stereophile

EQUIPMENT REPORT

ELECTRONICALLY REPRINTED
FROM FEBRUARY 2010

Bryston
BDA-1
D/A CONVERTER

LARRY GREENHILL

Bryston BDA-1 D/A processor

DESCRIPTION Digital-to-analog converter with remote control of digital input and volume. Digital inputs: USB 1.1, four S/PDIF electrical (RCA, BNC); two S/PDIF optical (TosLink), AES/EBU (XLR). Digital input sample rates accepted: 32, 44.1, 48, 88.2, 96, 176.4, and 192kHz (transformer-coupled S/PDIF, AES/EBU); 32–48kHz, USB. Input word lengths accepted: 16–24-bit, S/PDIF and AES/EBU; 16-bit, USB. Digital output: S/PDIF bypass loop output via RCA jacks. Control inputs: RS-232 port via 9-pin subminiature connector; remote 12V power-on/off trigger. Analog outputs: 1 pair each RCA, balanced XLR. Maximum output level: 2.3V RMS unbalanced, 4.6V balanced. Output impedance: 100 ohms balanced, 50 ohms unbalanced. Frequency response: 20Hz–20kHz, ±0.1dB. THD+noise at 1kHz: 0.002%. IMD (CCIF): 0.0003%, 19+20kHz. Channel separation: 109dB at 1kHz. Output noise: <4µV or –100dB, 20Hz–20kHz (ref. 1V). Signal/noise: 140dB. Dynamic range at –60dBFS: 123dB. Jitter: <250ps peak–peak. Power consumption: 10VA.
DIMENSIONS 17" (432mm) or 19" (483mm) with rack ears W by 2.75" (44mm) H by 11.25" (286mm) D. Shipping weight: 18 lbs (8.2kg).
FINISHES Black, silver.
SERIAL NUMBER OF UNIT REVIEWED 000100.
PRICE $1995; add $350 for BR-2 remote control. Approximate number of dealers: 150. Warranty: 5 years parts & labor, digital circuits; 20 years, analog circuits.
MANUFACTURER Bryston Ltd., PO Box 2170, 677 Neal Drive, Peterborough, Ontario K9J 6X7, Canada. Tel: (800) 632-8217, (705) 742-5325. Fax: (705) 742-0882. US: Bryston Service USA, 79 Coventry Street, Suite 5, Newport, VT 05855-2100. Tel: (802) 334-1201. Fax: (802) 334-6658. Web: www.bryston.ca.

In February 2009, I reviewed Bryston Ltd.'s first CD player, the $2695 BCD-1, and was very impressed by what I heard. The BDA-1 ($1995) is the Canadian company's first standalone DAC. It's slim, only 2.75" high, with the engraved company name, model number, and infrared sensor grouped at the extreme left of a front panel of polished aluminum. Farther to the right are two columns of four LEDs each that comprise the sample-rate indicator, which identifies the selected input's signal frequency and whether the BDA-1 has locked to it. Closer to the center is the Upsample control, which governs the conversion of the incoming digital signal synchronously to 192kHz or 176.4kHz. The Upsample LED turns green for 192kHz, red for 176.4kHz. Digital sources are selected by pressing one of eight pushbuttons just right of center: two TosLink, four S/PDIF (coaxial), one AES/EBU XLR, and one USB 1.1, the last accepting only signals with sample rates at or below 48kHz. An LED above each pushbutton lights

green for incoming PCM datastreams and red for other types, including multichannel Dolby Digital streams.

All of these functions, and the BDA-1's output level, are accessible from Bryston's BR-2 remote control (a $350 option). The BR-2 also can control Bryston's BCD-1 CD player, BP26 preamplifier, and B100 SST integrated amplifier. The remote automatically lights up when you pick it up in a dimly lit room.

On the rear panel, starting from the left, are: balanced and single-ended pairs of analog audio outputs; a single S/PDIF output; a single USB input; an AES/EBU XLR input; four S/PDIF inputs; two optical TosLink optical inputs; a two-pin trigger input to facilitate remote hardwired on/off control; an RS-232 port for uploading firmware; and an IEC 320-C14 power inlet to mate with an IEC-320-C13 AC mains cord.

Internal Details

Just behind the rear panel is the full-width, multilayered printed circuit board that carries the D/A and analog stages. I wasn't able to get inside the chassis because I didn't have a driver that matched its Torx #8 screws; however, the BDA-1's brochure includes a clearly labeled view of the BDA-1's innards. Most of the interior is empty space, with a single ribbon cable joining the circuit board to another behind the front panel.

Starting at the left of the main board are separate toroidal power transformers for the analog and digital power supplies. Nearby are multistage voltage regulation and filtering components, including electrolytic capacitors and a row of heatsunk voltage regulators. Each stage (input receiver, sample-rate converter, DAC) is independently regulated to prevent interaction and to minimize jitter. Careful trace routing is used to reduce the risk of capacitive coupling to achieve greater reduction of noise and distortion, especially for the low-voltage analog signal leaving the DAC. In the center is a Burr-Brown SRC4392 sample rate-converter chip, to the right of which is a pair of DAC chips, these 128x-oversampling 24-bit delta-sigma Cirrus CS4398s, the same as used in the BCD-1, though only one chip is used in the CD player. Finally,

MEASUREMENTS

I examined the measured behavior of the Bryston BDA-1 using the high-performance Audio Precision SYS2722 system (see www.ap.com and "As We See It" in the January 2008 issue, www.stereophile.com/asweseeit/108awsi), as well as, for some tests, my Audio Precision System One Dual Domain. To examine its performance as a USB DAC, I drove the BDA-1 with the USB 2.0 output of my MacBook running OS10.4.11, playing WAV files using Bias Peak 6.2. The Bryston identified itself to the host computer as "BRYSTON BDA-1." The BDA-1 offers two modes of operation: the audio data can be processed at their native sample rate, or can be first upsampled to 176.4kHz (44.1 and 88.2kHz data) or 192kHz (48 and 96kHz data). I performed complete sets of measurements in both modes, but comment in the text only where I found any significant difference between the two.

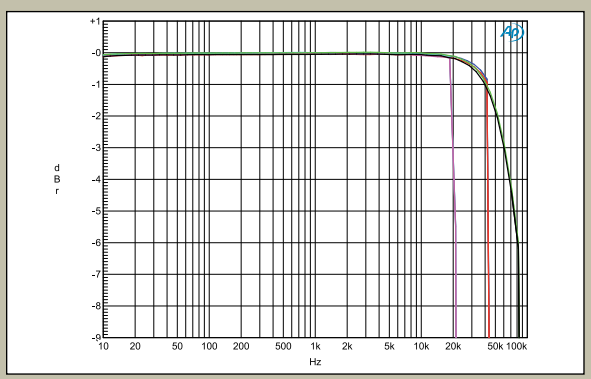

Fig.1 Bryston BDA-1, frequency response at –12dBFS into 100k ohms at: 192kHz sample rate (left channel green, right gray), 96kHz (left blue, right red), 44.1kHz (left cyan, right magenta). (1dB/vertical div.)

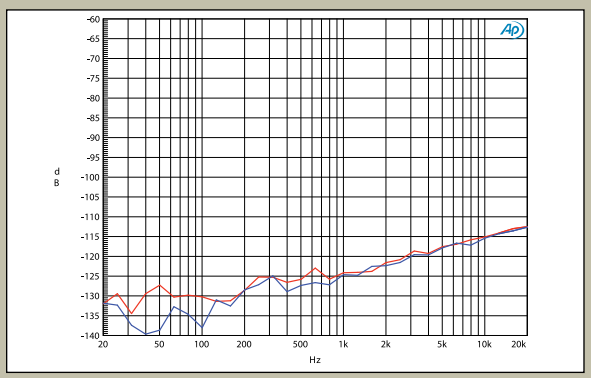

Fig.2 Bryston BDA-1, channel separation (L–R blue, R–L red, 5dB/vertical div.).

Fed S/PDIF or AES/EBU data, the BDA-1 successfully locked to 16- and 24-bit digital streams with sample rates ranging from 32 to 192kHz, with the exception of 176.4kHz. Peculiarly, trying to feed data at this sample rate to the BDA-1 via TosLink locked the front-panel buttons, mandating a reboot. As expected from its use of a Burr-Brown PCM2707 chip as the USB receiver, the BDA-1's USB input was limited to 44.1 and 48kHz data, with a maximum bit depth of 16.

The processor's maximum outputs were 4.76V from its balanced outputs and 2.38V from the unbalanced ones, the latter 1.24dB higher than the CD standard's 2V RMS. Both sets of outputs preserved absolute polarity; *ie*, a positive digital pulse was reproduced as a positive analog pulse. The output impedance from the unbalanced RCA jacks was a usefully low 74 ohms at high and middle frequencies, rising inconsequentially to 98 ohms in the low bass. As usual, the output impedance from the balanced XLRs was twice that from the RCAs.

Fig.1 shows the Bryston's frequency response with data at sample rates of 44.1, 96, and 192kHz. The audio-band is flat almost to 20kHz, and in each case the ultrasonic rolloff follows the same profile, with a sharp rollout just below the appropriate Nyquist Frequency (half the sample rate). Channel separation (fig.2) was superb, at >125dB below 1kHz and still 113dB at 20kHz.

For constancy with the tests of digital components *Stereophile* has published since 1988, I examine resolution by sweeping a ⅓-octave bandpass filter from 20kHz to 20Hz while the unit under test decodes data representing a dithered 1kHz tone at –90dBFS (fig.3). With 16-bit data

on the far right are four rows of components that comprise the discrete analog amplifier's output stages.

Bryston describes the PCB as being constructed of double-sided epoxy glass with clearly printed component markings. All the components are surface-mount types, and high-quality, 0.1%-tolerance metal-film resistors and polystyrene capacitors are used. Soldered and other gas-tight mechanical connections are used for the signal circuits. Bryston's warranty is five years for the digital circuits, including parts and labor, and 20 years for the analog circuits.

Design Considerations

One of Bryston's primary goals for the BDA-1 was to reduce clock jitter, *ie*, mistimings of the digital datastream presented to the DAC. Unlike the company's BCD-1 CD player, a one-box transport and DAC, the standalone BDA-1 must reclock all signals fed to its data inputs. To maintain timing accuracy, the Bryston engineers used three different methods of maintaining accuracy and keeping jitter to a minimum: impedance-matching transformers to provide the best interface possible, reclocking the signal, and synchronously upsampling the signal.

The BDA-1's Burr-Brown SRC4392 sample-rate converter provides synchronous upsampling: 32, 48, and 96kHz data are upsampled to 192kHz, while 44.1 and 88.2kHz data are upsampled to 176.4kHz. The Compact Disc's 16-bit depth can be increased to 24 bits, the additional 8 bits filled with placeholder information. While this adds no new information, the conversions of the sample rate and bit depth transform the digital signal into a format that can be optimally converted into an analog signal by the DAC, says Bryston. The D/A conversion is done by a pair of Crystal CS4398 integrated-circuit chips, which feed discrete-component, class-A output amplifiers.

Set-up

Knowing that the BDA-1's USB 1.1 input is limited to sample rates of 48kHz or lower, I used a Bel Canto USB Link 24/96 adapter (see John Atkinson's review in the May 2009 *Stereophile*, (top traces), the performance is dominated by the recorded dither noise. Increasing the word length to 24 bits reveals that the BDA-1's true noise floor is 20dB lower in the midrange and treble, implying a resolution of almost 20 bits, which is close to state-of-the-art. No power-supply–related spuriae are visible, and the Bryston readily resolves a tone at –120dBFS (bottom traces at 1kHz). Repeating the spectral analysis with an FFT technique (fig.4) unmasks some *very*-low-level harmonics with 24-bit data, as well as some odd noise modulation between 1.5 and 3.5kHz. This graph was taken with 44.1kHz data without oversampling engaged; switching in the oversampling raised the levels of the harmonics by up to 10dB (although the highest in level, the fourth and fifth harmonics, still lay at a low –126dB), but the low-treble noise modulation was not affected.

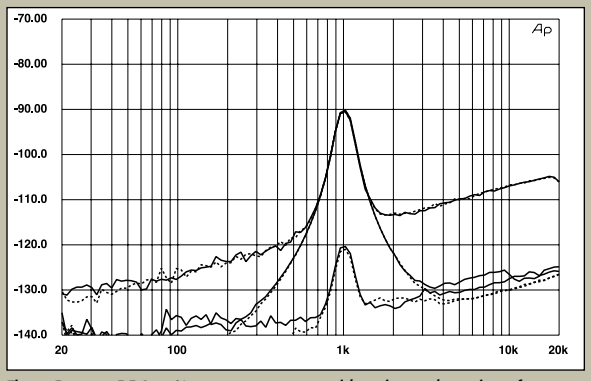

Fig.3 Bryston BDA-1, ⅓-octave spectrum with noise and spuriae of dithered 1kHz tone at: –90dBFS with 16-bit data (top), 24-bit data (middle at 2kHz); and dithered 1kHz tone at –120dBFS with 24-bit data (bottom at 1kHz). (Right channel dashed.)

The plot of the BDA-1's linearity error with 16-bit data (not shown) revealed only the effect of the recorded dither. However, with its very low noise floor and superb resolution, the Bryston's reproduction of an undithered tone at exactly –90.31dBFS (fig.5) was superb, with the three DC voltage levels well resolved, the waveform perfectly symmetrical about the time axis, and the Gibbs' Phenomenon "ringing" on the waveform tops clearly evident. With undithered 24-bit data (fig.6), the BDA-1 gives a good approximation of a sinewave, despite the low signal level. (For poorer results on this test, see the review of the Playback Designs MPS-5 elsewhere in this issue.)

The harmonic distortion in the BDA-1's discrete output stage was very low, even into the punishing 600 ohm load

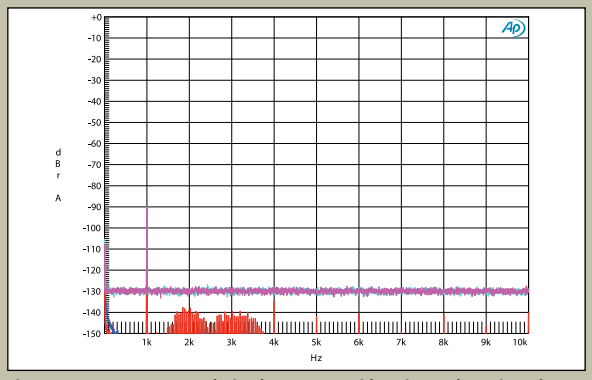

Fig.4 Bryston BDA-1, FFT-derived spectrum with noise and spuriae of dithered 1kHz tone at –90dBFS with: 16-bit data (left channel cyan, right magenta), 24-bit data (left channel blue, right red).

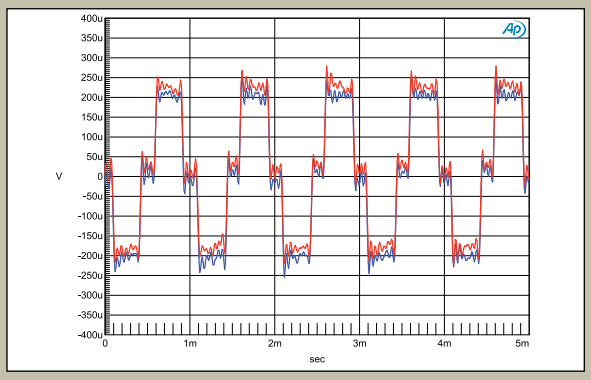

Fig.5 Bryston BDA-1, waveform of undithered 1kHz sinewave at –90.31dBFS, 16-bit data (left channel blue, right red).

Vol.32 No.5) to connect my Lenovo X61 laptop's USB feed to one of the Bryston's S/PDIF inputs with audio data up to 96kHz sample rates. The BDA-1 is small enough that I could place it atop my BCD-1 CD player. I connected the BCD-1's S/PDIF output to the BDA-1's S/PDIF input via a single Wireworld Starlight coaxial cable. I ran both single-ended and balanced Bryston XLR interconnect cables from the BDA-1's output jacks to my Bryston BP26 preamplifier. I left in place the single-ended interconnects that ran from the BCD-1's analog output to the Bryston BP26, whose front-panel input switch could then switch between the BCD-1's analog output, the BDA-1's analog output via single-ended interconnects, and the

The Bryston BDA-1's D/A and output stages.

BDA-1's analog output over balanced XLR interconnect, all sourced from the BCD-1's CD transport.

The BDA-1 functioned flawlessly while I had it in my system. Digital signals were decoded instantly when an input was selected. As on Bryston's BCD-1 CD player, the BDA-1's status light goes *dark* when the unit is turned on; in standby mode, it glows red.

Listening

The first hi-rez digital music tracks I played on my laptop was a 24-bit/88.2kHz WAV file from a Naim recording of the Chamber Soloists of the Royal Philharmonic Orchestra playing Mozart's *Eine kleine Nachtmusik* (from Naim Classical HD126). I also downloaded two files from HDtracks.com: a 24/88.2 file of Beethoven's Symphony 3, "Eroica," performed by Andrew Manze and the Helsingborg Symphony (from Harmonia Mundi HMU 807470); and all eleven 24/96 tracks of Chesky's *Ultimate Demon-*

measurements, *continued*

(fig.7), though the spectrum was dominated by odd-order spuriae. However, the highest-level harmonic, the third, lay at just –103dB (0.0007%). This behavior was not affected by oversampling, but spectral analysis of a higher-frequency tone again revealed the odd, low-level modulation of the noise floor in the low treble (fig.8). Without oversampling, the BDA-1 performed superbly when fed a high-level mix of 19 and 20kHz tones with 44.1kHz data (fig.9), with all intermodulation spuriae at or below –106dB (0.0005%). With oversampling, however, even though the intermodulation artifacts remain vanishingly low in level, the noise floor is corrupted by a regular series of spikes (fig.10), though these spikes are still very low in level. I did wonder if there were some possible mathematical limitations in the oversampling chip (a Burr-Brown SRC4392), but the Musical Fidelity V-DAC, which uses the same chip, performed fine with this test (see fig.8 at www.stereophile.com/digitalprocessors/musical_fidelity_v-dac_da_processor/index4.html).

Finally, fed 16-bit data representing a high-level tone at exactly 1/4 the sample rate, over which had been laid an LSB-level squarewave at 1/192 that rate, the Bryston BDA-1 offered moderate suppression of word-clock jitter in the worst case, which was when the data were sourced from an RME soundcard in a PC via 15' of plastic-cored TosLink. The Miller Analyzer calculated there to be 456 picoseconds peak–peak of jitter-related sidebands, primarily at the data-related frequency of 229Hz (fig.11, which also shows some broadening of the central spike due to low-frequency random-noise jitter, particularly in the left channel). Switching in the oversampling didn't reduce the level of jitter—an

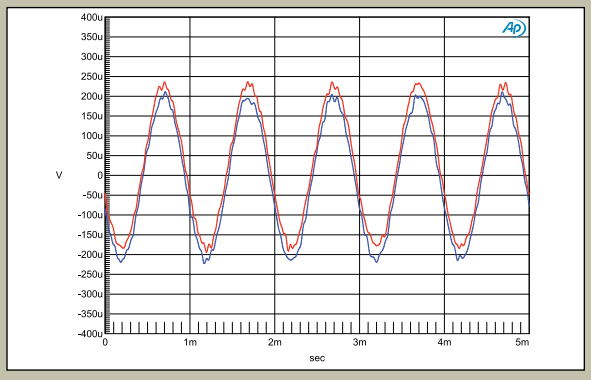

Fig.6 Bryston BDA-1, waveform of undithered 1kHz sinewave at –90.31dBFS, 24-bit data (left channel blue, right red).

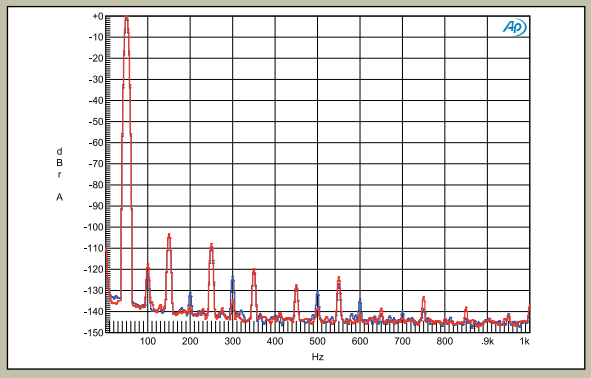

Fig.7 Bryston BDA-1, spectrum of 50Hz sinewave at 0dBFS into 600 ohms, 24-bit data, no oversampling (left channel blue, right red; linear frequency scale).

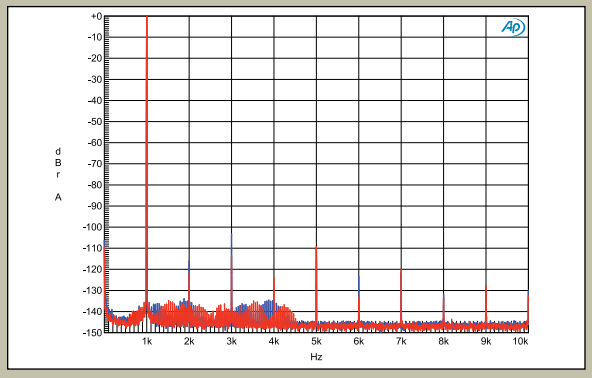

Fig.8 Bryston BDA-1, spectrum of 1kHz sinewave at 0dBFS into 100k ohms, 24-bit data with oversampling (left channel blue, right red; linear frequency scale).

stration Disc, Volume 2 (originally on SACD, Chesky SACD343). The BDA-1 processing these hi-rez tracks sounded light-years ahead of CD-sourced music I've heard in my listening room. The BDA-1 reproduced the music's warmth and fullness with none of the irritating edginess I've heard from earlier standalone DACs.

The resulting soundstage was the most realistic, palpable, and three-dimensional I'd ever heard in my room. Singers were enveloped in a 360° space that extended well behind them, as heard with the performance of Jimi Hendrix's "Little Wing," from the Chesky sampler. The first movement of the "Eroica" was spellbinding—I could hear subtle ambience cues I'd previously heard only at concerts.

Soundstages were also wider and deeper when I played CDs. There was an enhanced sense of three-dimensionality, with more precise images of the instruments in space, as heard during the percussion solo in "Nardis," from Patricia Barber's *Café Blue* (CD, Premonition/Blue Note 21810 2). The cymbal appeared at extreme right, the double bass was centered behind the drum kit, the piano was on the right, and Barber's voice floated three-dimensionally between my Quad ESL-989s. Similarly, Mary Gauthier's voice was stunningly real as she sang "Long Way to Fall," from her *Filth and Fire* (CD, Signature Sound SIG 1273).

For the deepest bass notes, I supplemented the Quads with a pair of JL Audio Fathom f212 subwoofers (review forthcoming) and Bryston's 10B SUB external crossover. The BDA-1's recovery of microdynamic details was then

THE RESULTING SOUNDSTAGE WAS **THE MOST REALISTIC, PALPABLE, AND THREE-DIMENSIONAL** I'D EVER HEARD IN MY ROOM.

unexpected result, given the success of this topology in such products as the Benchmark DAC1. Fed data via USB, the jitter dropped to just 98ps p–p (fig.12), though a couple of sidebands at the power-supply–related frequencies of ±120Hz are now evident.

Overall, and assuming the problem with 176.4kHz data was sample-specific, the Bryston BDA-1 measured very well. Still, I was puzzled by the noise modulation in the low treble, and the less-good performance with oversampling was not what I expected.—**John Atkinson**

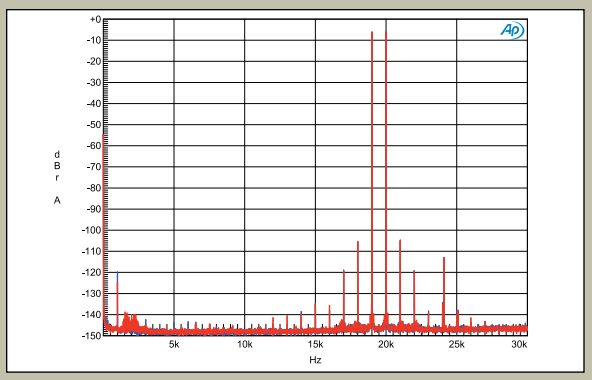

Fig.9 Bryston BDA-1, HF intermodulation spectrum, 19+20kHz at 0dBFS peak into 100k ohms, 24-bit data, no oversampling (left channel blue, right red; linear frequency scale).

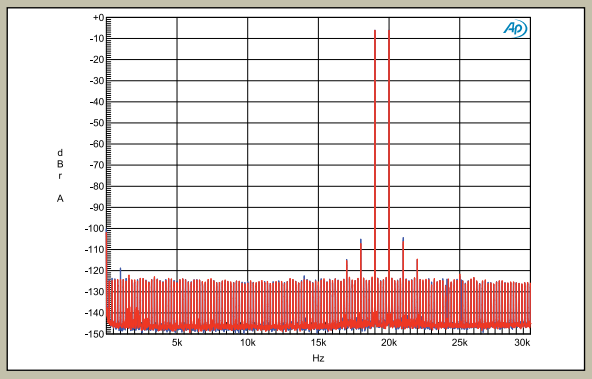

Fig.10 Bryston BDA-1, HF intermodulation spectrum, 19+20kHz at 0dBFS peak into 100k ohms, 24-bit data with oversampling (left channel blue, right red; linear frequency scale).

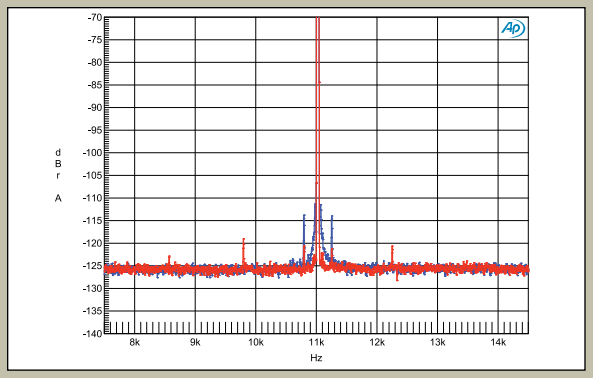

Fig.11 Bryston BDA-1, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz, 16-bit data sourced from PC via 15' of TosLink. Center frequency of trace, 11.025kHz; frequency range, ±3.5kHz (left channel blue, right red).

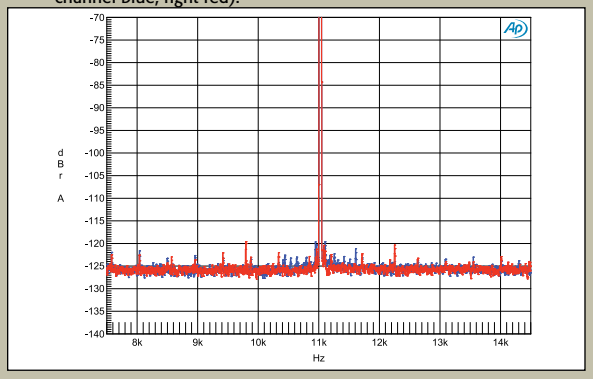

Fig.12 Bryston BDA-1, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz, 16-bit USB data. Center frequency of trace, 11.025kHz; frequency range, ±3.5kHz (left channel blue, right red).

most evident, sharpening the leading edge of deep-bass transients and giving the combination of Quads and JLA subs a light, fast quality. The bass notes were integrated in time and space with the rest of the music. Powerful synthesizer bass notes were captured with dead-on pitch definition, adding pace, energy, and emotional weight to film soundtracks. The deepest synthesizer growls and pulses literally shook the room in the tortuous mix of percussion, chimes, gongs, and snare drums that is "Attempt on the Royals," from James Horner's soundtrack score for *Patriot Games* (CD, RCA 66051-2). The bass remained clean, solid, pitch-perfect, with no spurious noises. I could easily discern subtle changes of pitch in timpani notes in Eiji Oue and the Minnesota Symphony's recording of Stravinsky's *The Rite of Spring* (CD, Reference RR-70CD).

The BDA-1's midrange reproduction was effortless and clean, with excellent tonality and instrumental timbres. I was strongly impressed with the rightness of the timbres of guitar and saxophone on L.A. Four's *Going Home* (CD, Ai Music 3 2JD-10043). Male singers benefited from the BDA-1's tonal accuracy. Willie Nelson's cover of T.S. Bruton's "Getting Over You," from *Across the Borderline* (CD, Columbia CK 52752), was particularly natural and clean, and entirely free of honk or hollowness. I heard the same rich but totally natural timbre in Buddy Miller's mando-guitar accompaniment in "Prayer in Open D" from Emmylou Harris's *Spyboy* (CD, Eminent EM-25001-2). I heard layers of resonant male-voice textures from the Turtle Creek Chorale, led by Timothy Seelig, singing John Rutter's *Lord, Make Me an Instrument of Thy Peace*, from *Requiem* (CD, Reference RR-57CD). The solo that opens H. Owen Reed's *La Fiesta Mexicana*, from Howard Dunn and the Dallas Wind Symphony's *Fiesta!* (CD, Reference RR-38CD), was unusually lovely, sweet, and captivating.

The BDA-1's highs were clean, open, effortless, grain-free, and extended. Clarity and extension were so good that I heard the subtle sweep of the guitar in the opening of David Bowie's "Putting Out Fire," from the *Cat People* soundtrack (CD, MCA MCAD-1498). The clarity and openness of the BDA-1's treble response let Patti Austen's soft contralto emerge easily from the Latin arrangement of "Only You," on Arturo Sandoval's *Hothouse* (CD, N2K 10023). In Emmylou Harris's a cappella performance of "Calling My Children Home," also from *Spyboy*, the silken, translucent tonality of her effortlessly ethereal voice stood out separately from Buddy Miller's sweet tenor in both location and tonality.

The Bryston BDA-1 reproduced the extraordinary dynamics of Mark Flynn's flash-bang drumming in the opening of "Blizzard Limbs," from Attention Screen's *Live at Merkin Hall* (CD, Stereophile STPH018-2); Mick Fleetwood's thunderous kick drum, which opens "Dreams" on Fleetwood Mac's *The Dance* (CD, Reprise 46702-2); and David Hudson's raw, pulsing, raspy bass didgeridoo in "Rainforest Wonder," from his *Didgeridoo Spirit* (CD, Indigenous Australia IA2003 D). Best, perhaps, was Tito Puente's solo on "Tito," on Arturo Sandoval's *Hothouse*: the Bryston conveyed an image of his timbales spread across the soundstage, Puente moving back and forth among the three drums, each clean drumstroke producing a sudden snap of drumhead, rim, and stick wood, mixed with trumpet blasts and more rim shots—all without compression. And I delighted again in hearing the sledgehammer-like thudding of the bass synthesizer in "Assault on Ryan's House," from *Patriot Games*, and a segment of Stravinsky's *Le Sacre du Printemps*, from the recording by Esa-Pekka Salonen and the Los Angeles Philharmonic (SACD/CD, Deutsche Grammophon 02899 477 5198-2), in which wind instruments are mixed with the thunderous stomping of strings in a pulsing tempo and surging energy that build through the *Adoration of the Earth*, then erupt into the explosive *Dance of the Earth*.

THE BRYSTON BDA-1 LET ME ENJOY **THE BEST-SOUNDING DIGITAL PLAYBACK I'VE EVER HEARD** IN MY LISTENING ROOM.

Conclusions

The Bryston BDA-1 let me enjoy the best-sounding digital playback I've ever heard in my listening room, outshining even Bryston's own BCD-1 CD player. This might be related to the fact that the BDA-1 has *two* Crystal CS4398s *vs* the BCD-1's single chip.

The Bryston BDA-1 has become an essential part of my listening experience. Mated to my Quad ESL-989 loudspeakers and used with Bel Canto's USB Link 24/96, the BDA-1 let me enjoy hi-rez files downloaded from the Internet, producing open highs, detailed imaging, deep soundstaging, and well-defined and authoritative bass that connected me to those crucial elements of music: pace, rhythm, and emotion. And, yes, the BDA-1 also let me enjoy a higher level of musical dimensionality and realism. As Bob Reina did when he added the Audio Research Reference 110 amplifier to his reference system, at the end of my listening sessions for the BDA-1, I put down my notebook and picked up my checkbook. I give the BDA-1 my heartfelt recommendation for the highest rating in *Stereophile*'s "Recommended Components."

ASSOCIATED EQUIPMENT

DIGITAL SOURCES Bryston BCD-1 CD player, Sony SCD-C555ES SACD/CD player, Bel Canto USB Link 24/96 USB-to-S/PDIF converter, Lenovo X61 laptop for media storage.
PREAMPLIFIER Bryston BP26.
POWER AMPLIFIERS Mark Levinson No.334 (stereo) & ML2 (monoblocks).
LOUDSPEAKERS Quad ESL-989, JL Audio Fathom f212 subwoofers (2) with Bryston 10B SUB external crossover.
CABLES Digital: Wireworld Starlight Coaxial. Interconnect: Mark Levinson Silver, Red Rose Silver One, Totem Acoustic Sinew single-ended, Pure Silver Cable, Bryston balanced. Speaker: QED X-Tube 400, Pure Silver Cable R50, Ultralink Excelsior, Coincident Speaker Technology CST 1.
ACCESSORIES Bryston Universal Silver remote control, Torus RM-20 power conditioner, ATI SLM-100 analog sound-level meter. Listening Room: 26' L by 13' W by 12' high with semi-cathedral ceiling, moderately furnished with sound-absorbing furniture. Left wall has large bay window covered by Hunter Douglas Duette Honeycomb fabric shades. Rear of room opens through 8' by 4' doorway into 25' by 15' kitchen.

—Larry Greenhill