

The reasons for these and other significant improvements are many, and are the subject of patent applications. We hope you will agree that taking a few minutes to read the following design background on the development of this, our newest concept in analogue playback, will be interesting and informative....

First, we've suppressed resonances at every conceivable point. This has been accomplished with exotic materials; for example, the Lorzic-ceramic arm tube, introduced with the Model 2.0, has been refined with a slightly larger diameter that is progressively-extruded (to resist standing waves in the tube) and precision ground. A proprietary-process glass overlay, acting as extensional damping, is applied to further suppress resonances. (As a bonus, this black glass surface provides a fine-china appearance, complementing the other tonearm components).

The armtube itself, easily removable and using our patented alignment system, offers the safety, convenience and accuracy of off-turntable cartridge installation and alignment, as well as allowing quick interchange of multiple pre-mounted cartridges. It is significantly improved from the earlier armwands, and attaches to a nearly half-inch wide stainless-steel post-and-connector that supports the armwand under tension, resulting in virtually a one-piece armtube/pivot assembly with high damping.

The connectors avoid the use of common brass as the base material; instead, they use high copper-content phosphor bronze which, in addition to being a better conductor than brass, also has less "memory"; i.e., it won't deform as much with use, but will keep its proper tension and mechanical strength over time. The internal wiring has also been improved, with purpose-made 4-nines silver incorporating both solid and litz construction, and with teflon and silicone insulation jackets for fast transmission speed.

Secondly, we've addressed the all-important (and often ignored) area of dynamic balance. Tonearms should have as little inertia as possible; yet, too often, as a result of the correct placement mass distribution being overlooked, they contribute excessive resisting forces in opposition to the requirements of the phono cartridge as it attempts to follow the ups and downs of a typical record. The Phantom, in spite of its robust appearance, has been designed with a very low moment of inertia, so that the majority of phono cartridges can be used with ease and maximum performance.

-- At this point, a brief description of Balance Theory may be helpful: There are basically three types of static balance systems, Neutral, Stable, and Unstable. Stable balance, normally seen in laboratory scales, occurs when the CG (center of gravity) of the moving system is placed BELOW the pivot point. When this type of system is displaced from its preferred rest position, it will generate an immediate and opposing force which tries to return to that same position.

Unstable Balance, completely undesirable for any tonearm application, is when the CG is placed ABOVE the pivot point. A moving system with unstable balance will not have any stable position, and will exhibit reduced force as it's lifted.

The third, and most desirable system for tonearms, is Neutral Balance. With this system, the pivot point and the CG of the moving system are in the same plane. When the arm is raised or lowered, there is no opposing force trying to return the arm to a rest position; the pivoting system doesn't really know or care if the stylus is at the record surface level or a half-inch above or below it; as a result, there is no opposing force to the arm as it is traversing record deflection during play. The only downward tracking force is that of the

adjustable counterweight, which remains a constant. --

Previously, all true unipivots - that is, those with a single contact point for the bearing and NO secondary stabilizing surfaces, bearings, etc. - required the use of side weights or a significantly lowered counterweight in order to provide stability. (And even those with a secondary stabilizing guide generally require a displaced CG in order to provide constant contact with the stabilizer guide piece).

The drawback to both these conditions is that this design becomes a Stable Balance system, which is normally used, as mentioned, in laboratory scales for precision weight measurements. But laboratory scales have very different requirements than a tonearm. If Stable Balance is applied to tonearms, the arm will have a preferred rest position and always tries to return to this point; any change in tonearm height, as in tracking warped records, causes an immediate and equally opposing force that tries to push the arm back to its rest position. The higher the warp, the more counter-force is applied.

You can see that this force would work against the cantilever, deflecting it during warps and causing the magnetic system to be displaced. This, in turn, will certainly affect the reproduced sound, with diminished performance in all areas, including soundstage compression, loss of detail and dimensionality, not to mention record wear. This is why most tonearms must have their tracking force measured at the record surface level; any height change during the measurement will cause an incorrect reading.

A tonearm with Stable Balance can be identified by measuring the tracking force at the record surface level and again at a raised position above the record. If the tracking force INCREASES at the higher position, the arm has Stable Balance. Our own previous designs - the best we could make at that time - also had this limitation due to the use of side weights to provide lateral stability. We minimized the effect by placing the weights as close to the pivot as possible, but it was still measurable. Other unipivots with low-slung counterweights will also exhibit this force; the lower the weight, the more counter-force is applied. Although this technique is often promoted as a "high-stability" design, it does so at the expense of consistent tracking force. It actually results in varying tracking forces during play when traversing even small warps, accompanied by non-linear cartridge operation, and increased record wear.

If an arm were produced with Unstable Balance - although this approach should always be avoided in tonearms - such a design would actually cause the tracking force to DECREASE with arm height, and provoke serious mistracking as the arm is raised, as when negotiating warps.

Once Neutral Balance is chosen for use in a unipivot tonearm, one must remember that both the vertical and lateral planes will be affected the same way; without proper lateral stability, such a design would not have consistent, proper vertical alignment, and the pivot would tend to flop over to one side or another (usually in the direction of the weighted cartridge offset angle mounting) and stay in the position it happened to find itself. Obviously this condition must be avoided. In achieving Neutral Balance for vertical pivoting motion of the Phantom, a means was needed that would provide strong lateral stabilization, while not adversely affecting Neutral Balance in any way.

The answer to this lies at the very heart of the Phantom's design and its unique ability to retrieve groove information unprecended in our experience. The key is a magnetic stabilization system which is the subject of patent applications, and which we have called

"Magne glide" (TM). With this unique system, all lateral stability, and a portion of the damping, is provided by powerful neodymium ("rare-earth") magnets, placed in a horizontal line from the pivot point of the tonearm. Working as an adjustable system, Magne glide (TM) provides, simultaneously, the following: lateral stability, azimuth adjustability, damping assist, true vertical pivoting of the stylus tip with no rotation as the arm is raised, and easily adjusted anti-skate compensation.

In concert with pivot fluid damping (similar to that used with the Model 2.2), the Magne glide (TM) system allows normal vertical pivoting of the tonearm in true Neutral Balance, with vanishingly low friction; yet, provides a strong lateral stability that feels almost like fixed bearing arms. (No wobbling of the arm as it is lifted, for instance).

In addition, this dual-damped system forces the Phantom to pivot in the correct vertical plane of the stylus tip, with no rotation as the arm is raised. No regular unipivot can achieve this important geometric requirement. Even a few fixed bearing arms don't get this right! If the vertical motion of the tonearm is in plane of the armtube itself (and not the correct plane of the stylus face angle), the cartridge will tend to tip over to its side as the arm is raised, as when tracking over warps. This will cause noticeable channel imbalance and reduced tracking accuracy.

While there are other possible approaches to stabilize a unipivot bearing - besides stable balance, previously discussed - these efforts require some sort of secondary contact surface within the tonearm, and thus are no longer true unipivots. Although these quasi-unipivot designs can hold the arm upright, they do so at the expense of an additional bearing contact surface which cannot ever be properly loaded (the force required to maintain uniform bearing contact pressure, and to eliminate chatter) to the same degree as a vertically arranged contact point which supports the entire weight of the tonearm.

With the secondary contact stabilizer, whether it's a ball bearing or guide plate, the unavoidable lower contact load thus opens the possibility for secondary bearing chatter from the system vibrations always present in turntable operation. In this regard, the Phantom offers the distinct and demonstrable advantages of being a true single-contact unipivot tonearm, while retaining absolute lateral stability under dynamic conditions.

With the patent-pending Magne glide (TM) design, this achieves a high-load, chatter-free and virtually friction-free damped unipivot, combined with true Neutral Balance, and with the all-important geometric accuracy of correct vertical pivoting parallel with the face of the stylus tip.

If all that weren't enough, the Magne glide (TM) system also permits the application of anti-skate through the magnetic coupling of the design, thereby eliminating ANY direct contact or possible resonance to affect the main pivot assembly of the tonearm. The anti-skate system is completely independent, mechanically, and is easily adjusted either by a thumb-wheel rotation or sliding motion (user's choice) of the bias weight for minute adjustments from near zero force to 3+ grams.

Other refinement details abound: the use of a proprietary Swiss-made matched cup-and-pivot made of tungsten carbide (far stronger than any steel pivot) as the super-low-friction main unipivot bearing, a refined and far-improved removable armwand with our patented alignment system, the easiest and most accurate of all alignment systems, plus an increased VTA height range with calibrated vernier scales, a wide range of cartridge weight compatibility (5-18 grams), and two mounting profiles: the standard Graham Custom Mount and an SME mount.

The Custom Mount is the same as with the 2.2 and so the Phantom can be mounted in all 2.2 installations without any modification to the turntable. Similarly, the SME mount will allow the Phantom to be used on all SME profile mounts.

The Phantom B-44 is our best effort , a state-of-the-art instrument that is not to be equalled by any other fine tonearm, regardless of design. This is true even for other arm designs made by turntable manufacturers. It is NOT true, as some believe, that "the best arm for my turntable must come from the same manufacturer" (although some turntables are purposely designed to be impossible for use with any other arm, and which will severely limit your options for later improvement).

The Phantom was developed and tested on many fine turntables, such as the SME, VPI, SOTA, Basis, Clearaudio, etc. While many of these manufacturers provide armboards (either for our own Custom Mount or the SME mount), we also make armboards when necessary for a proper fit.

The Phantom is a true "drop-in" replacement - an improved one - over any other tonearm, and the proof will be in the listening. Claims - and counterclaims - abound in the high-end market (and we just made a bold one!), and it can become confusing as to what's really correct; however, once you experience the Phantom for yourself, we know you will agree that this is, truly, the finest tonearm we've ever produced and quite probably the best arm available today.