of our new optical cartridge design.'

Even though the technology is based on the design of Toshiba's C-100P cartridge (one day, I must find where I put mine...), DS Audio transformed it into a more viable product by refining the concept with miniature laser-optic technologies not available 40 years ago. Aoyagi, a mere 29 years old, admits that he is 'not of the

analogue record generation. In fact, I had never listened to analogue records before getting involved in this cartridge development. My first introduction to analogue sound was at Dr Yamada's home. Even though he is said to be the "Father of DVD", he loves records.

'The sound I heard in his audio room ... I never heard such wonderful sound. Just speechless! I really have no words to describe that fantastic experience.'

**"I never heard such wonderful sound. Just speechless!"**

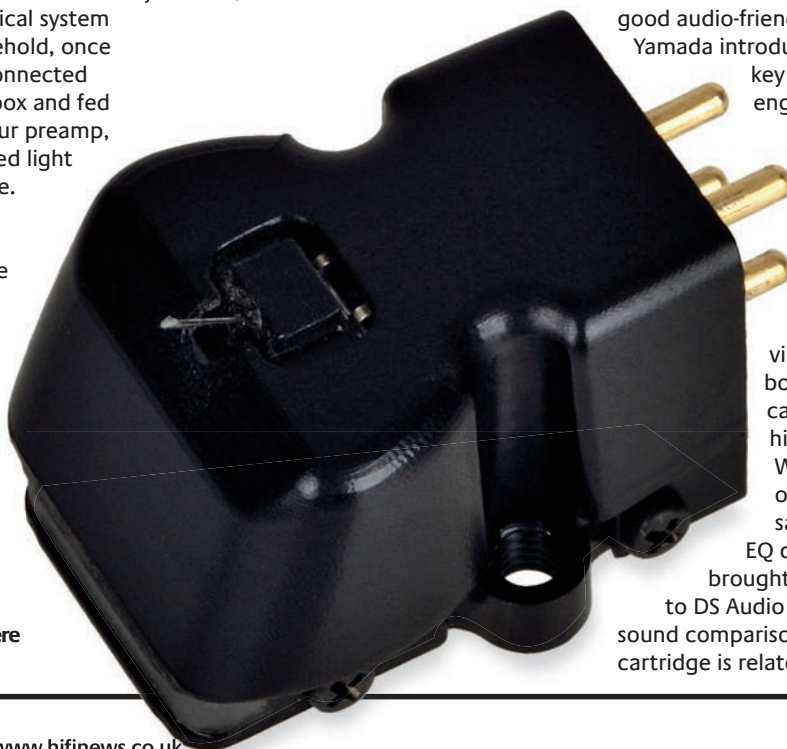
And despite listening to what he feels is the best digital can offer, he adds that, 'Amazingly, Dr Yamada's more-than-40-year-old analogue records sounded far better and deeper than what I usually listen to. It hit my

heart so strongly that I will never forget that experience. Simply fantastic!'

Aoyagi happened to be listening to the Toshiba C-100P optical cartridge, developed by Hamaguchi-san, who worked for Toshiba at that time.

'Dr Yamada and Hamaguchi-san remain good audio-friends even today, and so Dr Yamada introduced him to us. He is now a key resource as chief electrical engineer at DS Audio.'

Hamaguchi-san maintained his belief in optical cartridges, Aoyagi agreeing that 'this is the very best and most advantageous method to reproduce musical information on vinyl. So, Hamaguchi-san bought many C-100P optical cartridges, and kept them in his audio room up to now. When I started to develop our cartridge, Hamaguchi-san supported us for the EQ design, and naturally, he brought his C-100P cartridge to DS Audio for the evaluation and sound comparison. So this is why I say our cartridge is related to the Toshiba C-100P.'





Following the DS-001 launched in 2013 for sale solely in Japan, the DS-W1 (nicknamed 'Night Rider' by the US importer) has been the talk of the hi-fi show circuit for the past year [visitors to the Hi-Fi Show *Live* – see p19 – will be able to hear it for themselves]. As with any cartridge that *isn't* an MM or MC design – again, think of SoundSmith's strain gauge offerings [HFN May '10], for example – curiosity is piqued, especially when its output requires a dedicated box.

Let's deal with the conventional elements first. The cartridge, lightshow aside, looks like any MM or MC, and it employs a boron cantilever and Shibata stylus. This is emphatically not a replay of the Finial, which used a laser to read a groove's modulations. It is installed exactly

as any other, attending to its lightweight of 6.5g and a tracking force of 1.5g  $\pm$ 0.2g. I had no trouble substituting it for a Kiseki Blue in the SME Series V-12, though the arm height had to be readjusted, as did overhang, because the DS-W1's aluminium body is not as tall as the Kiseki's.

PM's boxout [below] explains the inner workings, but you really must approach this as if it were 'normal', especially as the 5.5kg, 325x96x210mm (whd) outboard box takes care of all settings – no worrying about impedance, capacitance, etc – and produces a line level signal you feed into any single-ended line level input. (One wonders, though, why DS Audio didn't also provide balanced XLR output.)

There is only one choice for you to make

**LEFT:** A machined aluminium body and fully-enclosed, threaded lugs ensure the DS-W1 can be cranked tight into any standard headshell. The internal LED light source gleams, Cylon-like, from a decorative strip

when installing this, which is whether or not to use the regular outputs or the pair with the subsonic filter, which cuts off 25Hz and below at 12dB/octave, ostensibly to cope with warped records [but see Lab Report p57].

The black box comes with pointy feet and cups are supplied if you want to site it on a surface that's not spike-friendly. And the usual observations remain about cable choice between the equaliser box and the preamp, which will affect the sound: I opted for Crystal Cable.

Turntables included an SME Model 30/12 with Series V-12, and the SME Model 15 [HFN Oct '15] with regular Series V, specifically because I anticipated odd bass behaviour, and that's the area where the '30 and the '15 differ. These fed an Audio Research REF 5SE preamplifier, D'Agostino Stereo power amplifier [HFN Aug '12], and Wilson Alexia speakers [HFN Mar '13], with Transparent cables throughout.

## SEDUCTIVE SMOOTHNESS

PM is careful not to prejudice reviewers when he previews a new product – unless we need warnings about peculiarities. Before even discussing the DS-W1 with

Paul and confirming my findings with his, I had already experimented with and tweaked the cartridge with the SME's variable damping and anti-skate – the behaviour was as expected of Shibata styli and boron cantilevers, meaning that attention to detail is critical, especially VTA.

Paul did say that the technology had its own inherent advantages, including 'the fact that the response of the cartridge is free of the multitude of small HF

resonances that afflict all MM and MC types'. That in itself is enough to seduce those who came to vinyl after a life of digital, Paul adding, 'It could be the single most important factor in determining the "smoothness" and "blackness" of its sound'. [See Opinion, p111].

Because I'd reviewed the SME Model 15 with the aforementioned Kiseki MC, I ➔

## THE LIGHT FANTASTIC

Inside the DS-W1 light from an LED shines on a photocell, which generates an electrical current that's modulated by the (rear) of the vibrating cantilever interrupting its path. It's a derivative of the technology used in optical pick-ups for guitars and for optical mice. In this case, power is fed to the LED via the cartridge's R- and L- pins while the output is returned via R+ and L+. In practice the output of the optical pick-up – its sensitivity – is optimised by matching the wavelength of the internal LED to a photocell that offers the highest efficiency. But the DS-W1's uniqueness doesn't end here.

Traditional MM/MC pick-ups are velocity-sensitive devices whose voltage output not only increases with groove excursion but also with frequency (as the stylus moves more quickly). By contrast, DS Audio's photo-electric conversion is solely sensitive to the *amplitude* of the movement of the stylus. However, as LPs are cut with the RIAA replay characteristic then both MM/MC and optical pick-up types still require equalisation before the audio signal is passed to a standard line-level pre or integrated amplifier. PM







**ABOVE:** DS Audio's power supply for the DS-W1's internal LED is housed in this substantial enclosure along with the custom phono equaliser. Spiked feet sit in cups made of the same alloy

dug out the same LPs and took to my notes to see if they could explain what was indisputably a 'different' kind of presentation. I wanted to start with something lean and clean, so I could discount, say, audience noises or too much clamour, so I chose Dire Straits' *Brothers In Arms* [Mobile Fidelity MFSL 2-441].

We aren't allowed to use expletives in this magazine, but the first words I issued upon hearing 'Money For Nothing' rhymed with what a chicken would say if it asked a butcher to remove its feathers. Pace/rhythm/timing drivel had nothing to do with what I heard. Rather, the DS-W1 had its own ideas about soundstage shape, detail retrieval, 'air' and tonal balance.

## ROCKING AND FLUID

Yes, I was *shocked* at the incredible dynamic sweeps, the blackness of the background and the speed of transients. I was less enamoured of the bass, though, which was more overwhelming than I expected: not fat, not too rich, not bloated, just pronounced in the manner of modern listeners' preferences. But then I listened to the vocals, and they were a

spot-on match in every way for what I had heard via the Kiseki moving-coil.

So I had to ask: was what I heard relative to the Kiseki more at variance than if I played a Shure V15 V followed by a Clearaudio Goldfinger [HFN Jan '15] and then a Decca Gold? No, it wasn't. I was letting the novelty of the technology upset my objectivity, allowing it to produce expectations that coloured my reactions.

'Here's what matters most: it was coherent and consistent'

The Dire Straits album sounded as rocking, fluid and involving via the DS-1W as through the Kiseki, but the 'attitude' – and that's the best word I can find to describe it – was altered. Analysing it, everything

was as it should be: fast guitar licks, layers of sound. It was clear that the soundstage was not as wide as the Kiseki's, let alone a Denon DL103's, and the treble couldn't cut through a haze with the surgical slicing of a Decca, but here's what really mattered: it was coherent and consistent throughout.

But, aah, the bottom! My system as it stands is already balanced on a precipice of 'too much bass'. The DS Audio tipped it over that point more than once, so I tried the outputs with the subsonic filter: it made no difference. I fiddled with

## TETSUAKI AOYAGI

By eliminating the heat of the old 'lamps', the sheer bulk and other problems of the past that restricted the success of the original Toshiba design, DS Audio has delivered a fascinating alternative to MM, MC, Moving Flux and other cartridge types. Getting there wasn't simple.

CEO Tetsuaki Aoyagi states succinctly that the most difficult challenges to overcome were 1) to get the signals out of the vinyl, 2) to fit the optical components in a small space and 3) fine-tuning. 'We never developed cartridges before, and to make a cartridge with an optical methodology was totally new to us.'

Regarding the first challenge, he says, 'Our initial sample could only make a tiny sound at the maximum volume of our amp. We tested many LEDs, the distances between them, the slit size. Slowly, we began to understand how the signals are coming out and how to control our optical system to optimise the performance. Now the output is roughly over 30mV.'

As for the fine adjustment/tuning, he says, 'The optical system is very sensitive to adjustment errors in general. How to adjust the position of the LED itself, for example, was a big challenge. We had to check four outputs: L-AC, R-AC, L-DC, R-DC. To adjust to the best position simultaneously was an almost impossible task. We improved the process to make this adjustment more accurately and quickly – because we believe this almost precise optical alignment defines the core sound quality that our customers are looking for.'



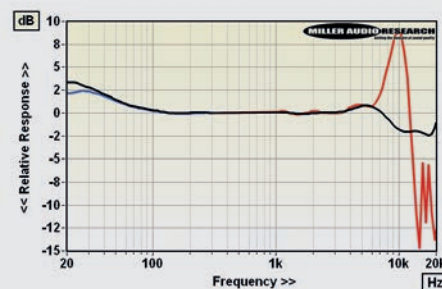
**ABOVE:** The rear of the equaliser carries just three sets of RCA phonos: 'In' connects to the tonearm leads while 'Out' provides a line-level feed (with limited bass filtering via 'Subsonic') to your preamp

## LAB REPORT

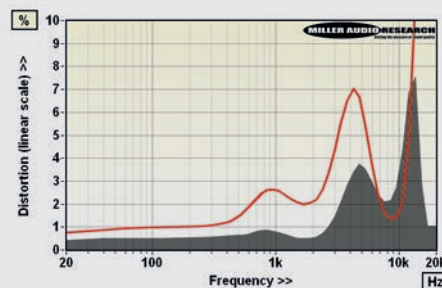
### DS AUDIO DS-W1

With a recommended downforce range of 1.3-1.7g and tested at 1.5g, this innovative pick-up proved to be a superb tracker, surmounting the maximum 80µm groove pitch and clearing both channels at +18dB (315Hz lateral cut, re. 11.2µm at 0.5% THD). However, distortion was uniformly higher on the left than right channel with our sample (1.5% versus 0.3% at 315Hz/+9dB), despite meticulous alignment in the SME 20/3 test rig. Furthermore, free of internal magnets, its overall bodyweight is a mere 6.5g so its 25cu compliance delivers a low 8Hz subsonic resonance in medium mass arms. This is emphasised by the DS-W1's strong sub-100Hz bass amounting to +4dB/20Hz (or +2.8dB/20Hz via the filtered 'subsonic' output – not ideally suited to big, reflex-loaded loudspeakers!

The fine line contact diamond is beautifully finished although the practical VTA is closer to 29° than 20°. Output is a healthy ~0.77V via the equaliser (re. 1kHz/5cm/sec) but symmetry is not the DS-W1's strong suit as evidenced by the differing L+R and L-R responses [see Graph 1, below]. The smooth and extended lateral response [black trace] indicates that centre-stage images (solo vocalists, etc) will be very uniform-sounding, while the vertical 10kHz/+10dB resonance may well bring a 'sting' to detail at the periphery of the soundstage. Distortion is also higher here too while stereo separation all but collapses above 12kHz. Readers may view a comprehensive QC Suite test report for the DS Audio DS-W1 pick-up by navigating to [www.hifinews.co.uk](http://www.hifinews.co.uk) and clicking on the red 'Download' button. PM



ABOVE: Frequency response curves (–8dB re. 5cm/sec) lateral (L+R, black; subsonic filter, blue) versus vertical (L–R, red). See Opinion, p111 for more...



ABOVE: Lateral (L+R, black infill) and vertical (L–R, red) tracing and generator distortion (2nd-4th harmonics) vs. frequency from 20Hz-20kHz (–8dB re. 5cm/sec)

### HI-FI NEWS SPECIFICATIONS

Generator type/weight	Optical / 6.5g
Recommended tracking force	1.3-1.7mN (1.5mN)
Sensitivity/balance (re. 5cm/sec)	767mV / 0.40dB (from Eq unit)
Compliance (vertical/lateral)	15cu / 25cu
Vertical tracking angle	29 degrees
L/R Tracking ability	>80µm / >80µm
L/R Distortion (–8dB, 20Hz-20kHz)	0.9–5.5% / 0.65–7.5%
L/R Frequency resp. (20Hz-20kHz)	+3.9 to –9.7dB / +3.8 to –9.5dB
Stereo separation (1kHz / 20kHz)	33dB / 4dB

another cable, changed the tracking force by a tenth of a gram. The bass remained heavy...

### GLORIOUS ANALOGUE-NESS

Rather than censure the cartridge, I accepted that the DS-W1 was, like certain loudspeakers, over-endowed down below. And that's something one would take into consideration when system building. It's not a condemnation, but an observation. Despite it, the transparency was glorious – thanks in part to the silences – while the midband was warm without being too sultry.

I hooked up a pair of LS3/5As for a laugh and, sure as shooting, the midband really is BBC-neutral, while the lack of lower octave activity from an LS3/5A ameliorated the bass issue.

Needing something from the other end of the spectrum, a session not sculpted in a studio, I played Lionel Hampton's *Newport Uproar!* [Pure Pleasure LSP-3891]. I was not expecting the DS-W1 to be as big-band-friendly as an MC, but here the Kardashian-esque lower registers supported the 20-piece orchestra with mass and scale appropriate to the performance. Everything sounded natural, as glorious in its analogue-ness as if I were hearing a Decca Maroon.

Again, the soundstage was not as voluminous as I know it to be, but neither was it worrisome. It was as far removed as could be from that sorry near-mono condition which circa-1985 'flat-earthers' deem to be acceptable 'stereo'. No sane audiophile with an understanding

of three-dimensional sound would complain. It was no more than the difference between two grades of cable from the same maker.

Turning to Bob Dylan's *New Morning* [Mobile Fidelity MFSL 1-425], the DS-W1 proved expert at dealing with its variety of unamplified instruments. There are certain albums, and this is one, that evoke a sense of 'woodiness', and I don't just mean the bodies of the guitars. I can almost smell cedar when I simply think of them. For all of its science-fiction-like high tech, the DS-W1 managed to sound as rustic as *New Morning* warrants.

But the killer moment? The piano salvo that starts 'Take It To The Limit' on Etta James's *Deep In The Night* [Pure Pleasure PPA-BSK3156]. If ever piano playback lacked artifice, it is here. Via the DS Audio cartridge, the majesty shone through. ☺

### HI-FI NEWS VERDICT

With the DS-W1, it's as much about fascination with the technology as it is the merits of the actual performance. It is, by any measure, a superlative device, a serious contender in its price class, with the bonus of its own equaliser/PSU. The sound, though, is enough of a departure from classic MC or MM behaviour that you absolutely must hear it, like going from ribbons to ESLs. Bloody clever, too.

Sound Quality: 88%



**LEFT:** Another view of DS Audio's precisely aligned boron cantilever and robust alloy body. The cartridge pins are gold-plated and well spaced to accommodate most tonearm leads/tags – power for the internal LED is supplied via the green and blue pins

