

BARDO Turntable – technical information

History

After many years of research and development, Helmut Brinkmann constructed the magnetic direct drive turntable *Oasis*. Since this project was well received by music lovers all over the world, we decided to release a second model that features the same ground breaking magnetic direct drive system, though visually more inspired by the design of our top-of-the-line models; the *Balance* and *LaGrange*.



BARDO turntable with 10.5 tonearm

The BARDO features the magnetic motor drive and platter first introduced in the *Oasis* turntable, with an acrylic platter mat. The spindle & bearing are the same as found in the *Balance*. An outboard power supply in a metal housing is shown below.

The tonearm base of the BARDO can be rotated and secured without play to allow a simple and precise adjustment for all tonearms between 9" and 10.5". Brinkmann will drill the base to accept the tonearm of the customer's choice.

The output sockets found on the back of the turntable can be equipped with either RCA or XLR sockets, and it is also possible to install tonearms with DIN connectors or fixed cables.

The two possible speeds, 33 1/3 and 45 rpm, are selected by a switch located at the front of the turntable and can be finely adjusted via individual trim potentiometers that are located next to the switch.

Magnetic Drive

The BARDO has a magnetic direct drive motor, which uses only one bearing for the motor and the platter. A circular magnet is mounted in the bearing of the platter and is concentrically driven into rotation via coils on the circuit board under the magnet. An electronic circuit drives the coils via two magnetic sensors that react to the magnetic fields and push the heavy-weight platter in a precise and slow circular rotation.

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Many of the older direct drive turntables were constructed for studios and radio stations where it was necessary to have a quick start-up time, usually less than a second, which was achieved by using a high torque motor that speeded up and stopped a relatively light-weight platter very rapidly. This caused heavy cogging effects accompanied by high wow & flutter distortion.



To avoid this, we developed our own proprietary motor control system that transfers just enough energy to the motor to rotate the 22 lb. platter at a constant speed. Bear in mind that the BARDO platter is so heavy that once it is set in motion; maintaining a constant speed needs only a small nudge from the magnetic drive. The motor's stator consists of four specially designed field coils, which are mounted concentrically and precisely around the platter's bearing. Based on extensive listening sessions we decided to forgo the typical 90-degree mounting angle in favor of a non-standard 22½-degree roster, which, due to the magnetic fields overlapping, further reduced cogging. The motor's rotor also acts as the sub-platter and carries a magnetic ring with eight poles on its underside. Inside the motor, the revolutions of the tachometer disc are measured and turned into variable voltage that is fed into a control circuit where the rpm are compared to the reference voltage that is adjustable via the trim pots. A separate heater for the bearing, (to heat the oil in the bearing housing) as included with the LaGrange and Balance bearings, is not necessary, as the motor circuitry is kept under current all the time, just the speed is switched between zero, 33 1/3 or 45 rpm. In this way, the bearing is kept warm by the quiescent current of the motor drive.

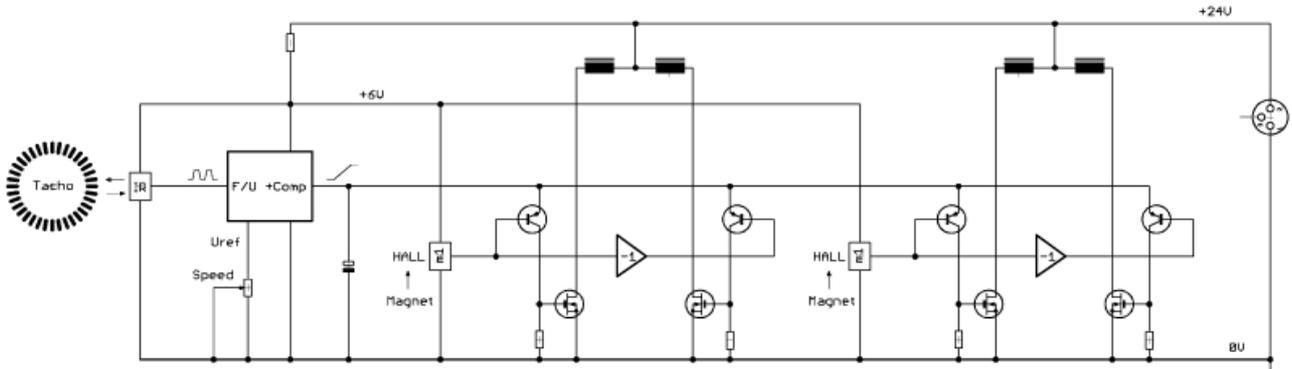


Electric motors work under the principle that an electrical current flowing through a conductor generates a magnetic field. Hence, coils are a fundamental element to an electric motor. Magnets complete the motor system as the opposing element. Both the OASIS and the BARDO utilize an eight pole ring magnet across four coils. When electric current flows through the conductors, a magnetic field is generated which, depending on the polarity, either attracts or repels the magnet's poles. This in turn sets the ring magnet, which is connected to the main platter via the bearing shaft mounted sub-platter, in motion.

Magnetically sensitive Hall sensors capture the momentary position of the poles and through an amplification system ensure that the current flowing through the coils always increases and decreases at the correct moment. The phase relationship between the coils is 25 degrees. This and the driving of the coils make sure that the motor doesn't cog and runs smoothly. The rotational speed is measured by means of an optical tachometer. As soon as the correct speed is achieved the current through the coils is reduced.

Analog Speed Control

The speed regulation is done with frequencies from the strobe (tachometer) under the magnet. These frequencies are transformed to voltage, and this voltage is compared to an adjustable but temperature stable reference voltage. This is necessary, as otherwise the frequencies would only be comparable by referring them to digital signals, and Helmut Brinkmann did not want to use digital signals because of the RF components which would cause a reduction in sound performance.



Turntable Upgrades

Upgrade Stage 1 - features the aluminum heavy duty power supply used normally with the Balance and LaGrange turntables. The result is a better defined & more articulate bass response and a wider soundstage.

Upgrade Stage 2 - features a precision ground glass platter mat and a locking record clamp. This results in a finely extended dynamic resolution.

Upgrade Stage 3 - combines upgrades options 1 and 2; now the BARDO has nearly the bandwidth and dynamic resolution of our big turntables.

Tonearm & Cartridge Options

The BARDO is currently available with a pre-installed Brinkmann 10.5 or the new Brinkmann 9.6 in 2010. Pre-drilled armboards are available for most popular tonearms, up to 10½". A new affordable Brinkmann MC cartridge will soon be offered with the Brinkmann 10.5 or 9.6 as a factory assembled package.

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Standard BARDO power supply

SPECIFICATIONS

Drive:	Platter driven by a magnetic field; proprietary motor, drive system and speed controller
Power supply:	External power supply utilizing solid state technology
Bearing:	Lubricated, precision (hydrodynamic) journal bearing, quiet and maintenance-free
Platter:	Resonance-optimized special aluminum alloy; surface-black acrylic platter mat
Chassis:	15 mm Duralumin with resonance-optimized geometry
Arm board:	Movable (rotating) without play for simple and precise tonearm adjustment, with quick release. Accepts all tonearms between 9 and 10.5" as well as several linear tracking tonearms
Connectors:	RCA, XLR or feed-through for tonearms with 5-pin DIN connectors; DIN connector (3 pin) for umbilical cord of external power supply; 2 mm connector for ground wire
Speeds:	33 1/3 and 45, selectable by a switch; LED indicator for speed (33 1/3 = green, 45 = red) Deviation from nominal speed: 0.0% (adjustable) Fine adjustment of speed: $\pm 10\%$ with trim pot
Wow & Flutter:	0.07% linear, 0.035% weighted DIN 45507
Speed-up time:	12 / 16 seconds (33 1/3 / 45 rpm)
Rumble (noise):	-64 dB (test record DIN 45544); -68 dB (measuring adapter)
Dimensions:	16.5" (420 mm) x 12.6" (320) x 4" (100) (mm) {w x d x h}
Weight:	Total 32.6 lbs (14.8 kg) (Chassis 11 (5), Platter 22 (9.8); Power Supply 1 (0.5 kg)
Accessories:	Granite platform 18 x 12 x 1.25" (standard in the USA), HRS platform (optional)
Tone-arm Options:	Brinkmann 10.5, or Kuzma Stogi (both factory fitted) Pre-drilled armboards available for most popular models, up to 10½"

* For a more detailed explanation about the magnetic drive system in our OASIS and BARDO turntables please visit our website: www.brinkmann-audio.com and read the white paper in the OASIS section.

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