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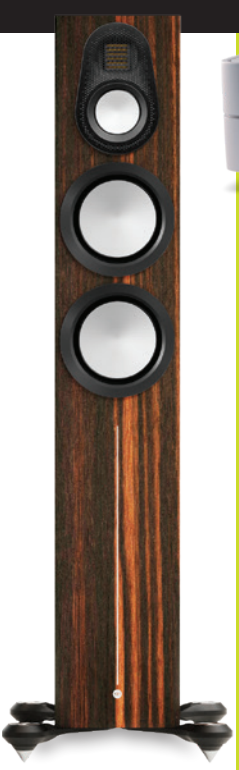

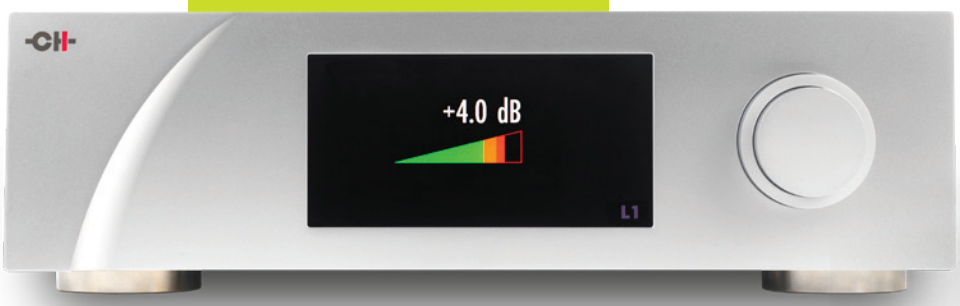

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JIM AUSTIN

CH Precision L1

LINE PREAMPLIFIER

As editor, I love it when *Stereophile* reviews new equipment. "New" attracts readers. But there are good reasons to review stuff that's not totally new (though usually it is still shiny). The best reason is experience, first-hand: You hear a component at a show or in your own system. You're impressed and decide it deserves a closer look.

That's why I'm reviewing the CH Precision L1 line preamplifier ($34,500 in silver), which has been on the market for several years; meanwhile the company has launched a new, even higher-end preamp, the L10.[1] But when, recently, I wrote a follow-up review of the CH Precision M1.1 power amplifier,[2] CH Precision loaned me an L1 so that I could experience the pair together. I admired the L1's performance. I really thought we had reviewed it before—we have reviewed most other CH Precision 1-series products—but when I looked I found that we hadn't. I set out to rectify the oversight.

CH Precision products are expensive. This is true for the 1 series, which long seemed cost-no-object; the recently introduced 10 series costs more. But in line with the impressive price, CH Precision products are sophisticated and well-made, with unusual, well-considered features—features that aim not to expand functionality so much as to optimize basic performance. The L1 is very much a

1 Look for a review of at least one CH Precision 10-series component in the coming months.
2 See stereophile.com/content/ch-precision-m11-power-amplifier-jim-austin-march-2024.

SPECIFICATIONS

Description Modular, dual-mono line level preamplifier with an 800 × 480 pixel, 24-bit RGB AMOLED display, eight inputs (four balanced on XLR, two each single-ended on RCA and BNC); four outputs (two fully balanced on XLR; one each single-ended on RCA and BNC). Relay-based input switching; 20-bit R-2R–based analog volume control with 236 0.5dB steps. Switchable absolute phase and mono settings. Max levels, input and output: 16V RMS balanced, 8V RMS single-ended. Input impedance: selectable 94k ohms or 600 ohms balanced, 47k ohms or 300 ohms single-ended. Output impedance: 50 ohms on BNC, 75 ohms on RCA, 30 ohms (×2) on XLR. Frequency range: DC–1MHz. THD+N (1kHz source at 3V RMS output, 22kHz bandwidth, unity gain): <0.001%. S/N ratio: Maximum output, unity gain: >136dB.
Dimensions 17.33" (440mm) W × 4.72" (120mm) H × 17.33" (440mm) D; 17.33" (440mm) W × 5.2" (132mm) H × 18.5" (470mm) D including connectors and feet. Weight: 44lb (20kg). X1 weighs 48.4lb (22kg).
Finishes silver, anthracite, champagne.
Serial numbers of units reviewed L1: 16070601; X1: 0ZDA0405. Designed and manufactured in Switzerland.
Price L1: $34,500 in silver, $37,000 in anthracite or champagne; X1 (as equipped, with dual outputs): $21,500 in silver, $24,000 in anthracite or champagne. Approximate number of US dealers: 7. Warranty: Three years, parts and labor.
Manufacturer
CH Precision
Sàrl, ZI Le Trési 6B,
1028 Préverenges, Switzerland.
Tel: (41) (0)21-701-9040.
Web: ch-precision.com.

purist line stage, if not, perhaps, a minimalist one.

First the circuits

The L1 is fully discrete (no op-amps or other integrated circuits in the signal path), fully balanced, pure class-A, DC-coupled (except when it isn't, about which more later), fully symmetrical, and complementary (which in this context means that NPN transistors are paired with PNP transistors). The designers endeavored to keep signal paths short and the parts count small, especially in the signal path.

The L1, though, goes beyond minimizing self-noise; it monitors and counters DC offset at various points in the circuit and measures and compensates for DC offset on each input.

Input switching is achieved with relays. After that comes a diamond-buffer circuit, which takes the L1's high input impedance and produces a low impedance for the volume-control stage, with no feedback, local or global. "The noise and distortion of such a stage is almost unmeasurable," CH Precision told me.[3]

The L1 is modular and configurable. The configuration I received is dual-monaural,[4] a single chassis with separate boards for the L and R channels. It can also be configured as true monaural, with two chassis, in which case each channel is 100% independent of the other. You can even put two boards in each chassis to expand the number of inputs from eight to 16.

The volume control utilizes a 20-bit R-2R network with precision metal-film resistors, each channel with 236 half-decibel volume steps, covering a 118dB volume range. The volume control circuit operates in current mode and so is followed by an I/V conversion

3 I asked the company how quotes should be credited. PR rep Louise Ford said they should be attributed to CH Precision.

4 JA1 points out that "dual-monophonic" is a better description of such topologies than "dual-monaural," which literally translates as something like " two single ears."

MEASUREMENTS

As Jim Austin primarily auditioned the CH Precision L1 using its direct-coupled balanced inputs and outputs with the gain adjust set to "0dB," the input impedance set to High, and with the preamplifier powered by the auxiliary X1 supply, I performed a complete set of measurements in that condition. (The manual says not to stack the L1 and X1; the supplied umbilical cable was long enough for me to place the X1 on the floor, well away from the L1.) I then repeated some of the tests using the unbalanced inputs and outputs, then performed the balanced input's Calibration procedure and repeated more tests. I powered down the L1 and X1, and after waiting for an hour to let the power supplies discharge fully, I tested the L1 without the X1. I mainly used my Audio Precision SYS2722 system,[1] repeating some tests with the magazine's higher-performance APx555.

The L1's volume control operated in accurate 0.5dB steps. The maximum gain was 18.08dB for the balanced and unbalanced inputs to the balanced outputs. The maximum gain from the unbalanced input to both the balanced and unbalanced outputs was 12.04dB. The preamplifier preserved absolute polarity (ie, was noninverting) with the balanced inputs and outputs. (Its XLR jacks are wired with pin 2 hot, the AES convention.) However, the unbalanced outputs inverted polarity with both input types. (I checked with the Menu that these inputs' "Phase Polarity" was set to noninverting.)

The L1's input impedance set to High is specified as 94k ohms, balanced, and 47k ohms, unbalanced. I measured 94k ohms at 20Hz and 1kHz and 60k ohms at 20kHz for the balanced inputs. The unbalanced input impedance was 42k ohms at low and middle frequencies and a still-high 21k ohms at the top of the audioband. Setting the input impedance to Low gave 594 ohms, balanced, and 301 ohms, unbalanced, both values consistent from 20Hz to 20kHz and close to the specified values. The balanced output impedance was close to the specified 60 ohms, at 54 ohms; the unbalanced output impedance was 72 ohms, RCA jacks, and 48 ohms, BNC jacks.

The preamplifier's balanced frequency response was flat from 10Hz to 200kHz into both 100k ohms (fig.1, blue and red traces) and 600 ohms (green and gray traces). Fig.1 was taken with the L1's volume control at its maximum setting of "+18.0dB." Both the frequency response and the

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

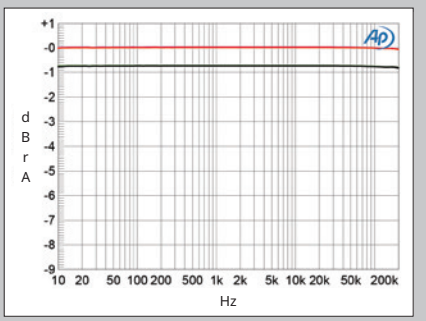

Fig.1 CH Precision L1, balanced frequency response with volume control set to "+18.0dB" at 2V into: 100k ohms (left channel blue, right red), 600 ohms (left green, right gray) (0.5dB/vertical div.).

stage.

During a visit to CH Precision's Swiss factory, I got to see the insides of some of the products. They're beautifully made, very clean. A technician was measuring just-finished products on a benchtop; each component the factory sends out has passed an analysis much like the one JA performs. One preamplifier I saw had a power supply with honkin' big capacitors, each big as a water bottle—that would look impressive in a power amplifier. That turned out to be the more expensive L10, but CH takes a similar approach with the L1; they just don't take it as far.

The L1 power supply is shunt-regulated. I asked what the advantages are. "The typical rejection ratio in the audio band for a series linear regulator is 70–80dB; very good ones reject up to 100dB," CH told me. "Our shunt-regulated supplies reject typically 115–120dB in the audioband." The downside to shunt regulation is that it's not efficient. Efficiency doesn't matter in a preamplifier. Noise does.

"Because we rely so heavily on discrete components and circuitry, the power supply takes on special importance and could be considered the foundation of every product we build."

If you think CH didn't go far enough with the built-in power supply, you can add an external power supply, the X1 ($21,500 in silver). CH describes it as "an ultralow noise, discrete, and fully regulated linear power supply, delivering an ultrastable and super clean DC feed to other CH Precision products"—to the L1 preamp, the P1 phono preamp, or various source components, but not the power amps or clock. CH says the X1 has "massive amounts" of powerline filtering and an additional regulation stage.

The L1 power supply has two transformers, the main one, which comes on when the unit is activated, and a smaller one that's on during standby and controls the microprocessor and relays. "When you add the X1, the larger, on-board transformer is taken out of circuit, although the on-board regulation remains in use. The power transformer and regulation in the X1 are used to supply regulated power to the L1." The L1's on-board regulation, then, supplements the regulation in the X1, "creating a cascaded topology to further reduce noise and ripple."

What does that accomplish sonically? CH says it lowers the system noisefloor and increases "dynamic range, resolution and speed of response, transparency, detail, and above all, musicality. Adding X1s to your system will bring intimacy, presence, tonal color and an unmistakable sense of life to your recordings." Each X1 chassis can be configured with either one or two power supplies.

I expressed in an email to CH Precision that their amplification products (including preamps) look like "power supplies with electronics hanging off them." That observation was mainly based on seeing the insides of an L10, not the L1, plus power amplifiers. CH replied, "The power supply is of the utmost importance in all of our designs. Yes, it might well be instructive (if not entirely accurate) to describe the CH products as 'power supplies with a bit of circuitry hanging off them.'"

It must be granted that the electronics hanging off those power supplies are hardly an afterthought.

Next, the features

As I've already said, the L1 has eight line-level stereo inputs; four balanced (XLR) and four single-ended (two on RCA and two on

measurements, continued

superb channel matching were preserved at lower settings of the control and with the unbalanced inputs and outputs. The CH Precision preamp's channel separation was superbly high, at 140dB in both directions below 1kHz, decreasing only slightly, to 130dB, at the top of the audioband (not shown).

From balanced inputs to balanced outputs, the L1/X1 combination offered extremely low noise, with no power-supply–related spuriae in its output (fig.2). The blue and red traces in this graph were taken with the volume control set to the maximum. Repeating the spectral analysis with the control set to unity gain and increasing the level of the input signal by 18dB so that the output level remained the same reduced the level of the lower-frequency noise components by up to 10dB (gray, green traces). The wideband, unweighted signal/noise ratio, measured with the balanced input shorted to ground but the volume control set to its maximum, was a very high 88dB ref. 2V output (average of both channels, which were very similar). Restricting the measurement bandwidth to the audioband increased the S/N ratio to a superb 102.5dB, while switching an A-weighting filter into circuit further improved this ratio, to 105.3dB. Neither the level of the noisefloor nor the S/N ratios changed when I repeated these analyses without the X1 connected or after I performed the balanced input Calibration.

CH Precision specifies the maximum output level as 16V, balanced, and 8V, unbalanced. Figs.3 & 4 respectively plot the percentage of THD+noise in the L1's balanced output against the output voltage into 100k ohms and 600 ohms, with the X1 connected. With clipping defined as

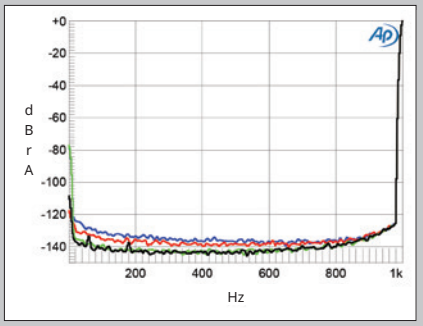

Fig.2 CH Precision L1/X1, balanced spectrum of 1kHz sinewave, DC–1kHz, at 5V into 100k ohms with volume control set to "+18.0dB" (left channel blue, right red) and to "0.0dB" (left green, right gray) (linear frequency scale).

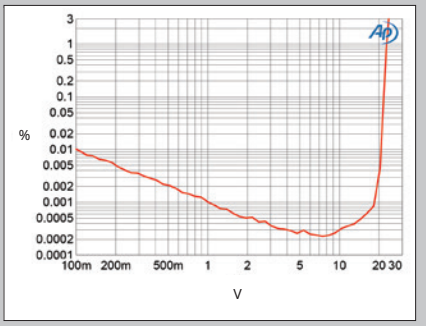

Fig.3 CH Precision L1/X1, balanced distortion (%) vs 1kHz output voltage into 100k ohms.

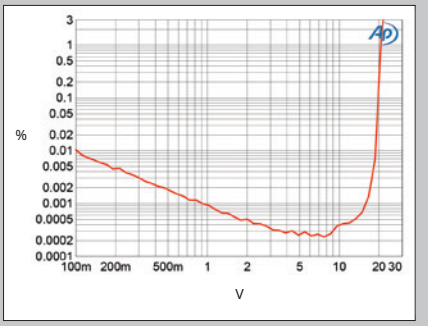

Fig.4 CH Precision L1/X1, balanced distortion (%) vs 1kHz output voltage into 600 ohms.

BNC). The L1 has four stereo outputs, two balanced (on XLR) and two single-ended (one each on RCA and BNC). Each input can be disabled or used as a pass-through, and each has gain that's adjustable by ±6dB in 0.5dB steps, to match input levels. As mentioned, the L1 is direct-coupled, but using the menu system and relay switching you can set the inputs one by one to be capacitor-coupled. That's useful if the DC offset for the connected component is above 50mV or so. Similarly, for flexibility, the input impedance of each channel can be set individually, high or low. Each input can be assigned a simple name, which is displayed on the front-panel AMOLED display in big, readable letters and on the app. More on the app in a bit.

The display can be configured for color, brightness, and what information is displayed, via the menu system or the app. You can select mono mode, which sums the L and R channels, and you can invert absolute phase, each with the push of a button. A balance control lets you adjust the L and R channels separately in 0.5dB steps, from +6dB to −6dB. You can set a startup volume, or you can set the L1 to start up at the volume it was playing at when you turned it off. You can set shortcuts in the menu system for frequently used adjustments.

One feature, called "Input Calibration," deserves special mention. It is a process you run during setup, input by input, that detects DC offset at the chosen input and, using "a mix of analog and digital technics," compensates. "Once you start it, it continues until it achieves stability, then it preserves those values," CH told me. The process takes a few minutes.

"In practice, we monitor the 0–10Hz frequency band at 12 specific points in the circuit (six per channel, at the input to the buffer, I/V and output stages), convert the measured values in the digital domain with precise A/D converters, process the signal in a DSP, and apply the bias-mismatch current via small R-2R D/A converters. Obviously, this is way more complex than a pure analog solution, but it allows us to keep the propagation delay of the audio signals constant over time, especially in the bass, and it avoids having to have any capacitors in the signal path." Those digital devices, of course, are also not in the circuit path.

"There are two main benefits to removing the DC offset in the

measurements, continued

when the THD+N reaches 1%, the balanced output clipped at 23V into 100k ohms and 20.5V into 600 ohms. As expected, the L1's unbalanced output clipped at half these voltages. These clipping voltages were the same when I repeated the tests without the X1.

The downward slope below 5V of the traces in figs.3 & 4 indicates that the actual distortion lies below the noisefloor. To be sure that the reading was not dominated by noise, I measured how the L1's distortion changed with frequency at 5V. The THD+N percentage was extremely low throughout the audioband into both 100k ohm and 600 ohm loads (fig.5), and, commendably, there was no increase in the top audio octaves. At 5V into 100k ohms, the third harmonic was the highest in level (not shown) but at –117dB (0.00014%) was negligible. When I raised the output level by 10dB, to 10V, the third harmonic rose to a still negligible –93dB (0.006%; fig.6). The level of this harmonic only rose by 1dB into the current-hungry 600 ohm load! Tested for intermodulation distortion with an equal mix of 19 and 20kHz tones at a peak voltage of 5V into 600 ohms, the second-order difference product at 1kHz lay at –130dB (0.00003%) and the levels of the higher-order products were only 10dB higher (fig.7). And as with the previous measurements, these results didn't change after I disconnected the X1 supply.

The CH Precision L1's measurements are superb, some of the best I have encountered, equaling and in some areas even bettering the measured performance of preamplifiers from Benchmark, MBL, Pass Labs, and Topping.—**John Atkinson**

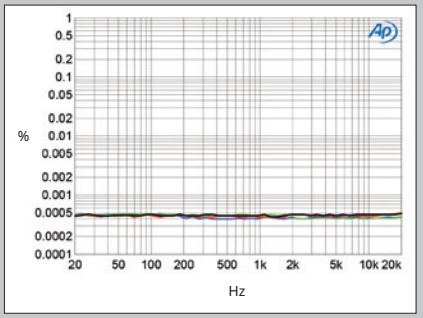

Fig.5 CH Precision L1/X1, balanced distortion (%) vs frequency at 5V into: 100k ohms (left channel blue, right red), 600 ohms (left green, right gray).

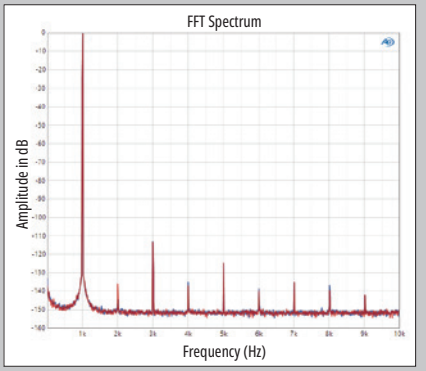

Fig.6 CH Precision L1/X1, balanced spectrum of 1kHz sinewave, DC–10kHz, at 10V into 100k ohms (left channel blue, right red; linear frequency scale).

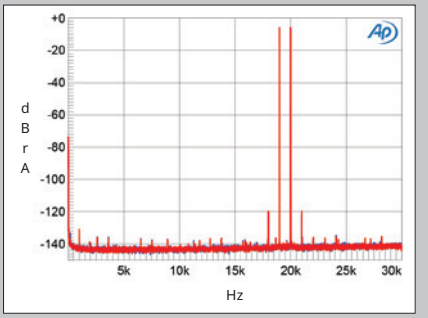

Fig.7 CH Precision L1/X1, balanced HF intermodulation spectrum, DC–30kHz, 19+20kHz at 5V into 100k ohms (left channel blue, right red; linear frequency scale).

line preamp: It avoids clicks when changing the volume control or switching inputs." The whole time I used the L1, I never heard a click. "It also avoids polarizing the dielectric of the interconnect cables between the L1 and the power amplifier. We feel that this latter effect makes the most significant sonic and musical difference." Which is interesting when you consider that some interconnects have dielectrics that are polarized intentionally.

The L1 has an Ethernet port, but it's only for setup and for app access; the app connects to the network by Wi-Fi and is intended for setup and for music playback. (Firmware updates are carried out with a USB stick.) I found the app intuitive, stable, and easy to use. The only downsides are that, as of this writing, it's available only for Android, and it's a power hog. Unless you shut the app down after every use, you're likely to find your Android tablet out of power when you pick it up the next day. CH Precision is, I understand, in the process of porting the app to iOS.

Day to day I found the L1 simple, intuitive, and a pleasure to use.

The only obvious controls on the front of the L1 chassis are a center knob with a concentric outer ring. Just turn the ring to select a source and turn the inside, smaller knob to adjust volume. The volume knob can also be depressed—that's the On/Standby switch—and the two knobs together with this "button" operate the L1's menu system. And don't forget about the small, chunky, simple remote control, which covers the most important features (source selection, volume, muting) and attaches magnetically to the side of the chassis so it won't get lost.

Setup

I put the L1 on my double-width, four-shelf Butcher Block Acoustics Rigidrack alongside the CH Precision C1.2 DAC[5] and the X1 power supply on the shelf below. The C1.2 (set to fixed volume) was sourced by a Roon Nucleus+ and, sometimes, an Innuos Statement NewGen server/streamer. From Roon, the C1.2 was connected via Ethernet; the Innuos was connected by USB. On the analog side, I used an SME 30/12 turntable (not the Mk.II) with its supplied tonearm and Ortofon Windfeld Ti, Ortofon Verismo, and Lyra Etna λ Lambda cartridges. For phono preamplification and RIAA correction, I used either the Pass Labs XP-27 or the Sutherland Big Loco. Each CH Precision component (including the L1) was on its own shelf—none were stacked—and all used the supplied footers. Amplification was provided by the CH Precision M1.1 stereo amplifier (while it was in for a follow-up review) and later by the Pass Labs XA60.8 class-A monoblocks. These amps drove Wilson Audio Specialties Alexx V loudspeakers.

CH Precision always sends one of its people to assist with setup—a good idea for a major review, since it guarantees that the setup is correct and the sound achieved is up to what the component is capable of. In this case, my visitor was Kevin Wolff, CH Precision's Seattle-based global sales director. Kevin went through the setup process as I looked on, paying attention some of the time. He turned off unused inputs, set input gain, chose DC coupling for the active inputs, and labeled them. Kevin activated a third channel for an experiment.

Kevin set the system to warm up and walked up to Broadway for some lunch. Returning, Kevin ran Input Calibration (DC-offset compensation) on two of the connected inputs, the ones to which the phono preamplifier and the D/A converter were connected. The process took several minutes. The third input, which for now had nothing connected, remained uncalibrated; moving interconnects to this third, uncalibrated input allowed a quick comparison between calibrated and uncalibrated inputs. I'll report the results of this experiment in the listening section.

The X1 power supply was used to power both the L1 and the C1.2 DAC. The C1.2 remained connected to it throughout the audition, but from time to time I removed it from the L1, for comparison with the L1 running on its own internal power supply. I'll report these results, too, in the following section.

Time for some listening

I have an affinity for preamplifiers—not some special talent; I just mean only that I view them with affection beyond what I feel for most other audio components. Yes, for me, relationships with hi-fi components can be personal.

The advantages of a fine preamplifier go beyond how simply and well it does the basics: select an input, adjust the volume, maybe (less critically but usefully) switch between stereo and mono or invert absolute polarity. Even if their *sonic* impact is subtle, preamplifiers can have a profound impact on how effectively a system conveys music.

I inserted the L1 in the system and spent time listening to varied music and making casual observations, taking occasional notes, working toward understanding the L1's particular sound. Weeks later, I got serious.

From chamber music and small-group jazz, you can learn a lot

5 See my review at stereophile.com/content/ch-precision-c12-da-processor.

about the palpability of sonic images, how well a component maps out the sonic space, and something about its ability to convey timbre and rhythm. First up: Schubert's song cycle *Winterreise*, the piano part transcribed for string quartet (played here by the Raggazze Quartet), sung by baritone Martijn Cornet (24/192 FLAC download, Presto CSS 43521). With the L1 in the system, Cornet's voice emerged from a big, deep stage, the voice somewhat distantly miked but rich and tangible, positioned just behind the quartet, which was arrayed from speaker to speaker. Subtle shadings of voice and strings were clearly conveyed.

Charles Ives's Violin Sonata No.4, "Children's Day at the Camp Meeting," is among the works on the brilliant recent album *American Road Trip* (24/96 FLAC, Warner Records/Qobuz), a varied collection of American works written or transcribed for violin and piano, performed by Augustin Hadelich and Orion Weiss. In the second movement, *Largo–Allegro*, the violin was woody, warm, richly colored, precisely and stably positioned on the soundstage—tangible—and the piano was big and bold, with booming (in a good way), resonant low notes.

Marc-André Hamelin Live at Wigmore Hall (16/44.1 CD rip, Hyperion 66765) has been a favorite recording for decades. The music on this 1994 album was chosen not so much for its musical gravity but to display pianist Hamelin's astonishing virtuosity. It succeeds. It includes, for example, a movement of Alkan's transcription of Beethoven's Piano Concerto No.3 for solo piano. But the recording is also interesting for its sonic perspective. Courtesy of recording engineer Ken Blair, it's one of the most convincing midhall perspectives I'm aware of.

I remember that, shortly after I acquired the CD in the mid-1990s, my then-modest system couldn't sort it out; the recording didn't make sonic sense. This current system, with the L1 assisted by the X1, nailed the middle-seat perspective in the relatively intimate performance space that is Wigmore Hall. What was special was the tangibility—physicality—of the piano and its changes of timbre as Hamelin moved up and down the keyboard and altered his touch, and how well it mapped out the space the notes resonated within. It is rare for both things—the piano's richness and timbre and the hall's acoustic—to come through so clearly at the same time.

I enjoy Roon's Radio feature, not least when it screws up, making weird leaps, as when the *Finale* of the Bruch Violin Concerto No.1 in G minor gave way to "Out ta Get Me," the fourth track on *Appetite for Destruction (Super Deluxe)* (24/96 FLAC, Geffen/Tidal), by Guns N' Roses.

Even in this remastered version, the sound on this recording is a fuzzy, but the precision and depth of the soundstage and the visceral solidity of the images was impressive. I admired the simple (if messy) production, faithfully conveyed by the L1 and the rest of the review system. It put the musicians in fixed positions on the stage and left them there.

I said I'd return to both the X1 external power supply and the input calibration feature. I'm going to discuss them together because, despite the differences in what they are doing technically, I found their *sonic* influence nearly identical, except that the X1's was greater. Both effects fall in the category of "I didn't know there was a problem until it was solved." At this level, most things are like that, it seems to me. You think, "How could it get any better than this?" Then it gets better, and you wonder how you got along without the improvement.

Musically, the effects of the X1 and input calibration were varied. Images became meatier and more precise (less fuzzy or grainy). The soundstage was more concretely laid out, easier to parse, and deeper. Musical flow seemed improved; individual instruments had more drive. Sonically this could all be attributed to improved precision in the musical signal, both within and across channels, resulting most obviously in images within the soundstage being nailed in place and, as a result, seeming more palpable.[6]

This is what I lost when I took the X1 out of the system, and it's what I gained when I ran Input Calibration—despite the fact that I was using the balanced inputs and that the signal in question came from the Pass Labs XP-27. I would expect this phono preamp to have very little DC offset in its output, and frankly, I was surprised that I could hear the effect with something as imprecise as phono, with its wow and flutter and limited channel separation. Yet the effect was audible and meaningful.

When I had finished listening and was writing my report, I sent a note to CH asking what they thought was happening when DC offset was corrected. The response: "We think it likely that these effects are down to the greater accuracy in the channel balance (both L/R and +/–), concentrating or focusing energy within the sound field. Musically, they translate to a greater sense of purpose and a more confident, emphatic delivery, not just on loud passages, but in the shape and spacing of notes and phrases in quieter passages, too." "More confident, emphatic delivery" maps well onto what I heard.

"It's a bit like a high jumper: The more solid the takeoff, the higher they can jump, and the more accurately they can execute the jump itself. It's not a precise analogy, but I think it does describe what you hear."[7]

Wrap

I would happily live forever with the CH Precision L1, especially paired with the X1. Considering the prices and CH Precision's perfectionist approach, this is not surprising. What *is* surprising is how much extra performance apparently remains unrealized, even in a very well-designed product, as demonstrated by the improvement when the X1 was employed. I find myself wondering how much room for improvement is still out there, waiting to be realized. How much better could a four-box L1/X1 system, or the L10 preamp, be?

Assuming you can pay the tab, it's highly recommended. ■

ASSOCIATED EQUIPMENT

Analog sources SME 30/12 (original version) with Series V-12 tonearm. Phono cartridges: Ortofon Windfeld Ti, Ortofon Verismo; Lyra Etna λ Lambda.
Preamplification Line: Pass Laboratories XP-32. Phono: Pass Labs XP-27, Sutherland Big Loco.
Power amplifiers Pass Laboratories XA60.8 monoblocks, CH Precision M1.1.
Loudspeakers Wilson Audio Specialties Alexx V.
Cables Digital: AudioQuest Carbon, Cinnamon, & Coffee USB; CAD USB; Wireworld Platinum Starlight 8 Ethernet. Interconnect: AudioQuest ThunderBird (XLR and RCA). Speaker: AudioQuest ThunderBird ZERO. Power: AudioQuest Tornado High-Current C13, NRG-X3, and Monsoon. Nordost QBase 8 v.3 power strip with 20A Nordost Valhalla power cord.
Accessories Melco S100, Silent Angel Bonn N8 Pro, and Innuos PhoenixNET Ethernet switches; Butcher Block Acoustics Rigidrack, IsoAcoustics, and Magico footers.—**Jim Austin**

6 The images were not larger; if anything, they were smaller. They were more tightly confined, with clearer outlines, in better focus. I am suspicious of larger images. Most often, I think, they are a result of signal imprecision, a bug not a feature.

7 I eagerly await the results of JA's measurements. On the one hand, the effect (especially of the X1) was obvious. On the other hand, in the past, our standard measurement suite has usually failed to detect differences resulting from power supply improvements.