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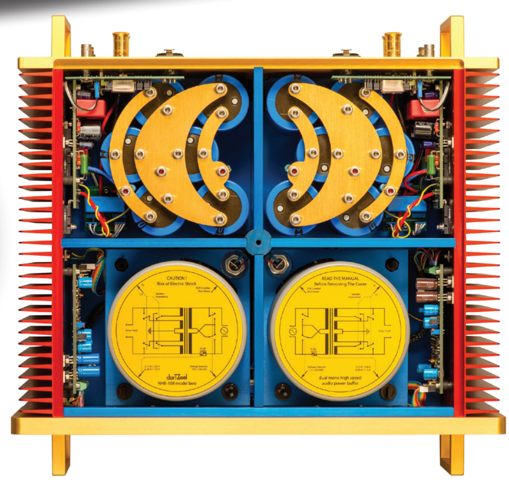

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JIM AUSTIN

CH Precision D1.5

SACD/CD/MQA-CD PLAYER/TRANSPORT

There's a school of thought that maintains that among all hi-fi components, the D/A converter is easiest to perfect or come close to perfecting. Just make sure that every sample is converted accurately, that there's little rolloff in the audioband, that aliased images are suppressed almost completely, and that background noise is extremely low, and you have a top-quality D/A processor. Use of a high-quality DAC chip is assumed.

The transport part of the player is even easier to nail, this thinking goes, because all it needs to do is extract the data accurately, something any box-store CD player can do. Jitter? No need to worry about that, or anything happening in the time domain, as long as the data are transferred to a decent DAC via an asynchronous isochronous interface and reclocked inside the converter. Reclocking salves all digital wounds, or so this thinking goes.

What's especially reassuring to like-minded audiophiles is that all this can be verified with a simple set of measurements that almost anyone can do; all you need is some affordable software and a $150 USB computer interface—or, at most, an Audio Precision analyzer, which isn't cheap but costs half as much as Michael Fremer's reference phono preamplifier.

Such an approach allows the manufacture of players and DACs that can be sold for perhaps $1000, or even several hundred less than that, assuming it's manufactured in a low-wage country. Manufacture it in the US or Europe and, even if it's built to an exceptionally high standard, the price can remain quite low.

A top-quality digital source, then, is a commodity, like gasoline, a dozen eggs, or flash drives. It's pointless to spend more, or so the thinking goes. Or perhaps not.

Digital is analog

The subject of this review—the CH Precision D1.5—is hardly a commodity. Fundamentally, it's a transport, built to a very high standard and equipped to read and output data from CDs, SACDs, and MQA CDs. But it's modular. It accepts add-in cards that turn it into a CD/SACD/MQA-CD *player*.

Equipped as a transport—with, of course, a digital output card—the D1.5 costs a formidable $41,000. Equipped as a player, with two mono DAC boards added in, the price rises to $46,000.

As I prepared to write this review, I spoke by Zoom with CH Precision's two principals: Florian Cossy, the "C" in CH Precision and also in "CEO," and Thierry Heeb, the "H" in CH Precision and a senior researcher at the University of Applied Sciences and Arts of Southern Switzerland specializing in audio/video DSP. Cossy and Heeb are both engineers, Cossy on the analog side and Heeb—obviously—digital.

During our chat, both admitted the possibility, even the likelihood, that other, quite different approaches could be equally valid. Still, they have their own vision, their particular approach. Their job, as they see it, is to execute that vision to the best of their collaborative abilities. So, what is that vision?

"I would say that one very important point in digital products apart from the pure software part is that it's actually analog design," Heeb said at the start of our interview. If there was a broad theme, that was it. "Even if the signals or the electrical signals are supposed to be digital, basically just two levels, a zero and a one, as

SPECIFICATIONS

Description CD/SACD/MQA-CD player/transport supporting "Red Book" CD, CD-R, CD-RW, MQA CD, hybrid and single-layer. 800 × 480, 24-bit AMOLED display. User control via dual-concentric rotary knob with push function, CH Control Android app, and remote control. Requires 100V, 115V, or 230V AC (switchable) at frequencies from 47Hz to 63Hz. Maximum power consumption: 100W, <1W standby. Digital outputs: CH Link HD (proprietary) supporting high-definition uncompressed audio and control; data rates: 16/44.1 or 24/88.2kHz (CD, MQA CD); 1 bit/2.8224MHz (SACD); AES3: 16/44.1 or 24/88.2kHz (CD, MQA CD); 24/44.1, 88.2, 176.4kHz or 1/2.8224MHz DoP (SACD); S/PDIF (RCA) 16/44.1 or 24/88.2kHz (CD, MQA CD), 24/44.1, 88.2, 176.4kHz or 1/2.8224MHz DoP (SACD); TosLink: 16/44.1 or 24/88 (CD, MQA CD); 24/44.1, 88.2, 176.4kHz or 1/2.8224MHz DoP (SACD). Analog outputs (with two mono analog boards installed): True balanced stereo pair (XLR); Single-ended stereo pair (RCA and BNC). Output level 4V RMS balanced, 2V RMS single-ended. Frequency response (–3dB): DC–30kHz (SACD, balanced and single-ended, noise-shaping filter enabled); DC–20kHz (CD, balanced and single-ended); DC–176.4kHz (MQA CD, balanced and single-ended, MQA-content–dependent). Dynamic range: 120dB (SACD, balanced and single-ended); 96dB (CD, balanced and single-ended). S/N ratio: 121dB (SACD, balanced and single-ended), 121dB (CD, balanced and single-ended). THD+N: <0.0015% (SACD, balanced and single-ended), <0.002% (CD, balanced and single-ended).

Dimensions (including connectors and feet): 17.3" (440mm) L × 19.4" (492mm) D × 6.3" (160mm) H. Weight: 59.5lb (27kg).

Finish Silver.

Serial number of unit reviewed Y3D1204. Manufactured in Switzerland.

Price $41,000 equipped as transport, $46,000 with two mono analog-output cards. Approximate number of US dealers: 7. Warranty: Three years, parts and labor.

Manufacturer CH Precision Sàrl, ZI Le Trési 6D, 1028 Préverenges, Switzerland. Tel: (41) (0)21-701-9040. Web: ch-precision.com.

soon as you get into an electronic board, they are actually analog signals, current or voltage flowing through components. That is especially true, for instance, for clock signals. If you just consider clock signals as being a shift between two values between zero and one, you don't really get what clock is. The most important point in clocking is in the time domain, with finite resolution. Basically, it boils down to an analog signal again."

Digital has two faces. On the one hand, it's symbolic; that's the "digital" part. Ones and zeros can be stored, read, and processed *almost* error-free (*almost*, because there can be computational errors due to the imprecision of digital data). But when you introduce time into the picture—as you must in audio—and anytime you require signals to be transmitted from place to place, it matters how those ones and zeros line up. Analog concepts like noise and distortion become important, not just for the analog part of the process but in the digital conversion itself. Those imperfections may be too small to cause inaccurate calculations, but that's not the point. The problem comes at transitions: Precisely *when* does zero become one, and vice versa?

This is hardly a new idea. The concept of jitter has been around as long as digital audio itself. (Longer, actually.) But isn't it a solved problem? Perhaps not. In an "on background" interview some months ago, a different well-known designer told me that even very small amounts of jitter can affect ultimate performance—much smaller than, eg, the results of the Miller-Dunn J-Test used by *Stereophile*. Indeed, many digital designers I've spoken to seem laser-focused (sorry) on timing accuracy.

Is that all it is then—just jitter? That's a big part of it, but no, not all. Also important is the timing precision of the digital conversion itself; Cossy and Heeb call it time-smearing. (So do Bob Stuart and the MQA folks.) More on this below.

The D1.5

I'll be auditioning the D1.5 as a player, but, as I said near the beginning of the article, it is fundamentally a transport, so let's focus first on the transport part.

Transports are relatively simple things: They spin silver discs and read the data on them. Even inexpensive transports can read data just fine; in the absence of defects, damaged discs, and intense vibrations, reading errors are rare. But if you're a perfectionist and you're building a transport, you acknowledge the analog nature of digital and aim to produce a datastream that's as pure as it can be, as perfect as possible when it arrives at that last little bit of wire before the D/A conversion. To do that, you have to account for vibrations and electronic noise.

A CD rotates at midrange frequencies, in the 200–500rpm range. (The spinning frequency varies depending on which part of the disc is being read.) SACDs spin faster than that. Any eccentricity in the disc will cause vibrations at those frequencies. Especially inside an electric or magnetic field, vibrations can translate directly to electrical noise.

If you want to solve this problem, you start by leaving off components, such as ceramic capacitors, that translate vibrations directly into electrical noise. (As Heeb mentioned in our interview, a ceramic capacitor is essentially a microphone.) The other thing you must do is keep vibrations away from wires and other circuit elements.

"In the D1.5, we completely redesigned the optical unit," Cossy said in the interview. In the D1, which used a high-quality drive from another manufacturer, the optical units were "mounted on very thin steel plate and inverted rigid dampers. There is a resonant frequency of this block which is between 300 and 800Hz. It is exactly where we don't want it to be"—right in the midrange and right in the range of the spinning CD.

So, in moving from the D1 to the D1.5, they redesigned the optical unit. The optical pickup and motor are now mounted on a brass "sled." The unit as a whole now "weighs 1.5kg instead of a few hundred grams." Resonant frequency is inversely proportional to mass, so that brings the resonant frequency way down. "We've been able to lower the resonant frequency to 25Hz," Cossy said.

Alpha GEL dampers isolate the mechanism from the chassis and the chassis from the mechanism;[1] these dampers are "fine-tuned to filter vibration down to AC mains frequencies," Cossy said. The chassis itself is reinforced with a rigid support frame made with more than 4lb of machined aluminum.

One reason some people—including me—are fond of turntables is that they're simple, mechanical devices. I like CD transports for the same reason: They employ principles of design that are easy to understand. As a transport, the D1.5 checks all the boxes.

Built in to the D1.5—after the transport but before the add-in DACs installed in the "card cage"—is a DSP unit that serves two main purposes. It decodes MQA CDs and upsamples CD data.

As a player, the D1.5 is capable of full MQA-CD decoding, which is followed by upsampling to DXD. Via its proprietary CH-Link connection, the D1.5 can output "MQA core" data stored on disc, "unfolded" to 88.2kHz, equivalent to what Roon or Tidal output with MQA-encoded files if you don't have an MQA-capable DAC. MQA says this is better than CD but not as good as all-out, fully decoded MQA.

Conversion

Cossy: "The DAC chips we are using are the WM8742." It's a sigma-delta chip produced by Wolfson/Cirrus Logic. (Cirrus bought Wolfson in 2014.) It became clear to me during this interview that CH Precision uses these DAC chips only for their core conversion function, ignoring the chip's peripheral features that are performing other critical calculations in software. "These chips accept eight times base frequency, so it's DXD rate. What we do prior to conversion is to transform everything into DXD, so it can be DSD to DXD inside the DSP, it can be 44.1kHz from a regular CD to DXD, or it can be MQA CD to DXD." For MQA data, the MQA "black box" interpolation filter is used.

Early digital focused largely on the frequency domain. As a result, mistakes were made. The "Red Book" standard for CDs settled on a sampling frequency of 44.1kHz because that was the minimum rate needed to cover the full audible range (you must sample at twice the bandwidth in order to allow "perfect" recovery of the original time series, which gets us up to a sampling frequency of 40kHz) plus a narrow transition band to allow for bandwidth-limiting.[2] But the folks who defined the "Red Book" spec didn't allow enough room for optimal filters—just sharp, fast ones. Sharp and fast in the frequency domain equal broad and slow in the time domain. At CD resolution, you can get near-perfect frequency response or good time-domain performance, but you can't have both.

"Another point, which is very specific to CH, is that we don't believe that much in the necessity of achieving pure 20kHz, 0dB passband," Heeb said in our interview. "That almost never happens in nature. As soon as you go back from a sound source, you will have a high-frequency rolloff in any case."

1 Alpha GEL is a trademark of the Taica corporation of Japan.

2 Here's the first problem for those who believe that bits-is-bits: The perfection Shannon's theorem promises can be realized only for information that is strictly band-limited, to half the sample rate. Which, for real music, means that you must low-pass–filter the signal before you can convert it. You can argue that nothing matters if you can't directly hear it, but if your standard is to perfectly recreate what was captured on the recording—well, there goes "perfect."

MEASUREMENTS

I tested the CH Precision D1.5 SACD/CD player/transport with my Audio Precision SYS2722 system.[1] As the D1.5 doesn't have digital inputs, I assessed its performance, using its own power supply and internal clock, with a Sony test SACD and a CD-R with 16-bit test signals.

I used the *Pierre Verany Digital Test CD*, which has gaps of various lengths in the data spiral, to check the D1.5's error correction. The Compact Disc Standard requires only that a player cope with gaps of up to 0.2mm in length, but the D1.5 played the tracks with gaps up to 2mm without audible glitches, which is excellent performance. However, the player wouldn't read the disc when a single gap was 3mm long or there was a succession of two gaps, each 2.4mm long.

The D1.5's output with a 1kHz signal at 0dBFS was 3.71V, balanced, and 1.85V, unbalanced, with both CD and SACD data. The balanced output impedance was a low 69 ohms from 20Hz to 20kHz. The single-ended output impedance was an even lower 31 ohms, again at all audio frequencies. The CH Precision's impulse response (fig.1) indicates that the player doesn't invert absolute polarity and that its reconstruction filter is a minimum-phase type, with all the ringing following the single sample at 0dBFS on the test CD track.

With 16-bit white noise at –4dBFS (fig.2, red and magenta traces), the D1.5's response was flat up to 14kHz but then rolled off sharply, reaching full stop-band suppression at 21kHz, which is lower than the Nyquist frequency of 22.05kHz (green vertical line). The top audio-octave rolloff meant that a full-scale tone at 19.1kHz (blue and cyan traces) was reproduced at –36dB. An aliased image at 25kHz of this tone is present but lies at just –104dB (0.0006%). More significantly, the noisefloor above 20kHz is suppressed by 25dB compared with frequencies below 16kHz.

I examined the D1.5's frequency response in more detail, using spot frequency tones. Playing the test SACD (fig.3, magenta and red traces), the D1.5's output extended to 40kHz, above which it rolled off rapidly. With CD playback (cyan and blue traces),

1 See stereophile.com/content/measurements-maps-precision.

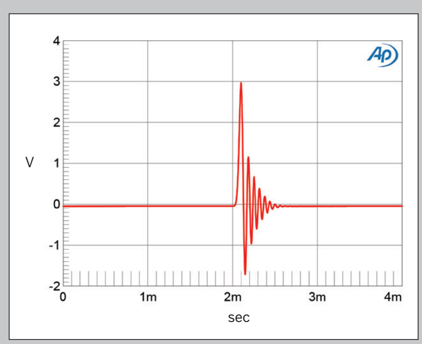


Fig.1 CH Precision D1.5, impulse response (one sample at 0dBFS, 44.1kHz sampling, 4ms time window).

The D1.5's converter "has been designed on a set of principles that we recognize at CH as being important for proper digital audio reproduction or audio reproduction in general. One of the key points is to limit the time smearing of those filters—that is, limit basically the time dispersion that a sample would bring once it is passed through the filter."

Even ignoring jitter, and beyond the narrow transition band mentioned above, the traditional approach to digital conversion has some time slop in it due to the fact that the sampling "kernels" used—the mathematical functions used to divide audio into samples in ADCs and then to reassemble it into a continuous whole in DACs—are longer in the time domain than they need to be. They're *too slow*.

To address this issue, the CH Precision interpolation filter utilizes splines, an algorithm that carries the acronym PEtER. A spline is a certain kind of mathematical function, a smooth, piecewise polynomial.

"It's compact support," Heeb said. "This is exactly what I was talking about before when I told you we want to reduce the time smearing. Time smearing is basically if you put a single pulse through the system, if you have a filter with a very long impulse response, that single sample will extend over a large number of samples. We prefer to use splines, which have a much more compact support, which makes it so that when the sample goes in, what comes out has, in our case, [no more than] 100µs of pre-ringing and post-ringing." 100µs is the target because it's a level of timing precision where errors are thought to be audible. It's a conservative figure; I've seen estimates in the literature as low as 5–6µs.

CH Precision's approach to optimizing timing in digital audio has much in common with the MQA approach. CH Precision tries to achieve as much time compaction as possible without having

measurements, continued

the response was flat to 12.5kHz but then was down by 1.1dB at 15kHz, by 3.9dB at 16kHz, and by almost 10dB at 17kHz. With the ear's reduced sensitivity in the top audio octave, the premature rolloff will be difficult to hear, but it does suggest an error in the programming of the digital reconstruction filter.

Channel separation (not shown) was okay, at 63dB in both directions from 20Hz to 20kHz. The low-frequency noisefloor, examined with a 1kHz tone at 0dBFS on the test SACD, was clean (fig.4), with no power supply–related spuriae present. This graph was taken with the internal supply. Repeating the analysis with the external supply gave an identical spectrum.

Fig.5 shows the D1.5's output spectrum with a dithered 1kHz tone at –90dBFS from the CD (cyan and blue traces) and with a 1kHz tone at –60dBFS from the SACD (magenta and red traces). With the 16-bit data, the noisefloor is actually that of the dither. With the SACD data, the noisefloor drops by 20dB, which suggests a resolution of slightly more than 19 bits, and the third harmonic makes an appearance. With undithered 16-bit data representing a tone at exactly –90.31dBFS (fig.6), the three DC voltage levels described by the data were

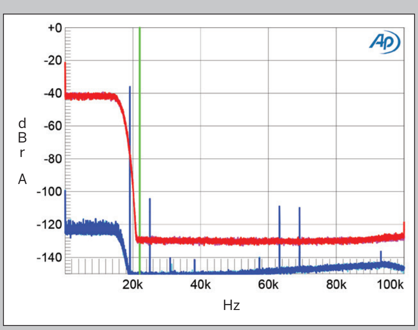


Fig.2 CH Precision D1.5, wideband spectrum of white noise at –4dBFS (left channel red, right magenta) and 19.1kHz tone at 0dBFS (left blue, right cyan), with data sampled at 44.1kHz (20dB/vertical div.).

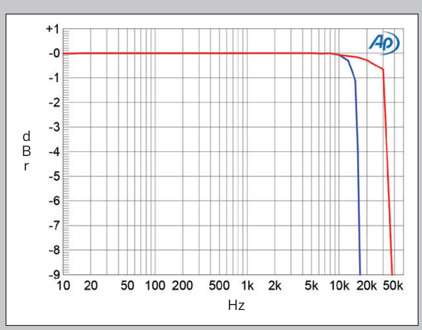


Fig.3 CH Precision D1.5, frequency response into 100k ohms with CD data at –12dBFS (left channel cyan, right blue) and with SACD data at –3dBFS (left magenta, right red) (1dB/vertical div.).

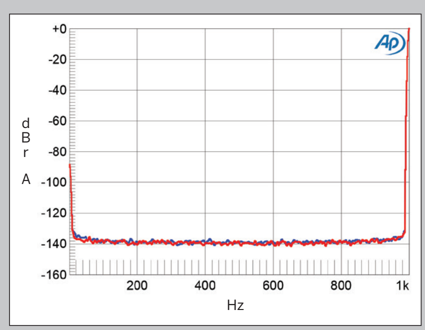


Fig.4 CH Precision D1.5, spectrum of 1kHz sinewave, DC–1kHz, at 0dBFS (left channel blue, right red; linear frequency scale).

access to information about the ADCs used in the original digital conversion—and, of course, without MQA's controversial "audio origami," which reduces file size. Of course, MQA wasn't the first to think about these things, either. Heeb told me that this line of thinking goes back at least to the late 1980s, to Luxman's Fluency DAC, a design based on the splines-related DSP work of Professor Kazuo Toraichi of the University of Tsukuba in Tokyo. Other early splines users in digital audio include Robert Moses of Wadia[3] and Pioneer products employing the "Legato Linear" filter.

A related issue—related, that is, to timing precision—is phase coherence. Heeb: "Phase coherence is extremely important, we find out. What we mean by phase coherence is how the phase at a given frequency compares to the phase at neighboring frequencies. It is important to keep a certain level of what we call coherence between the phase response of adjacent frequency bins. This is one of the key points of the digital filters that we use in the D1.5." Consequently, Heeb told me, when we measure the frequency response, we'll "see that it has a little bit of a rolloff at 20kHz." (Actually, we found more than a little bit, but only at the highest potentially audible frequencies: See the Measurements sidebar.) "On the other hand, it has a very short time localization and implements to the full this concept of phase coherence that I was talking about before. That's really the essence.

"The other very important point that we have in those digital filters is the minimization of the errors in the computing itself," Heeb said. "A typical example would be the errors that round up when you do floating-point representations and [when] you do additions of very large and very small numbers that will create a distortion due to the limited precision [of] floating-point numbers." Get the calculations right, in other words.

That's the CH Precision approach to digital, as manifested in the D1.5, in a hefty nutshell.

3 See stereophile.com/digitalprocessors/wadia_digital_1000_decoding_computer.

measurements, continued

well resolved, the waveform was perfectly symmetrical, and the minimum-phase ringing at the bit transitions is visible.

The CH Precision player featured very low levels of harmonic distortion, with the third harmonic the highest in level at –100dB with SACD data (fig.7). The level of this harmonic didn't increase when I reduced the load to 600 ohms. For consistency with *Stereophile*'s measurements of digital products, I have showed the spectrum of the D1.5's output while it reproduced a mix of equal levels of 19 and 20kHz tones, the signal peaking at 0dBFS (fig.8). (The test signal was from CD-R, as the test SACD didn't include this signal.) The aliased images of the tones at 24.1kHz and 25.1kHz can be seen, but with the premature rolloff of the player's CD reconstruction filter, there are no intermodulation products visible. As was seen in fig.2, the ultrasonic noisefloor is almost 20dB lower in level than that in the audioband, which makes me wonder if there is also an analog low-pass filter present with CD playback.

I tested the D1.5's rejection of word-clock jitter with the undithered Miller-Dunn

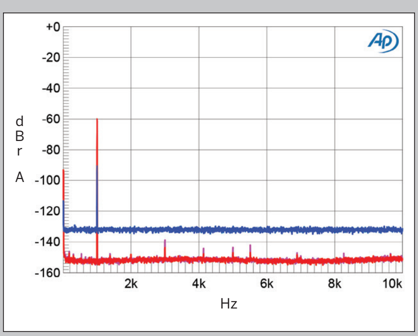


Fig.5 CH Precision D1.5, spectrum with noise and spuriae of dithered 1kHz tone at –90dBFS with CD data (left channel cyan, right blue) and of dithered 1kHz tone at –60dBFS with SACD data (left magenta, right red) (20dB/vertical div.).

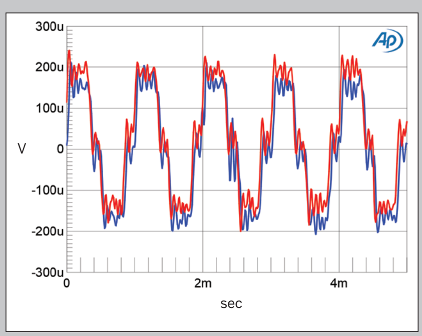


Fig.6 CH Precision D1.5, waveform of undithered 16-bit, 1kHz sinewave at –90.31dBFS (left channel blue, right red).

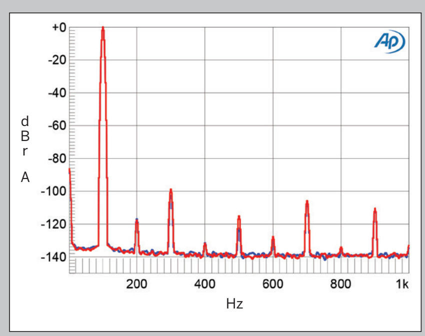


Fig.7 CH Precision D1.5, spectrum of 100Hz sinewave, SACD data, at 0dBFS, DC–1kHz, into 100k ohms (left channel blue, right red; linear frequency scale).

In use

Once you know how to operate it, the control system on the D1.5 is simple and elegant. On the right side of the front panel are two coaxial knobs. Turning the inside knob to the left opens the CD drawer. Turning it to the right closes the drawer. Turning it to the right again initiates play. Turning it to the left stops play. The outside knob, turned clockwise, moves the player to the next track; turning it the other way moves it to the previous track.

The inner knob is also a button; pushing it provides access to the Setup menu, which can then be navigated, intuitively, via the two knobs.

You can also set up most functions on the D1.5, and on other CH Precision products, using the CH Precision app, which however is only available on the Android platform: No iOS (Apple) version is available. There's also an elegant, chunky, metal remote control, with minimal functions: Play/Pause, Stop, Forward, Back, Mute. Some functions can only be performed on the player itself, via its setup menu. If you want to choose a different layer of a multilayer disc—say, the MQA layer on a hybrid SACD/MQA-CD disc, such as those from 2L or Impex, you'll need to get out of your listening chair.

Listening

Reviewing the D1.5 proved a logistical challenge because most of my silver discs are in storage. My reference recordings are mostly files and LPs; I also utilize Qobuz and Tidal for reviews. None of that is helpful in reviewing a transport/player. I dug through boxes to access a few CDs; otherwise, I relied on discs I've received over the last couple of years as promos and review copies.

The first disc I chose was Radiohead's *Amnesiac*, on a regular CD (Capitol CDP 724353276423), which I had recovered from its storage box a few months ago because I wanted to listen to it in my car. I bought this disc at a Barnes & Noble in northwest Washington, DC, during a monthlong stay in that city years ago when I was starting a new job. I recall walking along the Lincoln Memorial Reflecting Pool on a rainy Saturday and lying still on the bed in a meditative state in the basement room I was staying in, listening to this on a portable CD player. This is how Records to Die For are made.

This disc sounds plenty good on anything, including that portable player and whatever cheap headphones I was using circa 2001. Did I hear any advantage to this expensive player? Yes, I did: It was most noticeable in the bass, which felt more fundamental (with emphasis on the root of that word, *fundament*): seismic weight, especially on the 10th track, "Like Spinning Plates." On the third track, "Pulk/Pull Revolving Doors," in the electronic interlude that starts before 9:00, percussion had real, physical presence in the room, even though much of it is electronic. On the final track, "Life in a Glasshouse," the feeling of immersion, amidst a noodling quasi-Dixieland jazz band, was as powerful as I've experienced with two-channel audio, even as I sat 12' from the Wilson Alexx V speakers. Thom Yorke's voice, as haunting as ever, just hung there in space between the two speakers.

From there I moved on to Vladimir Ashkenazy's 1965 recording of Chopin, Debussy, and Ravel on a 2007 CD (Decca 475 8499) from Decca's "The Originals" series. It's a superb performance—the young Ashkenazy was a machine, although a very human one—and a very good-sounding CD. The piano sound is very natural from top to bottom, and the instrument has real, tangible body when it resonates in the lower part of its range.

There's not a lot to say about its reproduction by the D1.5, and I mean that in the best way. The recording sounded the way I've come to expect it to sound, with real sparkle in the highs, lovely tone in the midrange in the powerful, soft passages, and real power when the pianist plumbs the depths. The image of the instrument has depth; you can hear the notes moving back to front as he runs

measurements, continued

J-Test signal. The CH Precision reproduced the odd-order harmonics of the LSB-level, low-frequency squarewave very close to the correct levels (fig.9, sloping green line), and no other sidebands were present.

As the CH Precision D1.5 has digital outputs, to allow it to be used as a transport, I examined the quality of those outputs. Fig.10 was taken from the TosLink output with 16-bit J-Test data plotted over one "unit cycle." The eye pattern is wide open, with almost no blurring of the leading and trailing edges. The average jitter level, assessed with a 50Hz–100kHz bandwidth, was very low, at 340.5ps. Repeating the test with the coaxial S/PDIF output gave an identical eye pattern but with just 253.9ps of jitter. Turning on 2× upsampling gave a similarly wide-open eye pattern (though half the length of that shown in fig.10), with 340.5ps of jitter.

The CH Precision D1.5 offers generally excellent measured performance. It performed well as a transport and with SACD playback, but I remain puzzled by its premature high-frequency rolloff with CD playback.—**John Atkinson**

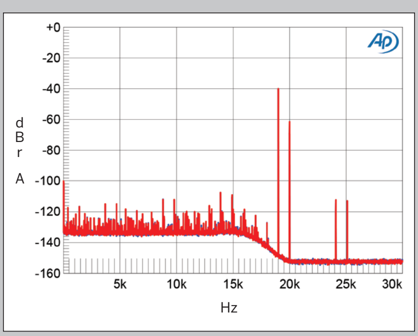


Fig.8 CH Precision D1.5, HF intermodulation spectrum (DC–30kHz), 19+20kHz, CD data, at 0dBFS into 100k ohms (left channel blue, right red; linear frequency scale).

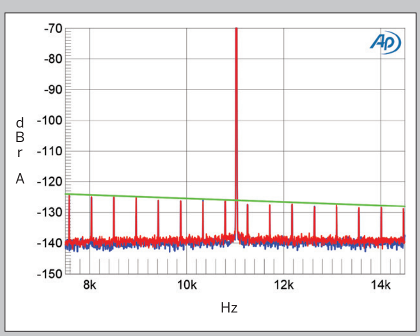


Fig.9 CH Precision D1.5, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz: 16-bit CD data (left channel blue, right red). Center frequency of trace, 11.025kHz; frequency range, ±3.5kHz.

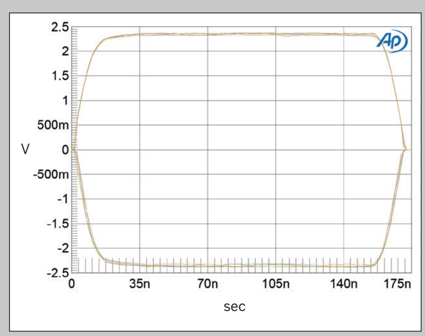


Fig.10 CH Precision D1.5, eye pattern of TosLink data output carrying 16-bit, 44.1kHz J-Test data (±2.5V vertical scale, 175ns horizontal scale).

up and down the keyboard. Better piano recordings exist, but this disc—as played back here—makes a strong case for "Red Book" CD as a valid high-end container for acoustic music.

Clique

Clique, the latest album from Patricia Barber, with liner notes by *Stereophile* jazz critic Tom Conrad, was engineered by Jim Anderson, who has won three Grammy Awards and may well win a fourth, for this recording. (He has already been nominated.) Anderson also wrote the My Back Pages column in the February 2022 issue of *Stereophile*.

Clique is a beautifully recorded album, and much more musically interesting than it seems on first listen, but it took a while to grow on me. The silver-disc version from Impex includes audio in three formats: stereo and surround DSD and MQA CD. Listening at first to the stereo DSD layer, I had the repeated impression of being pleasantly *surprised* by aspects of the sound—the way particular sounds emerged from otherwise empty space, by the creamy texture of one of Barber's vocals (as on "The In Crowd"), by the realism, that in-the-room feeling. Such things caused me to smile and look up with something like delight. It made me think Jim Anderson must have been having great fun sitting at the console, collaborating with Barber and the other musicians in creating this.

What is it about this music, produced by this player and this system, that makes me respond this way? It feels like surprise, the unexpected. Little pearls of piano notes, almost visible, float in space, each with unexpected nuance, inflection, and tonal color. It can be a surprising bit of imaging or surprisingly deep and resonant bass. I sense that dynamics are important in this. Music that's dynamically compressed loses that sense of surprise. Dynamic compression is imposed monotony.

What causes this sense of surprise? I can tell you what it feels like.[4] It's *novelty*. *Nonuniformity*. No order is imposed; the individuality of each sound is preserved. This makes me think of a concept in Zen—the pattern that is *no* pattern, the pattern of perfect randomness, like the pattern leaves form on grass after falling from a tree. No conscious mind could arrange them that way. This is something like that: Natural patterns are untainted. They remain interesting, colorful, artful, human.

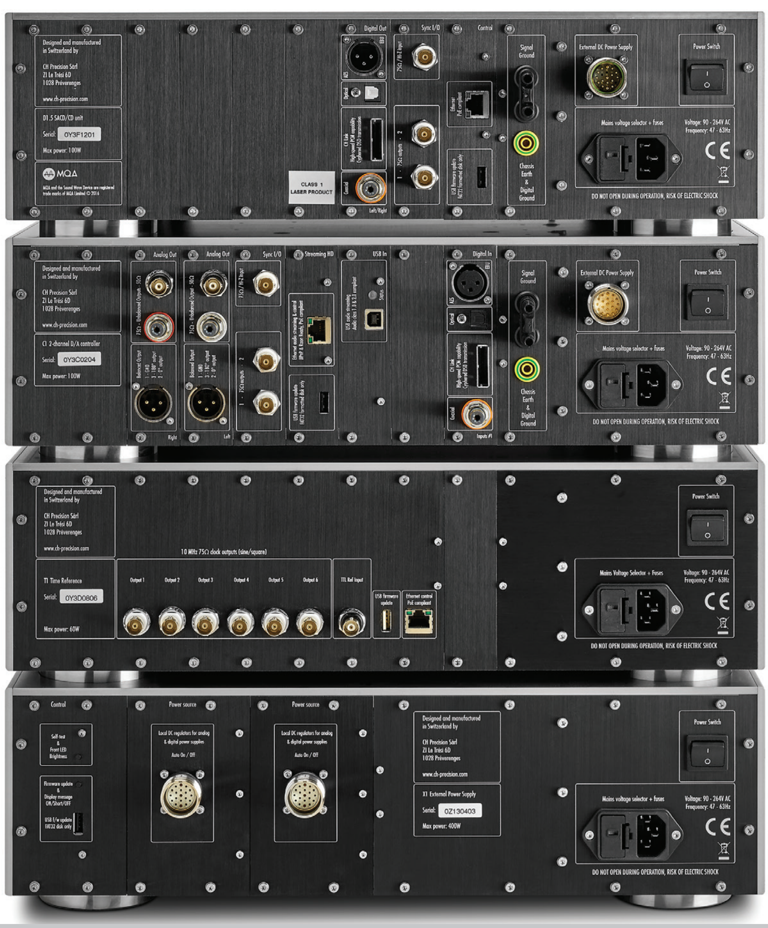
Sometimes, in listening, it's not clear *what* is surprising, what keeps us engaged or re-engages us, but *something* is. *Something* does.

One thing I noticed early on in my time with the D1.5 is how good it sounds at low volume. This sense of surprise was present even—perhaps especially—when the music was playing at background levels. Notes kept their shape—their character—even when the music was quiet.

Why is this all better through the D1.5? Surely, to make a great player, you've got to get a lot of things right, but what sets the D1.5 apart? Considering the focus of Heeb and Cossy in designing the D1.5, as expressed in the interview above, could it perhaps be the timing?

As a final experiment, for now: Using the CH Precision app, I changed the clock source from the D1.5's internal clock to the T1 Time Reference, which was already connected. I don't really understand the use of external clocks when you're using just one high-quality component. If you've got both a transport and a DAC that need to work together—well, then it certainly makes sense. But with just one component, isn't the most important thing to put the clock as close as possible to the digital converter? The external clock would need to be very much better to offset the disadvantages of being external.

I was listening to a recent acquisition, *En attendant* from the Marcin Wasilewski Trio (CD, ECM 2677). With the internal clock, the sound was very good—remarkable in some ways. There was plenty of surprise—sounds popping up all over the stage, with interesting timbre and tonal color, lots of wood and sparkle. But when I switched in the T1 Time Reference, the improvement wasn't subtle. Though I'd been completely unaware of it—completely happy with the sound—it now seemed as though the music had been slouching and now it snapped to attention. More depth, more separation. The stage was slightly bigger, slightly deeper, more erect. Percussion instruments became more distinctive in timbre and in their position in space. The remarkable thing was that now bass had extra impact, quite apparent on the louder low notes of the piano and the upright bass. I don't know why an external clock would make the bass more forceful, but this last experiment makes me think: Yes, it must be the timing.



MQA CD

From the time I first heard about it, MQA CD seemed like an interesting idea. On the one hand, on a 16-bit CD, there's no place to squirrel away data, as MQA is known to do on 24-bit files. On the other hand, if it's true—as both MQA and CH Precision believe—that time smearing is a serious issue in digital playback, then correcting it is likely to be much more audible at CD resolution than at higher resolutions, where filtering need not be as aggressive.

The numbers are still small, but there are more

MQA CDs out there than I realized. Most are on audiophile labels such as Impex, 2L, and Eudora—but the format is becoming more mainstream: Some recent Doors reissues on Rhino/Elektra include MQA CD, and a series of rock-pop MQA CDs (Blondie, Police, Stevie Wonder, King Crimson) has been released in Japan, available as imports at, eg, Amazon.com.

Until now, I'd never had an opportunity to listen to an MQA CD on an MQA-CD–enabled player. (How many such players exist?) Patricia Barber's *Clique* has an MQA layer. It's time to compare it to the SACD layer auditioned above.

I created a shortcut to switch layers, which is very easy to do. Once the shortcut was created, switching layers was trivial, although after each change, the player has to read the disc again, which takes several seconds.

The first thing I noticed: The MQA layer is significantly louder than the SACD layer, by perhaps 3dB.[5] So, for the comparison, I lowered the volume by 3dB.

On the MQA layer, "This Town" (first track) sounded superb. Barber's voice had a lovely, creamy texture. Slap was accentuated on Patrick Mulcahey's bass. After the 2:00 mark, as the music got louder, I detected some congestion. Textures thickened. It was subtle.

Switching back to the SACD layer (and increasing levels by 3dB), I didn't hear *as much* creaminess on the vocals, but they didn't sound worse—just different. I listened for that congestion in the louder parts. I didn't hear it.

Wrapping up—for now

One of the reasons that audio is so addictive—and takes such a big hit on our pocketbooks—is that we get used to a certain level of performance. We raise our systems to a certain level and acclimate. We stop noticing the surprise, and the music starts to bore us again. There are ways around it: meditation, rituals, certain substances—but if we don't employ those or other methods, we may soon find ourselves craving something new, better, and probably more expensive.

Except that sometimes, at a certain level of performance, this doesn't happen anymore. The music keeps surprising us. That level may be different for each of us. Lately, I've had the privilege of listening consistently to very good equipment—I'm used to good digital—and after several months with the D1.5, I never got bored. If that sounds like faint praise—well, it isn't.

Software, of course, is a major variable, which is why I chose a superbly recorded disc—*Clique*—for the most important bit of listening. Some digital recordings have monotony encoded in the bits and pits. Among the CDs I recovered from those boxes was a Philips recording of Schubert's *Winterreisse* by Dietrich Fischer-Dieskau, with Alfred Brendel on piano. It's an early digital recording, from 1985, remastered and reissued in 2001 as part of the Philips "50 Great Recordings" series. It's not a bad recording, just a bit dim: monochromatic and lacking that element of surprise. A player can't dig out what isn't there. Probably.

I've mentioned that I have the whole CH Precision digital system here: the D1.5, the C1 DAC, the T1 clock, the X1 power supply, and a bunch of very expensive cables installed for this review. It's all stacked (appropriately, using CH Precision's interesting stacking system) on an HRS amplifier stand. That's $136,000 worth of CH Precision components, plus the cables and stand. I'm not letting it go before writing about how it all works together—but that will have to wait. For now, my work here is done. ■

4 See this month's As We See It on p.3.

5 Later, I confirmed a 3dB difference by comparing maximum levels.