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June 2011 / Brinkmann Bardo Stereophile May 11 Review

Bardo

THE STEREOPHILE REVIEW



Turntable
by Brinkmann Audio
review by Michael Fremer



“I won’t debate here how to make a turntable’s platter go around.”

Choose your favourite: belt vs direct drive, idler wheel vs belt, spring-windup vs wind power, whatever. As far as I’m concerned, there’s nothing to debate. Each of these technologies has its pluses and minuses, but none can produce CD’s accuracy of speed and inherent freedom from wow and flutter.

Despite that, you’ll never convince me that CDs produce music that sounds better or more lifelike than LPs, or that CDs even come close to communicating music’s ability to evoke emotions from listeners, or the sensation that you’ve been transported to the concert hall, or that the musicians are in your room performing for you. They just don’t.

Play the best CDs for an hour and convince yourself that the technology has gotten really good - and it has - then play an LP on even a modestly priced turntable, and the sensations of quiet, relaxation, and relief are profound. As one friend who hadn’t heard vinyl in years said when he heard The Clash on my turntable, “That’s the sound I’ve been missing!” His decision was made in an instant: He got rid of most of his CDs and replaced them with the LPs he’d ditched when he went digital.

The Bardo

Brinkmann Audio built its reputation for turntables on belt drive. Then, wanting to produce a less expensive model, they devised an elegant direct-drive system for the Oasis, their first turntable to incorporate a plinth. More recently, founder Helmut Brinkmann has designed the Bardo, essentially a plinthless Oasis that more closely resembles the company’s sleek, plinthless, belt-driven La Grange but costs less than either.

The basic Bardo costs £... and shares the superbly designed and machined spindle and bearing used in the Oasis, the La Grange, and Brinkmann’s top turntable model, the Balance. For another £..., Brinkmann will substitute for the standard acrylic platter mat an integral one made of precision-ground crystal glass, and add a screw-on record clamp. The glass mat includes for the record label a recessed area of stainless steel around the spindle to accept a raised washer insert. Screwing down the clamp produces a force around the record’s perimeter that flattens it against the platter. A second option (£...) adds a heftier outboard power supply for the motor, with a larger transformer that’s said to increase the bass response. A slab



of polished granite measuring 18" W by 1.25" thick by 12" D for the turntable to sit on is standard in the US. An isolation base, made by Harmonic Resolution Systems, which has had a long relationship with Brinkmann, is available.

The Bardo supplied for review included the glass platter and clamp but not the power-supply upgrade, in a complete plug'n'play package that included Brinkmann's 9.6 tonearm (£....) and Pi moving-coil cartridge (£....). Brinkmann will supply custom-drilled armboards for your choice of tonearms; Helmut Brinkmann was kind enough to include boards for my Graham Phantom II and Kuzma 4Point arms.

What any mass-loaded turntable sits on will have a great effect on its sound. The Bardo sat on my HRS rack atop an HRS isolation base tuned for the 'table's weight. In my opinion, the HRS rack is one of the greatest audio products ever manufactured.

A Non-Disco-Friendly Direct Drive

The Bardo and Oasis share the same neat, efficient direct-drive motor, designed and manufactured by Brinkmann. It consists of a large, eight-pole ring magnet mounted in the subplatter bearing housing, and a series of coils arrayed on a circuit board mounted below the magnet. An aluminum subplatter holds the steel bearing shaft, the ring

magnet, and the tachometer. A circular fixture of machined aluminum, bolted to the plinth, contains the electronic drive circuit and the four field coils, which, interestingly, are not symmetrically arrayed at 90° angles to one another. Instead, in order to allow space for the control circuitry on the printed circuit board that supports the coils, they're arrayed at 22.5° angles, which puts the first at about 8:45 o'clock and the fourth at about 3:45. Why the space between the coils doesn't cause asymmetrical rotational performance, I don't know. Maybe it does. The bearing shaft, which rides on a Teflon thrust pad that sits in a machined aluminum carrier at the bottom of a circular opening in the center of the coil array, completes the compact design.

Two Hall-effect sensors - ie, transducers whose electrical output varies in response to variations in a magnetic field - track the ring magnet's North and South pole positions, and direct an amplification system that precisely times the sequential increases and decreases of current flowing to the coils, as needed, to ensure smooth rotational performance. The concept is not new - see my review of the Grand Prix Audio Monaco direct-drive turntable in the November 2007 *Stereophile*, Vol.30 No.11 - but the execution appears to be.

Though Thorens is credited with developing the earliest direct-drive turntables decades ago, modern direct-drive technology took into account the quick-

start, quick-stop needs of radio stations and DJs. Thus, motors were high-torque, platters light.

Virtually all electric motors “cog,” ie, their rotational speed regularly fluctuates above and below the average speed as each magnet pole goes past each coil. A high-torque motor needs a greater number of poles - in some designs, dozens - and the more poles, the more cogging. With nothing to counteract the motor cogging that inevitably occurs directly within the platter of a high-torque, low-mass, direct-drive turntable, large amounts of wow and flutter are also inevitable.

Regulating a direct-drive motor’s speed with a phase-locked loop produces tight speed control and measurably low levels of wow and flutter, but the motor’s constant, ultra-high-speed hunting and pecking as it over-and-under compensates in the attempt to produce a consistent speed can create a jitter effect in the mid-treble to which the human ear is particularly sensitive, adding a hard, brittle texture to music. That describes the sound of Technics’ now-discontinued SL1200 series of direct-drive turntables, and explains why, despite their high build quality and relatively low price, few are used in serious audio systems, though some listeners claim that these ‘tables can be modified to improve their sonic performance.

In designing his direct-drive system, Helmut Brinkmann chose to flip the direct-drive paradigm and go with a 22-lb, “resonance-optimized,” aluminum-alloy platter and a relatively low-torque motor that takes about 12 seconds to get the platter up to 33.33rpm. Brinkmann claims that, once set in motion, the massive platter requires but a small electronic “nudge” to maintain accurate speed; thereafter, the ultra-low-friction bearing requires very little energy to maintain correct speed. Brinkmann also claims that the heavy platter and the close-proximity coil array’s overlapping magnetic fields help minimize cogging effects. The geometry of the coil array, he says, was arrived at through listening.

Brinkmann uses the same platter bearing in his belt-driven ‘tables. While in those designs the bearing is electrically heated, that’s not necessary in the Bardo, he says - the motor’s quiescent current produces enough warmth.

The Bardo’s speed control is analog - Brinkmann felt that the radio-frequency interference from a digital system would degrade the sound. An optical reader measures the tachometer’s strobe frequency, converts it to a voltage, and compares that to a temperature-stable variable reference voltage. Trim pots for the two speeds can vary the reference

BRINKMANN 9.6 TONEARM & PI PHONO CARTRIDGE

Brinkmann’s 9.6 tonearm (£....) resembles the German company’s longer, more expensive 10.5 and 12.1 arms, which in turn resemble the legendary Breuer. The new arm includes the same headshell, armtube, mounting socket, and cueing device used in the other arms. The bearing system differs, though the Swiss-made ball bearings are identical.

While the more expensive arms use traditional fixed-gimbal bearings, the 9.6 has a unipivot-like construction for the horizontal bearing. The weighted arm housing sits on a small ball that rests on a pivot, also as in a typical unipivot design. A

second ball at the bottom of the housing prevents “arm lean,” but since the arm’s weight rests on the top ball, the lower one isn’t critical, and I could feel some play when I handled the arm. Vertical arm motion is effected via a second pair of captured bearings. This arrangement allowed the use of less costly parts and kept the price down, Brinkmann says. The arm’s effective length is 248mm (231.5 from pivot to spindle, plus 16.5mm of overhang), while its effective mass, referenced to the center position of the headshell slot, is 12gm.

The 9.6 arm’s design is basic: The counterweight slides freely on a shaft aligned with the armtube and is secured with a grub screw, as is the vertical shaft used to set vertical tracking angle (VTA) and stylus rake angle (SRA). Setting the cartridge’s vertical tracking force (VTF) is therefore less convenient

voltage, and thus the platter's speed of rotation, within a range of $\pm 10\%$.

I appreciated that Brinkmann's technical descriptions of what he's done don't minimize the difficulties of designing belt- or direct-drive turntables, and that he claims perfection for neither of his designs.

The Bardo's Other Parts

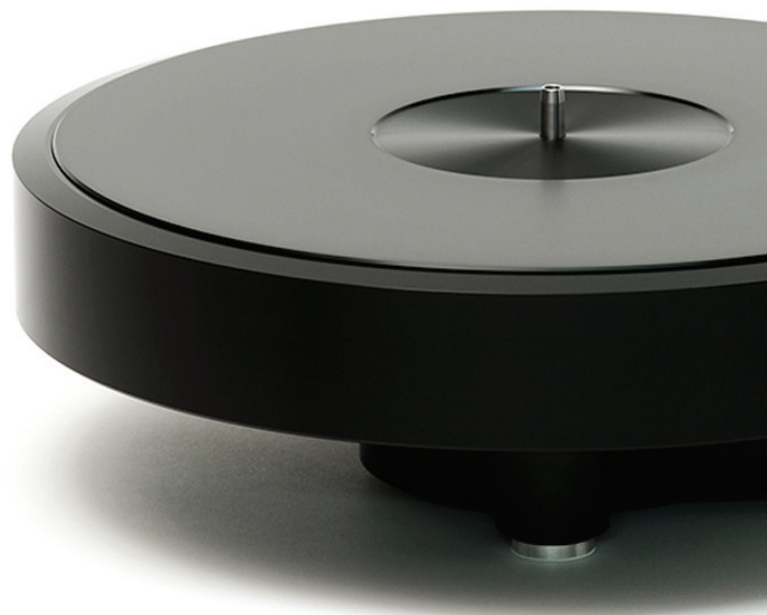
The self-contained motor and bearing system attaches to a substantial, resonance- optimized, tear-shaped, 16.4"-wide chassis of duralumin, to which are fitted three adjustable feet of machined metal. A circular platform accepts machined-aluminum armboard inserts that can be easily rotated to achieve the proper pivot-to-spindle distance with a wide variety of tonearms, before being secured with three locking bolts.

The chassis's far side holds a pair of RCA jacks (XLRs are an optional extra) that terminate in a DIN plug under the housing of the tonearm mount. An umbilical from the outboard power supply, which is housed in a nicely machined chassis, connects to a three-pin jack adjacent to the analog outputs.

The right side of the chassis, which lies underneath the platter, contains the two trim pots to vary the

speed and the speed selector switch: Up selects 33.33rpm (the end of the switch glows green), down selects 45rpm (glows red).

"In every way, the Bardo's machining and overall fit'n'finish are Class A. As with the Balance, which I reviewed in May 2005, I literally couldn't see the platter spinning - and it continued spinning a long time after I switched off the power."



than with a threaded rod, but if you carefully set the grub screw, you can nudge the counterweight along in small enough increments.

A threaded rod extending through the armrest platform to the base permits easy adjustment of arm height, hence VTA, after you've loosened a collar-mounted grub screw. This is less convenient than and not as easily repeatable as vernier-dial VTA adjustment, but unless you're delusional, you shouldn't need to change the arm height for every thickness of LP. The antiskating can be adjusted via a system of a magnetic ring opposed by a threaded pin magnet.

As with the other Brinkmann arms, the headshell has vertical walls that no doubt increase its rigidity, but also limit the width of the cartridges that can be

used. even if your wide-bodied cartridge of choice fits, be sure there's enough room to adjust its zenith angle. And as with some fixed-gimbal arms, the 9.6 offers no way to adjust a cartridge's azimuth. The arm's instructions include a method by which the azimuths of some cartridges can be adjusted by using a 10x or greater magnifying glass to insert, into the small lateral hole drilled in the rod that presses the transducer onto the rubber damper, a 0.8mm-diameter steel rod, and . . .

But don't even think about it. In short, what the 9.6 lacks in bells and whistles it made up for in the excellence of its machining and construction. The 9.6 tonearm is a very well made, basic design, but at £.... it faces some stiff competition for not that much more money - competition that offers greater functionality, perhaps with greater

Setup and Use

If you order the Bardo with the 9.6 and Pi, it will be delivered with the arm and cartridge already installed, even though there is no stylus guard. Not a problem, as you'll see when you unbox it.

After carefully removing a black nylon tie that holds the arm tightly to a rod threaded into the spindle, you place the arm on its rest, then remove the threaded rod and the orange protective tape around the subplatter-and-bearing assembly.



Carefully place the heavy platter on the subplatter assembly, level the turntable, add the counterweight to the back of the arm, set the tracking force, and in less than 30 minutes you're just about ready to play records. All that's left to do is connect your choice of output cables to your phono preamp, attach the umbilical to the power supply, and plug that into the mains. It doesn't get much easier - particularly for a sophisticated turntable with such high performance aspirations.

Place a record on the platter. (If you order the optional platter mat and clamp, you'll have to insert a washer into the recess around the spindle before placing an LP on the platter and apply the clamp.) Flip the switch to the correct speed, and you're playing records.

A word of caution: If you reach directly for the Bardo's on/off switch, your arm can easily collide with the stylus. It doesn't take long to get accustomed to reaching around the tonearm to get to the switch rather than directly toward it.

Brinkmann's specified pivot-to-spindle distance measured correctly per the latest Feickert gauge, but when I lowered the stylus onto the Feickert's overhang grid, it didn't line up with the scribe marks for the Lofgren, Baerwald, or Stevenson

dynamic capabilities and more precise extraction of information from the grooves.

The Brinkmann Pi cartridge's Benz-Micro heritage was obvious from the get-go. The motor is built to Brinkmann's specifications by Benz-Micro and includes a Micro-Ridge stylus. The cantilever material is not specified. The Pi's output is approximately 0.25mV, and its compliance is moderate at 15µm/mN. Recommended are a tracking force of 1.8–2gm, a VTA of 23°, and a resistive load of 600 ohms.

Helmut Brinkmann says he tweaked the Pi's design for a year and a half before he achieved the results he desired, including making the tiny set screws out of various materials. The Pi, with a body of machined aluminum designed to control the dissipation of resonant energy, weighs a hefty

14gm. Brinkmann supplies aluminum screws and titanium washers, which, he claims, in combination with special damping between the cartridge body and headshell, have been "sonically tuned to create a unique musical instrument."

The Pi cartridge strikes me as very competitive at and above its price of £...., but its lack of a stylus guard could be problematic for those with cats or ham-handed domestic help. Its tonal balance was slightly on the lean side of neutral but only slightly so, and its overall extension at both frequency extremes was impressive, as was its tracking ability.

-Michael Fremer

alignments. It was off by a few millimeters, which in this tiny world is a lot. I redid the overhang and zenith angle to conform to the Lofgren alignment, and contacted Brinkmann about this.

It turns out the original setting was deliberate. Brinkmann uses the Dennesen alignment protractor (in fact, he offers a nicely machined version of it) and a slightly different geometric methodology, describing the details of which space doesn't permit. As I say in my seminars on turntable setup, there are many ways of setting overhang to minimize tracking distortion. After our conversation, I returned the Pi's stylus to Brinkmann's preferred overhang position.

Using the Wally Tools Wallyskater, I found that the antiskating was set a bit too high - but again, skating is dependent on groove modulation, vinyl formulation, where on the record you measure it, and, for all I know, the day of the week. I suspect a modulated groove test was used to set antiskating; if that modulation was higher than what's found in typical musical signals, the setting will be too high.

When I checked the SRA with a digital microscope, I measured 90°, or 2° lower than what my experience has shown me is optimal. Raising the arm pillar 4° would produce an approximate 1° change in SRA, so I decided to raise it about 5mm, but not before listening to it as delivered. A digital oscilloscope and a Fozgometer (which in this case correlated well with each other) demonstrated that the Pi's azimuth had been set at the factory to perfection, which was fortunate - the 9.6 arm doesn't let you adjust azimuth.

Sound

“With three new variables - a turntable, a tonearm, and a cartridge - it was at first difficult to determine which was contributing what to the sound. But it wasn't at all difficult to love that sound.”

The Bardo-9.6-Pi produced superbly well-organized sound with clean, sharp attacks, reasonably strong sustain, and pronounced decay, all against a jet-black backdrop. The harmonic structures of

instruments, while somewhat lean, were intact. Most Benz-Micro cartridges I've heard tend to sound somewhat polite and self-effacing on top; this combination's high-frequency production was anything but. Instead, it was well extended and slightly sharp in a pleasingly Teutonic way, if more pronounced than I like - at least in my system. The mids were smooth and clean, the bottom taut, well defined, and well extended: all in all, this was a good start for a “tight” front-end not yet broken in.

Raising the arm pillar about 5mm upped the SRA to a bit above 91°, which smoothed out the top end considerably and produced a more balanced sound that only improved as the Pi continued to break in. After that, as the suspension material settled over time, it was necessary to raise the pillar more to maintain 91°, or raise it to approximately 92°.

Digging into the essential reissue of The Nat King Cole Story (45rpm LPs, Capitol/Analogue Productions APP-SWCL 1613) brought nothing but pleasure: the warmish-sounding opening tracks had the proper mellow richness. (Though everything was rerecorded in stereo for this 1961 release, the earlier tunes were kept in the warm style of the mono originals, with minimal stereo separation.) Cole's creamy voice rides atop the sound of the somewhat softly recorded piano with the kind of clarity and definition that 1940s recordings couldn't produce. The Brinkmann combo did a very good job of capturing this, though it seemed a slight bit of edge remained on top that became more obvious as, in “Nature Boy,” the producers maximized the stereo separation.

Switching to the equally remarkable Ella Fitzgerald Sings The Rodgers and Hart Song Book, Volume 1 (45rpm LPs, Verve/ ORG 055), there was a bit more edge than I'd been used to from Fitzgerald's voice, and the huge kick-drum whumps in “You Took Advantage of Me,” though deep, seemed robbed of the last bit of low-frequency extension and dynamic energy. Instrumental separation could have been more pronounced.

To get to the bottom of this, I made some 24-bit/96kHz recordings of the Fitzgerald, using my Alesis Masterlink hard-disk recorder as well as “Green Shirt,” from Elvis Costello's Armed

Forces (LP, Mobile Fidelity Sound Lab), then took a deep breath and began mastering the setup of the considerably more expensive, more complex, more massive Kuzma 4Point tonearm (£...., review to come) on the Bardo, with the Pi cartridge. I listened again to the same tracks, then recorded them, again at 24/96, so that I could do direct comparisons.

“Verdict: The Bardo is orders of magnitude better than I would have believed had I used it only with Brinkmann’s own 9.6 tonearm.”

That’s not to say the 9.6 isn’t a good arm at its price, or that the Bardo didn’t sing and swing when connected to it, or that, in a less revealing system whose speakers and amp don’t add up to £100,000, the Brinkmann combo wouldn’t be among the best analog front-ends you can own for under £20,000. It’s just that the costlier Kuzma 4Point is considerably better, and let the Bardo express itself more fully in every way.

With the Pi cartridge riding in the massive 4Point, the top end smoothed out considerably and was less pronounced without losing any air, transient speed, or high-frequency extension. Ella

Fitzgerald’s voice became more three-dimensional and nuanced and less bright, in part because the reverb better separated out into its own space instead of being submerged in the sound of her voice. The kick drum’s energy produced a greater wallop and more satisfying whomp. More than that, the wind instruments in the right channel took on a richer, rounder harmonic sheen, while the piano in the left sported more wood and less cardboard. Images became more stable and solid - and through the 9.6 they’d already been plenty good in that regard.

The Bardo’s dynamic presentation was very, very good, but not complete - and that’s where some of the more massive and expensive turntables can beat it. But unless the rest of your system can express the full dynamic palette, you won’t miss what the Bardo omits.

Comparisons

All that was left to do to really get the Bardo’s number was to record the same Fitzgerald and Costello tunes with my reference Continuum Audio Labs Caliburn turntable, Cobra tonearm, and Castellon stand - which together cost more than ten times the price of the Bardo-4Point combo - then mount the Ortofon A90 cartridge in the 4Point on the Bardo and record them again. (Thanks to



the digital USB microscope and an oscilloscope, I could be sure what I was hearing was not due to variations in setup, though with the 4Point's separate silicone damping systems for horizontal and vertical movement, you could vary the sound after the optimizing geometric setup.)

Here's what I found. The Bardo's speed control was, as expected, superb. If the direct-drive motor suffered from any rotational speed "jitter," it did so minimally. The Bardo's low-frequency extension and control were very, very good, and probably better than those of some more expensive belt drives in terms of low bass not creeping into the midbass, where it doesn't belong. Thin and/or malnourished in the bass the Bardo was not.

However, I suspect that the Bardo's bass wasn't as rich, deep, and weighty as that of Brinkmann's La Grange or, especially, Balance turntables. Some might argue that the Bardo gets all of what vinyl offers in the low frequencies - but I wouldn't be one of them, particularly when I compared the Bardo-4Point-A90 to the Caliburn-Cobra-A90. Where the far more expensive Continuum rig goes deeply and transparently into the recesses of recordings - a function of both micro- and macrodynamic range that I heard with the first LP I played on it almost six years ago - the Bardo stopped just as it entered the darkness.

However, you pay a lot to go that extra distance - as you do going from the Bardo to the Balance, which, as I remember (I was about to buy a Balance when the Continuum came along), gets you way into the depths of what's in the grooves of your favourite recordings. The Bardo, at a much lower price, does not. On the other hand, I know a few analog devotees who find the Balance's sound "polite," even boring. They're misguided, in my opinion, but they might be thrilled by the Bardo, regardless of prices.

With the Ortofon A90 in the Kuzma 4Point playing MoFi's stupendous reissue of Dead Can Dance's Into the Labyrinth (LP, 4AD/Mobile Fidelity Sound Lab 2-001), or España from Ernst Ansermet and the Suisse Romande Orchestra (LP, ORG 014), or The Nat King Cole Story, the Bardo addressed with great precision every aspect of analog playback

and left little to be desired. Its minor errors were those of omission, as previously described.

Conclusions

As a plug'n'play record-playing system costing just over £...., Brinkmann Audio's Bardo turntable, 9.6 tonearm, and Pi cartridge have a value greater than the sum of their parts.

If you're new to analog and can afford to spend this much, but don't want to get too heavily involved in setup and/or have to buy a boxful of setup tools, you can't go wrong with this combination. Even a novice with a digital stylus gauge can probably unbox it, set it up, and be playing LPs within an hour.

The Bardo is beautifully made, smartly designed (I think the high-mass platter and low-torque motor are key to its performance), looks elegant, and has no outboard motor and belt to potchky with. Out of the box, it's plenty good - and once you're hooked, you can make it even better. At £.... with glass and stainless-steel mat and record clamp, the Brinkmann Bardo is a contender for the best turntable under £...., and probably should be auditioned by anyone looking for a turntable costing £15,000, or even more. It sounds that good, and its build quality and fit'n'finish are worthy of 'tables costing far more.

"And if you're an experienced analog hand with £.... to invest and a prejudice against direct-drive turntables, you should definitely hear the Brinkmann Bardo before plunking down your money for anything else."

