

BDP-1 DIGITAL PLAYER

Bryston's sleek BDP-1 music player

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EQUIPMENT REPORT

Bryston BDP-1

LARRY GREENHILL

DIGITAL AUDIO PLAYER

ames Tanner, VP of marketing at Bryston Ltd., was frustrated. He'd borrowed a Music Vault 4000 music server to play high-resolution digital music files at Bryston's exhibit at the 2009 Consumer Electronics Show. Most of the time, the server delivered some of the best sound at that event. The rest of the time, there were dropouts and crashes. Tanner later experienced similar dropouts and crashes when he streamed hi-rez digital files over his home network to a Bryston BDA-1 digital-to-analog converter (see my review in the February 2010 issue, http://tinyurl.com/yeq538s).

I found a more relaxed Tanner at the 2010 CES. This time, he'd borrowed an Auraliti L-1000 digital file server (\$3000 at www.auraliti.com), a box with no front-panel controls, no display, no hard drive, no fans, and no CD drive. Instead of a Windows operating system, the L-1000 ran a stripped-down version of the Linux open-source operating system. Its simplicity of design solved the reliability problems Tanner had encountered the year before.

Then and there, Tanner decided to ask Auraliti to help Bryston create a simple digital music file player. The result is the BDP-1.

Design Principles

It should come as no surprise that Bryston's BDP-1 digital file player resembles the basic Auraliti L-1000 in that it has a soundcard, motherboard, USB port, and power supply. Though there is a display, there are no fans, no CD drives, no keyboards, no DAC circuitry, and no built-in routers to produce noise, RF interference, or heat, or to tax the player's central

DESCRIPTION Digital music-file player running modified Linux operating system. File formats accepted: AIFF, FLAC, WAV, MP3, M4A, OGG. Word depths supported: up to 24 bits. Sample rates supported: 44.1–192kHz. Digital input ports: 4 USB 2.0. Digital outputs: S/PDIF (75 ohm BNC, female), AES/EBU (3-pin XLR, female). Control inputs: RS-232 port via 9-pin subminiature connector; two 3.5mm 2-conductor phone jacks for implementing remote 12V power on/off trigger. Output impedance: 75 ohms BNC, 110 ohms AES/ EBU. Jitter: master-clock standard deviation, <20 picoseconds, 10Hz–10MHz. Power consumption: 10VA. Supplied accessories: Bryston BR-2 handheld infrared remote control; Web client software for iPhone, iPad, or PC using wireless connection via router. 2GB USB flash drive containing eight 24-bit/96kHz FLAC music files from Chesky Records. DIMENSIONS 17" (435mm) or 19" (490mm) with rack ears W by 2.75" (70mm) H by 11" (280mm) D. Weight: 12 lbs (5.44kg) net, 15.2 lbs (6.9kg) shipping. FINISHES Black, Silver. SERIAL NUMBER OF UNIT REVIEWED BDP-1000147. PRICE \$2150; BR-2 remote control adds \$350. Approximate number of dealers: approximately 80. Warranty: 5 years, parts and labor, digital 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. Web: http://bryston.com.







The BDP-1 is basically a Linux computer optimized for streaming audio data.

processing unit with multitasking demands. Like a CD transport, the BDP-1's only job is to output a digital stream from its S/PDIF BNC or AES/EBU XLR outputs. The opensource Linux software was selected to ensure the BDP-1's long-term viability. The BDP-1 differs from the Auraliti L-1000 in two ways: it has AES/EBU output in addition to S/ PDIF, and a front-panel display and keypad to control playback, the latter freeing the BDP-1 from the L-1000's dependence on a network.

The BDP-1 accepts uncompressed AIFF and WAV music files, lossless FLAC files, and lossy-compressed formats such as MP3. Though it will not play Apple's Macintoshformated files, this limitation may be fixed in future iterations of the player's operating system.

Like the L-1000, the BDP-1 plays digital files from external flash drives or portable hard drives that can be plugged into one of its four USB 2.0 ports. When a file is selected for play, the BDP-1 first copies the file from the external drive to an internal buffer, thus avoiding the usual jitter problems when data are streamed directly from a USB port. The BDP-1's soundcard outputs the stream via the player's S/PDIF and AES/EBU ports to feed an external D/A processor. Bryston didn't include a TosLink output because its restricted bandwidth limited the player's output quality.

Inside

Removing the BDP-1's top panel reveals a simple circuit layout free of moving parts. The analog and digital power-supply circuit boards are kept separate, each with its own ground plane. The analog circuit's toroidal power transformer is just behind the left half of the front panel, while the digital circuit's power supply sits at the rear of the chassis. A ribbon cable carries power and control signals from the power-supply board at the rear of the chassis to the front panel's display,

MEASUREMENTS

com/content/case-jitters.

examined the measured behavior of the Bryston BDP-1 using the Audio Precision SYS2722 system (see www.ap.com and "As We See It" in the January 2008 issue, www.stereophile. com/content/measurements-maps-precision), as well as the Miller Audio Research Jitter Analyzer. I played test tones, at various sample rates and bit depths, that I'd copied to a USB memory stick and plugged into one of the BDP-1's two front-panel USB ports. For the analog-domain jitter measurements,' I fed the BDP-1's AES/EBU data output to our original review sample of the Bryston BDA-1 D/A processor (serial number 00100) via the 2' Hosa AES/ EBU datalink LG had used for his review. (This datalink uses highquality, 110-ohm Belden cable.)

I used the BDP-1's front-panel controls to navigate the audio files stored on the USB stick. Their use was intuitive.

1 A primer in how and why I measure jitter can be found at www.stereophile.

The BDP-1 successfully played files in the following formats (all I had available): WAV, AIFF, Apple Lossless, AAC (both self-ripped and purchased from iTunes), and MP3. It correctly handled data with sample rates ranging from 32kHz to 192kHz. Most important, its data output was bit-accurate, and the active bits in its digital output followed the bit depth of the file being played, 16 or 24.

The primary test for a product whose output is a serial datastream is the timing accuracy of that datastream. (While the master clock may have very low timing error, factors such as the impedance of the transmitter and the bandwidth of the datalink will increase jitter.) The BDP-1's AES/EBU output produced a very clean eye pattern (fig.1), with very little timing uncertainty at the beginning and end of the unit-sample waveform when tested with 16-bit J-Test data. The Audio Precision calculated the







frequency of trace, 11.025kHz; frequency range, ±3.5kHz

(left channel blue, right red).

BRYSTON BDP-1

IR detector, and navigation keys. Two large cables run from the front two USB sockets down the middle of the chassis to the digital input board, which is also fed by the rear panel's USB ports. The two front and top rear USB ports share the same power source; the bottom rear USB port has its own supply, so power-hungry hard drives are best connected there. The right side of the BDP-1's chassis is filled with a multilayered printed circuit board (PCB) that runs the Linux operating system, stored on a plug-in 4GB compact flashcard along with the player's read-only BIOS. The large, surface-mounted central processing unit (CPU) chip occupies the PCB's center. A modified ESI Juli@ 24-bit/192kHz soundcard (www.esi-audio.com/products /Julia) is mounted on the left edge of the motherboard.

The motherboard itself is made of doublesided epoxy glass populated with surfacemount components, polystyrene capacitors, and high-quality, 0.1%-tolerance metal-film resistors. Surface-mount and other gas-tight mechanical connections are used for signal circuits. I was told that the PCB traces were laid out to reduce coupling between signal channels. The BDP-1's layout, components, circuit boards, and wiring are the best I've is an infrared (IR) sensor that can be used with Bryston's BR-2 remote control (\$350). A two-row alphanumeric display sits at the center of the panel. Farther to the right is a diamond-shaped file/folder navigation keypad with which the user can find music files

THE BDP-1'S LAYOUT, COMPONENTS, CIRCUIT BOARDS, AND WIRING ARE THE BEST I'VE SEEN IN A HOME AUDIO PRODUCT.

seen in a home audio product.

Controls and Connections

The BDP-1 weighs only 12 lbs, and its outer dimensions of 17" wide by 2.75" high by 11" deep match those of Bryston's BCD-1 CD player and BDA-1 DAC. Its aluminum front panel features two USB (A) ports grouped at the left. Toward the center of the panel stored on user-supplied USB data devices. To the right of this are the Play, Pause, Stop, Previous, and Next buttons, just as on the front panel of Bryston's BCD-1 CD player. A power switch is paired with an LED indicator that glows red when the unit is in standby, green when it's fully on.

The rear panel handles power and the digital output connections. An RS-232 port at

jitter level to be 637 picoseconds peak (measured with a 50Hz–100kHz bandwidth), which is relatively low.

Feeding the 16-bit J-Test data to the BDA-1 and performing an FFT analysis on the D/A processor's analog output produced the spectrum shown in fig.2. There is very slight accentuation of the primary sidebands around the central spike that represents the 11.025kHz tone at \pm 229.6875Hz—the Miller Analyzer calculated the level to be just 110ps peak–peak, which is at the limit of its resolution—and all the other sidebands visible in this graph are actually the residual odd-order harmonics of the low-frequency squarewave.

Very low-level sidebands are visible at ±250Hz in fig.2, as well as some modulation of the BDA-1's noise floor in the same regions. Repeating the spectral analysis with 24-bit data (fig.3)

made the picture clearer, as now the data-related components are eliminated. Three sideband pairs are visible, at ± 240 , ± 360 , and ± 1240 Hz. I don't know from where these arise, but their levels are so low that I can confidently predict that they will have no audible consequences. The lower-frequency noise-floor modulation disappeared when I repeated the 24-bit J-Test using the SYS2722 as the data source (fig.4), but some higher-frequency modulation is now visible. Though this

is higher in level in the right channel (red trace) than the left (blue), I suspect this behavior is still academic.

Bryston's BDP-1 proved to be an excellent-performing digital source, with a low-jitter, bit-accurate data output capable of operating at sample rates up to 192kHz. It is a natural partner for the company's BDA-1 D/A processor. –John Atkinson



Fig.3 Bryston BDA-1, high-resolution jitter spectrum of analog output signal, 11.025KHz at -6dBFS, sampled at 44.1KHz with LSB toggled at 229Hz, 24-bit AES/EBU data from Bryston BDP-1. Center frequency of trace, 11.025KHz; frequency range, ±3.5kHz (left channel blue, right red).



Fig.4 Bryston BDA-1, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz, 24-bit S/PDIF data from AP SYS2722. Center frequency of trace, 11.025kHz; frequency range, ±3.5kHz (left channel blue, right red).



The rear-panel USB ports can supply enough power for USB-connected hard drives.

the left side of the panel can be connected to an AMX, Crestron, or other hardwired control system. Moving right, two USB ports enable the BDP-1 to power attached USB hard drives. Nearby, an Ethernet port lets the BDP-1 interface with a router or network for remote operation or firmware updates. Midpanel are the BDP-1's transformer-coupled output connectors: S/PDIF and the 110 ohm XLR connector for the AES/EBU output. To the right of these are two 3.5mm twoconductor phone jacks, to support On/Off trigger switching from a home control center.

The engraved brushed-aluminum faceplate, the feel of the controls, and the clarity of the display are first-rate.

The BDP-1 is shipped with a USB 2.0 flash drive containing eight hi-rez music files from Chesky, and a file with instructions for connecting the BDP-1 to a router. The superb manual includes extensive setup instructions, diagrams of how to connect the BDP-1 to a single router or network, a glossary of definitions of digital playback terms, and details on setting up an iPad or iPhone to provide remote control, as well as a list of the music player apps available online for these devices.

Not included is a digital interconnect to link the BDP-1 to a DAC–Bryston leaves that to the dealer. In fact, the shipping carton and manual really should be emblazoned with "DIGITAL CABLE NOT INCLUDED."

Setup and Quick Start

James Tanner brought the review sample to my listening room, accompanied by Bryston publicist Micah Sheveloff and *Stereophile*'s editor, John Atkinson. JA and Sheveloff were there to learn how to hook up BDP-1s.

Tanner placed the BDP-1 atop my Bryston BDA-1 DAC. He used a 0.5m Bryston AES/ EBU digital cable to connect the BDP-1 to the BDA-1's AES/EBU input. The DAC's output fed a Bryston BP-26 preamplifier via balanced interconnects, which in turn drove a Mark Levinson No.532H power amplifier and Snell Phantom B7 speakers.

Pressing the BDP-1's power switch initiated a two-minute boot-up sequence that uploaded the built-in firmware from the player's read-only flash-memory card. Two-columnhigh letters spelling "BRVSTON" scrolled across its display, followed by a soft *beep*, then a display of the model number. Detecting the connection to the DAC, the BDP-1 announced that it was "INITIALIZING." Next appeared the serial number, "BDP-1000147" and the firmware version "S0.94," dated "2010-11-14." The screen cleared and the BDP-1 was ready.

Tanner then inserted the thumb drive preloaded with eight hi-rez music files into one of the BDP-1's front-panel USB ports. The flash drive's LED began to blink, and the BDP-1 displayed "UPLOADING" as it accepted the files. Tanner pushed the Down navigation button on the front panel to select the USB flash drive (name: "Bryston"), then pressed the Right key to scan its folder. Another push of the Right key loaded the playlist, and another pressing of Down scrolled to the desired song title. A final push of Right began play. Sound filled my listening room.

ASSOCIATED EQUIPMENT

DIGITAL SOURCES USB 2.0 flash drives, external USB HDD; NetGear WN-350 wireless router connected to BDP-1 with Ethernet cable; iPhone 4 used for control; Bryston BDA-1 D/A converter. PREAMPLIFIER Bryston BP-26. POWER AMPLIFIERS Mark Levinson No.334 & No.532H.

LOUDSPEAKERS Snell Phantom B7, Quad ESL-989.

CABLES Digital: Bryston, Hosa AES/ EBU; Wireworld Starlight Coaxial S/PDIF. 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 (PSC) R50 biwire double ribbon, Ultralink Excelsior 6N OFHC, Coincident Speaker Technology CST 1.

ACCESSORIES Torus RM-20 Power Isolation Unit; ATI SLM-100 analog sound-level meter.

LISTENING ROOM 26' L by 13' W by 12' H 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 While Tanner was very familiar with the navigation keys, it took me a few hours to grow comfortable enough with it to navigate the different drive devices and folders in search of a file.

Software for Remote Operation

Although he preferred operating the BDP-1's front-panel controls, Tanner demonstrated how to use Bryston's BR-2 remote control. With the BR-2 the user can Play, Pause, and Stop a selected file, but can't navigate the vertical levels of USB device, file, and folder. For that you needed a network connection. Tanner plugged a wireless router into the BDP-1's Ethernet port with a CAT5 cable. On his Apple iPad he typed in the BDP-1's local Web address, which brought up the player's MPD software, described in the BDP-1's manual as a "musical player daemon." The same wireless connection worked for my laptop PC's Web browser, Firefox, using the free Music Player Minion add-on client for MPD or Gnome's Music Player MPD Client (http://gmpclient.org/installation). Tanner then used MPoD, an Apple store app which I had loaded on my iPhone, to control the BDP-1's internal MIN software over a wireless connection. These wireless playlist managers worked best if I first rebooted my iPhone or laptop to clear its memory.

While the BDP-1's MIN and MAX internal softwares did their jobs, they didn't share the superb graphic user interfaces of the MPoD, Minion, or Gnome apps.

Walking the Walk: The Learning Curve

With the BDP-1, I was not a quick study. It took me some time to learn which keys to press on the BDP-1's front panel, and how to find a particular file. Part of my journey involved buying accessories: a Hosa 2' AES/ EBU interconnect (\$18.95 at www.zzounds. com); a NetGear WN-3500 wireless router (\$104 at www.Buy.com); a 320GB Western Digital My Passport Essential Portable USBpowered hard drive (\$49.95 at Best Buy) for my large, hi-rez 24/176 and 24/192 music files; and a 16GB USB flash drive (\$41 at www.kingston.com) for 16/44.1 files ripped

from my CDs. I bought the AVS4YOU file-converter software to convert my large library of WMA digital files to FLAC format (\$38 at www.avs4you. com), and dBpoweramp software for ripping more from my files CDs (\$38 at www.dBpower amp.com). And I bought hi-rez files: as downloads, HDtracks.com from (\$19.95 each); or stored on DVD-R discs, from Reference Recordings and Soundkeeper Recordings (\$45 each).

However, my BDP-1 learning curve couldn't al-

ways keep up without help from Bryston's readily accessible technical support. When the BDP-1's display and controls froze up, a call to the mothership revealed that I needed to reboot the player. When the BDP-1 crashed when I plugged a second USB device—a flash drive or a hard drive—into another USB port, I was told to update the BDP-1's firmware. Bryston sent me instructions on how to do this.

First, I was directed to connect the BDP-1 to the Internet. I ran a CAT5 patch cable from the BDP-1 to my home network's router. Then I had to access the player's internal software from a networked PC. The manual explained how to display the BDP-1's network-assigned numeric IP address (192.168.1.7) by simultaneously pressing the Up and Left keys on the front panel. Plugging the IP address into my browser instantly brought up the BDP-1's internal home page; from there, I could pull up its settings menu for upgrading the player.

Then I was asked for the BDP-1's user name and password. I couldn't find any mention of these in the manual, on the shipping carton, or on Bryston's website. Another call to Bryston got me written firmware-update instructions, a default user name and password, and a small BIN file that automatically scripted the BDP-1's updating procedures. The BIN file directed the BDP-1 to Bryston's online FTP site so that it could download and install the newest version of its firmware (S0.97, dated 12/28/10). Downloading and installing this took 15 minutes, after which the BDP-1 could simultaneously access four USB devices without crashing.



The Minion PC client's screen displays most of the metadata you'll need.

Tanner informed me that the Bryston website will, by the time you read this, contain the default user name and password to access the settings portion of the BDP-1's internal webpage, the latest version of the BDP-1's manual, the text file that lists the date of and improvements included in each version of the firmware, and the upgrade instructions. The owner must supply Bryston with the serial number of his or her BDP-1 in order to get the BIN file that automates the upgrade. tween my speakers in "Nardis," from her *Café Blue* (Premonition/Blue Note 21810 2); and Emmylou Harris's softly beguiling, enveloping soprano in "Calling My Children Home," from *Spyboy* (Eminent EM 25001-2). The vibes solo on "The Mooche," from Jerome Harris's *Rendezvous* (CD, Stereophile STPH013-2), was cool, translucent, and shimmering, with no sign of harshness.

To play the hi-rez files, I used my iPhone to guide the BDP-1 to the 320GB hard drive. This contained 24-bit, 176.4kHz files from Reference Recordings, 24-bit/88.2kHz files from *Stereophile* master recordings engineered by John Atkinson, 24/88.2 WAV files of the Chamber Soloists of the Royal Philharmonic playing Mozart's serenades for winds (Naim Classical HD126), a 24/88.2 file of Beethoven's Symphony 3 with Andrew Manze conducting the Helsingborg Symphony (Harmonica Mundi HMU 807470), and the 24/96 version of Chesky Records' *Ultimate Demonstration Disc, Volume 2* (originally on SACD, Chesky SACD343).

Through the BDP-1, hi-rez tracks like Valerie Joyce's cover of Jimi Hendrix's "Little Wing," from the Chesky sampler had warmth, fullness, depth of soundstage, and layers of musical detail. Beethoven's Symphony 3 was deeply moving, with an immediacy

I MUCH PREFERRED USING THE MPOD REMOTE-CONTROL SOFTWARE ON MY IPHONE 4.

This is to prevent access to the upgrades by gray-market dealers.

Listening

I ripped favorite selections from CDs I've listed in various editions of *Stereophile*'s annual "Records To Die For" feature and copied them to my 16GB USB 2.0 flash drive; I copied hi-rez files to the 320GB hard drive. I navigated between these sources using the BDP-1's display and front-panel controls, but I much preferred using the MPoD remote-control software on my iPhone 4. The BDP-1's display read "NO DATA" for 3–5 seconds before the hard drive's playlist would appear; whereas the remote applications loaded the hard drive's full playlist instantly.

With the BDP-1 feeding the BDA-1 via the AES/EBU link, the files ripped from CDs revealed: the rich timbres of guitar and saxophone from the L.A. Four's *Going Home* (Ai Music 3 2JD-10043); a three-dimensional image of Patricia Barber's voice floating beI've sometimes felt at live performances. The bass in the hi-rez files was quicker, punchier, less diffuse than the CD versions. Eiji Oue and the Minnesota Symphony's 24/192 recording of Stravinsky's The Rite of Spring (Reference HRX RR-70) had clean, tight bass, with leading edges that were totally integrated into the rest of the music's textures. Wind instruments stood cleanly apart from the thunderous stomping of strings as the pulsing tempo and surging energy mounted in Adoration of the Earth and the explosive Dance of the Earth. The bass synthesizer in David Chesky's Urbanicity was captured with dead-on pitch definition, adding pace, energy, and emotional weight to the sound of the orchestra (24/48; or CD, Chesky HQCD351). Mark Flynn's flash-bang drums-and-cymbal opening to "Blizzard Limbs," from Attention Screen's Live at Merkin Hall (24/88.2; or CD, Stereophile STPH018-2), was more energetic and urgent-sounding than the CD version.

The upper midranges and highs in these

BRYSTON BDP-1

files were clean, open, effortless, and free of grain. Clarity and extension were terrific, as heard in the lilting tenor voices in Edie Hill's *A Sound Like This*, from male choir Cantus's *While You Are Alive*, engineered by JA (24/88.2; or CD, Cantus CTS-1208). Piano treble notes in Beethoven's *Diabelli Variations*, also engineered by JA, were effortless, translucent, open, and extended (24/88.2; or CD, Stereophile STPH017-2).

I listened to "Kote Moun Yo?" from February 2011's "Recording of the Month," Markus Schwartz & Lakou Brooklyn's *Equinox* (CD, Soundkeeper SR1002)—first through my BCD-1 CD player, then as a 16/44.1 file downloaded from Soundkeeper's website and played on the BDP-1, both players' digital outputs fed to the BDA-1 DAC. Listening to the CD, I easily heard the entwining of Monvelyno Alexis's guitar, Jean Caze's trumpet, Schwartz's shakers, and Paul Beaudry's double bass. Switching to the CD-resolution file sourced from the BDP-1, separate instrumental lines were a bit easier to discern. I then played a 24/192 file of the same tune on the BDP-1 and was blown away. What a difference! I loved the totally black background, deep soundstage, greater dynamic range, and smoother highs of the hi-rez files.

of classic Bryston value.

Setting up the BDP-1 was more challenging than I had anticipated, and its manual lacked key troubleshooting information. Bryston plans to post this information on their website, which should be in place by the time you read this review. However, once its firmware had been upgraded, the BDP-

WHEN YOU HEAR IT, YOU, TOO, WILL FIND THE BDP-1 A KEEPER.

Conclusions

The Bryston BDP-1 is simple in function and purist in design, a combination that worked well in playing high-resolution music files. Its slim chassis and case of silvery brushed aluminum, simple controls, and outstanding sound make it a prime example 1 was completely reliable. It played every hi-rez file I could lay hands on, including 24-bit/192kHz FLAC, WAV, and AIFF files, consistently delivering open highs, rich midrange timbres, a stunning dynamic range, and three-dimensional imaging.

When you hear it, you, too, will find the BDP-1 a keeper.

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Bryston Plays the Masters

High resolution digital master recordings embody music the way artists intended it to be heard, with up to four times the resolution of compact discs. The Bryston BDP-1 has been engineered and hand assembled to deliver unfettered playback of digital music. And the BDP-1 is the model of simplicity gracefully controlled by today's most popular portable devices.

Sonic perfection and easy to use—let the Bryston BDP-1 play the masters for you.

