Garrard Zero 100 Automatic Turntable

● GARRARD's new top-of-the-line automatic turntable, the Zero 100, features a novel articulated tone arm designed for zero lateral tracking error. The tone arm's cartridge head is pivoted in the horizontal plane, and a separate linkage, parallel to the stainless steel tone-arm shaft, constantly changes its offset angle as it moves over the record surface. Garrard claims the arm has a maximum tracking-angle error of only 90 seconds, which is 1/40 of a degree! This is far lower than can be achieved by any conventional pivoted tone arm, and Garrard's use of precision-loaded ball bearings appears to have eliminated problems of pivot play and friction that have troubled similar designs.

In other details also, the arm of the Zero 100 differs from that found on competing automatic turntables. Anti-skating correction is applied by two ceramic disc magnets. The repulsion between the like poles of the magnets applies an outward torque to the arm that is adjusted by a sliding magnetic shield. The shield position is indicated on a dual calibrated scale, marked to match the stylus force from 0 to 3 grams for conical styli and from 0 to 2 grams for elliptical styli. The arm is balanced by an elastically isolated rotatable brass counterweight. Tracking force is set by a separate sliding brass weight on the arm, whose scale is calibrated from 0 to 3 grams in ¼-gram intervals. No springs are used anywhere on the arm. The slide-in cartridge-mounting plate has an overhang adjustment, with a separate plastic jig for accurate positioning of the stylus. A two-position lever on the front of the cartridge head tilts the cartridge to set the vertical tracking angle for a single record or for the center of a full six-record stack. The tone-arm rest post has a built-in lock, spring-loaded so that attempting to lift the locked arm cannot cause damage.

The 11½-inch cast-aluminum platter is driven by a Synchro-Lab constant-speed motor at 33⅓ or 45 rpm. As on the Garrard SL-95B, the playing-speed control of the Zero 100 also sets the arm indexing point for 7- , 10- , and 12-inch records at 33⅓ rpm and for 7-inch records at 45 rpm. A record of any size can be played manually at either speed, of course. The platter is covered with a ribbed, matte-surface rubber mat. There are removable automatic and single-play spindles (the latter rotates with the record), and a single edge-support post for the record stack in automatic operation. Three levers control all operating functions: automatic start/stop, manual start/stop, and cueing. This last operates with a slightly damped lift and a slow, smooth descent that is totally free of lateral drift.

The vernier speed-adjustment control is a ring concentric with the speed selector. The nominal range is ±2.5 per cent at 45 rpm and ±3.5 per cent at 33⅓ rpm. Illuminated stroboscope markings under the platter are continuously visible through a window on the motorboard during play. The Garrard Zero 100 is $189.50. A molded plastic base and a dust cover are available for $6.50 each.

● *Laboratory Measurements.* The articulated arm of the Garrard Zero 100 lived up to the claims made for it, insofar as we could measure its performance. The limiting angular resolution of our tracking-error protractor is about 0.5 degree, and at no time did we find an error larger than that. Without a doubt, the tracking error of the Zero 100 has been reduced below ordinary measurable limits—and it is certainly far less than the inherent errors involved in cartridge mounting.

The arm showed no sign of resonances or other side effects from its unusual construction. The tracking-force calibration was accurate within 0.1 gram over its full range. The force increased by about 0.2 gram over a stack of six records when initially set for a single record. This is typical of the better automatic turntables we have tested. We were pleased to see that Garrard's anti-skating correction, unlike that on most arms, was approximately correct when set for the tracking force in use. One would expect the automatic reduction in head-offset angle toward the inner grooves of the record to require less anti-skating compensation. Perhaps the wedge-shaped magnetic shield achieved this result; at any rate, the correction was equally accurate over the entire record.

The turntable started rapidly at line voltages as low as 70 volts, and its speed was absolutely stable and unaffected by changes in line voltage or load. The vernier speed adjustment had a range of about ±3 per cent. The Zero 100 measured well: wow and flutter were 0.1 and 0.025 per cent at 33⅓ rpm, and 0.13 and 0.05 per cent at 45 rpm. Unweighted rumble was −32 dB, decreasing to −35 dB when the two channels were paralleled to cancel vertical rumble. With CBS RRLL weighting, the rumble was −55.5 dB, one of the lower figures we have obtained since we started making weighted measurements.

● *Comments.* Despite its unconventional design (or perhaps because of it), the Garrard Zero 100 was very easy to get used to. In particular, the finger lift (a straightforward extension of the main arm) was exceptionally convenient to use. We also appreciated the smooth cueing (a carry-over from the SL-95B). Indeed, everything worked smoothly, quietly, and just as it was meant to. If there were any "bugs" in the Zero 100, we didn't find them.

It appears to us that the Zero 100 was designed, first and foremost, as a single-record player, and only secondarily as a changer. Only 12-inch records (six of them) can be played automatically, since the changer's record-edge support post is fixed for that size. Ten-inch LP records are not common, but it is well to be aware of this limitation.

Obviously, the Zero 100 was designed to be used with the best cartridges. Its maximum tracking force of 3 grams, or 2 grams with elliptical styli, would rule out most low- or medium-price cartridges.

Garrard's Zero 100, in basic performance, easily ranks with the finest automatic turntables on the market. Its novel arm—which really works as claimed—and its other unique design features suggest that a great deal of development time, plus sheer imagination, went into its creation. In our view, the results were well worth the effort.

This is the brilliant new star among automatic turntables, featuring zero degree tracking error and 12 other major advances.

Again, the innovator!

The components that comprise high fidelity systems have become increasingly sophisticated. In turn, the demands placed on the automatic turntable for higher performance standards have also increased. These stringent requirements have led to higher price categories for automatic turntables than ever before.

Nevertheless, the Garrard Laboratories resisted the temptation to build a so-called "super changer", until they were satisfied that sufficiently meaningful improvements were feasible, to justify the establishment of such a new product category.

Over the years, Garrard has invented, pioneered and introduced virtually every significant new feature in automatic record playing units. Many of these have been revolutionary, and together they have upgraded the entire character of the automatic turntable.

But change, merely for the sake of change, has been sternly resisted. Therefore, such notable innovations as anti-skating controls, built-in stylus pressure gauges, cueing and pause controls, dynamically balanced low mass tone arms and combination synchronous-induction motors (to name a few) were first introduced on Garrard automatic turntables . . . but only after the need was established and they were thoroughly researched, tested and perfected. Today, they are standard on most of the higher-priced automatic turntables of all manufacturers.

The Zero 100 is a dramatic new concept, with styling as advanced as its features. It is a new classic, which others will emulate for years to come.

While the appearance of a product does not improve performance, it does connote craftsmanship and quality — and reflects the aesthetics most people appreciate in products which are precision-engineered. In the Zero 100, new materials have been used — such as plexiglas, brass, machined parts, satin finish aluminum — all set off on a sparkling white unit plate. Garrard has made the Zero 100 the very personification of quality. ☐

The revolutionary new

GARRARD ZERO 100

Only Automatic Turntable with Zero Tracking Error $189.50

Heart of the **ZERO 100** is a revolutionary new tone arm

"ZERO" stands for Zero Tracking Error

The maintenance of zero degree tracking error over the full surface of the record has long been an experts' dream. From an engineering standpoint, the value of the principle is well-recognized, not only for obtaining the finest sound reproduction and eliminating distortion, but for preserving the record grooves. The problem has been to obtain these results with minimal friction and realistic cost. Since the feature is so desirable, there have been some separate tone arms and manual combinations attempting to play records back with zero degree tracking error, but these have had unacceptable friction levels, or were unduly expensive. Certainly, they could not be used on automatic players.

Garrard has spent many years on this development, discarding hundreds of ideas which did not meet its criteria. Now, at last, this advancement of the first magnitude is presented for home use on the Zero 100 automatic turntable.

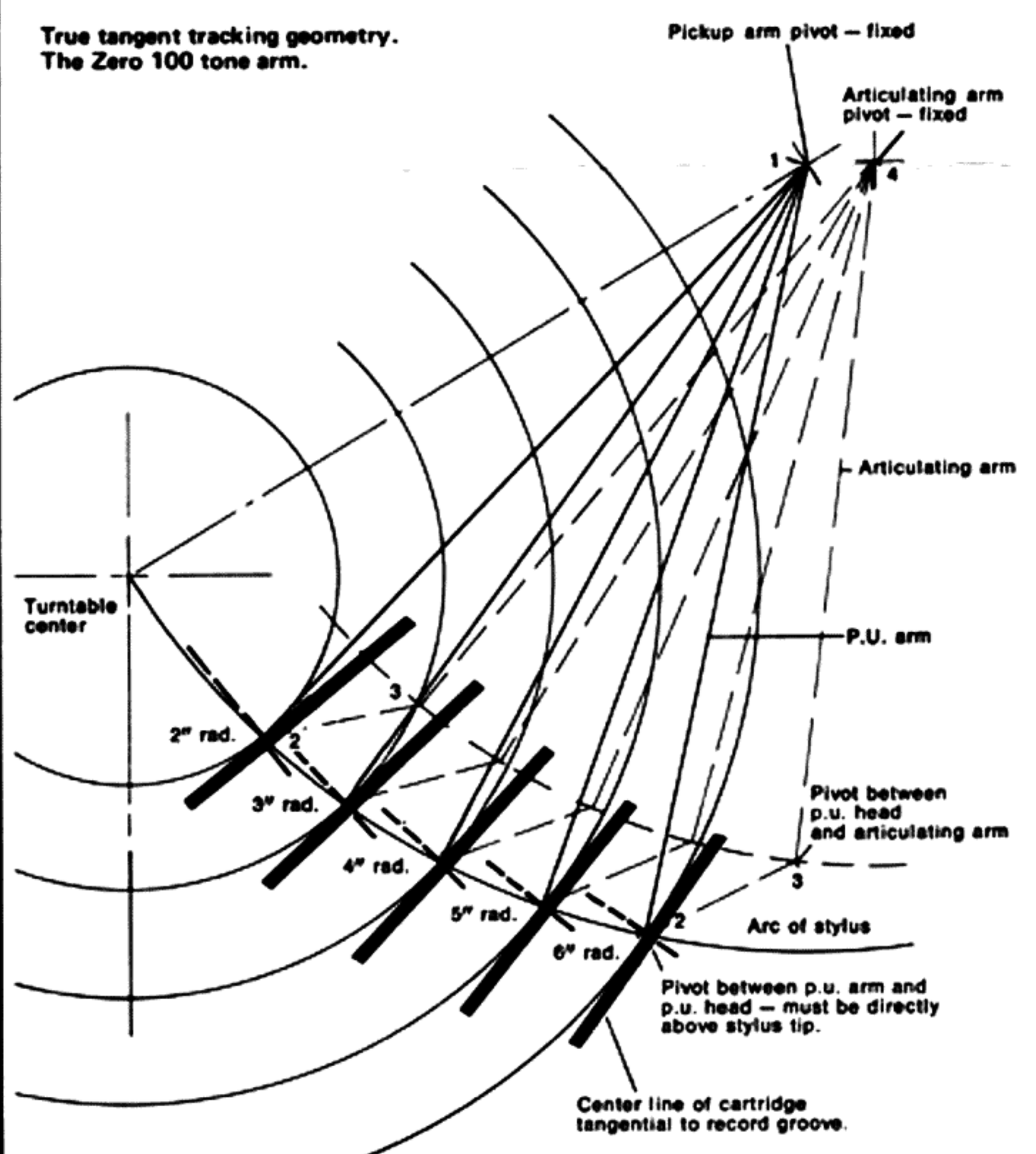
How the arm is built

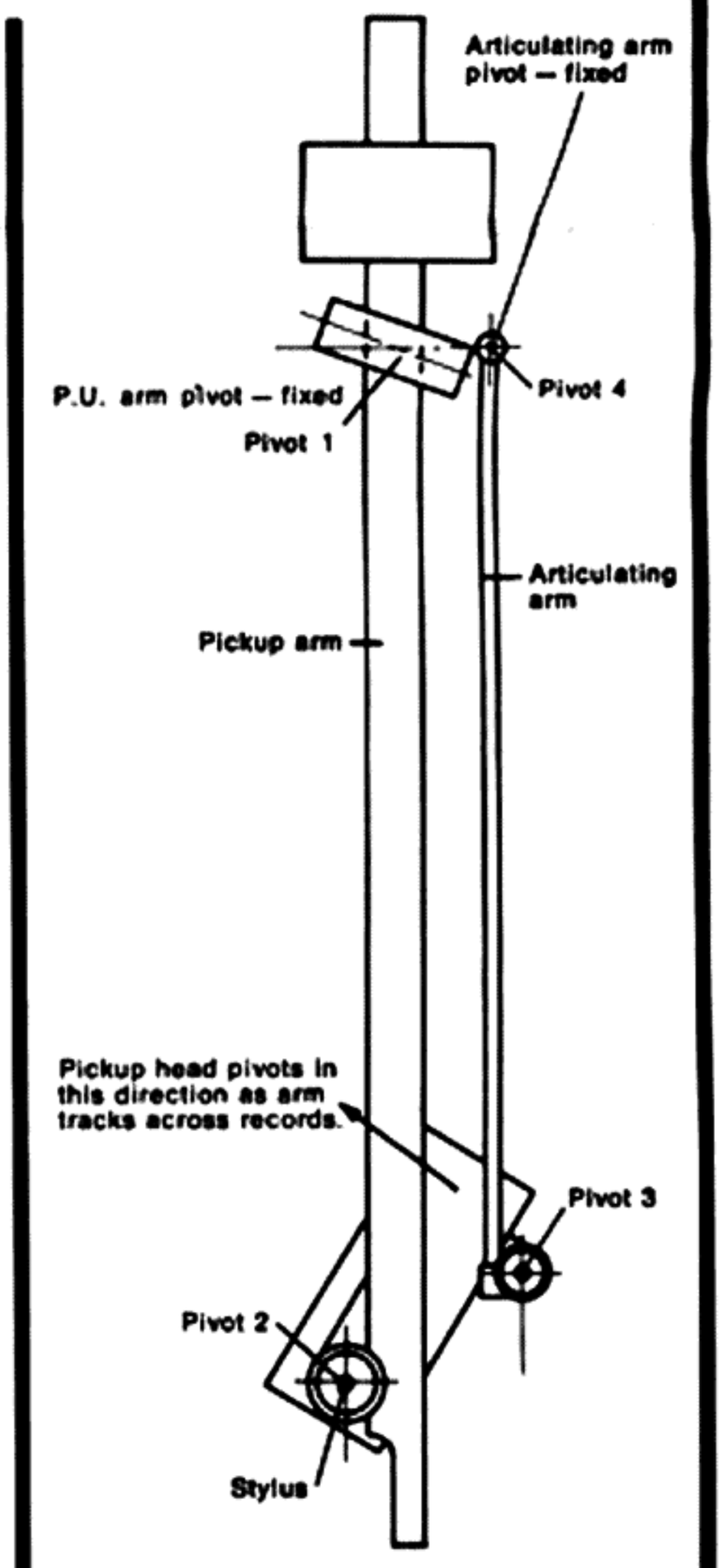
In common with many examples of engineering ingenuity, the solution to the problem of tracking error looks deceptively simple on the surface.

The new arm is designed so that the cartridge housing is pivoted directly above the stylus tip. The degree of pivot is controlled by an auxiliary articulating arm. The amount of cartridge head pivoting, the length and position of the articulating arm . . . indeed, all the complex geometrical problems involved . . . were solved and optimized by computer. Without this procedure, the successful design and execution of this tone arm would have been impossible.

The combination of computerized design and arm articulation through advanced pivotry, results in the tracking geometry shown in the diagram. Note that the stylus is perpendicularly tangent to the groove throughout the record — a dramatic achievement of primary importance in the search for perfect reproduction.

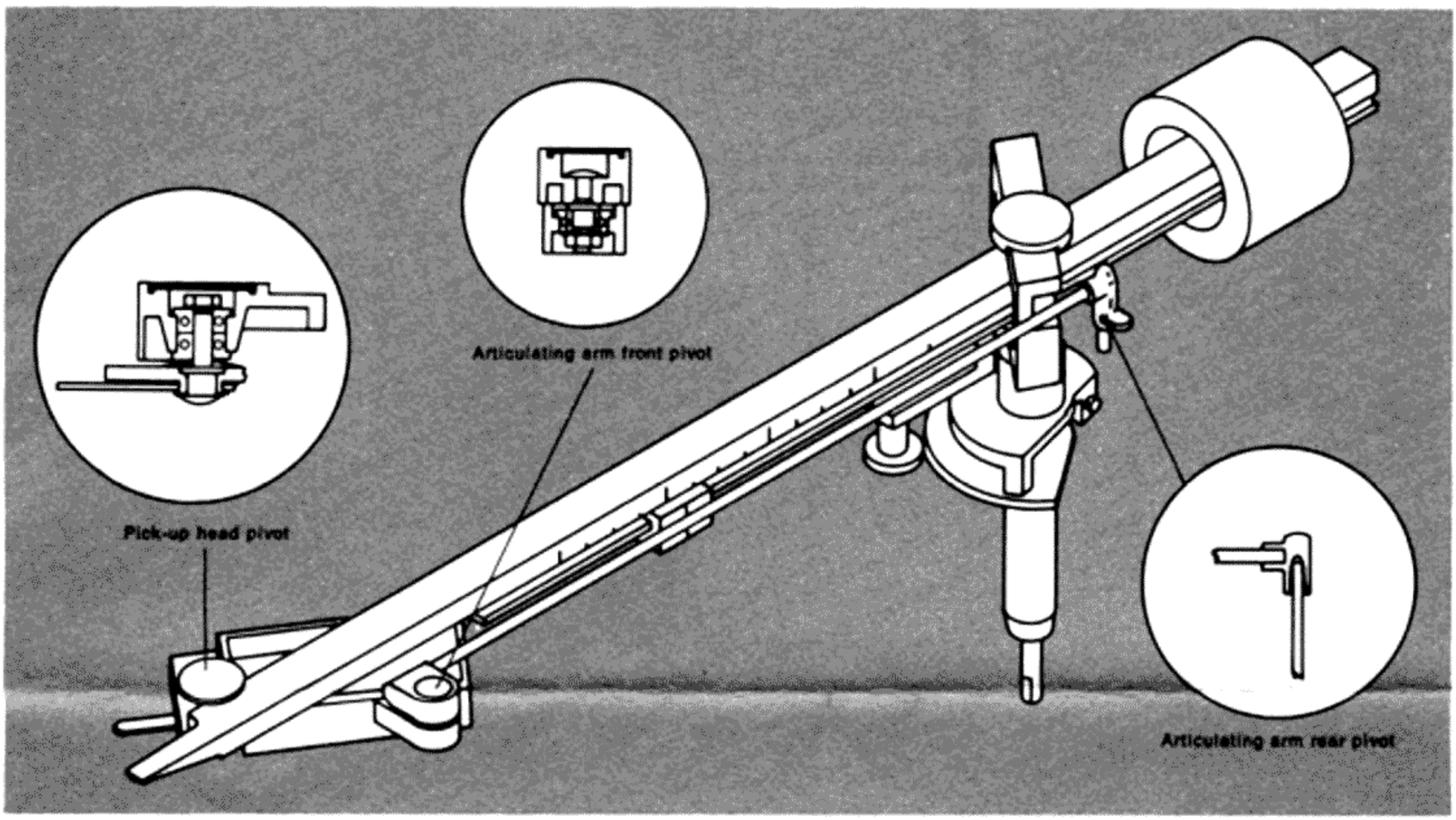
True tangent tracking geometry. The Zero 100 tone arm.





Advanced pivotry for minimal friction
The extremely low — in fact, negligible friction — which is essential to this concept, has been achieved with costly, precision-loaded ball bearings, and a free-floating universal pivot. These are among the very few parts of the Zero 100 which Garrard does not build. Instead, they are purchased from an outstanding manufacturer specializing entirely in the design and construction of pivots for gyroscopes and other sophisticated space-age equipment. The articulating arm, which depends upon this advanced pivotry, is fashioned of stainless steel tube by Garrard.

Records are made with the cutter perpendicular (tangent at right angle) to each groove. When a conventional tone arm plays this back, the arm describes an arc from its pivot. Because of the fixed head, it produces a varying amount of tracking error, which can only measure zero at the two points where the cartridge is truly perpendicular to the groove. Tracking error, therefore, is inherent in the performance of all conventional tone arms. It is measured and expressed in degrees per inch. It produces distortion in the second harmonic, and, until now, could not be successfully eliminated by any tone arm on automatic playback units.

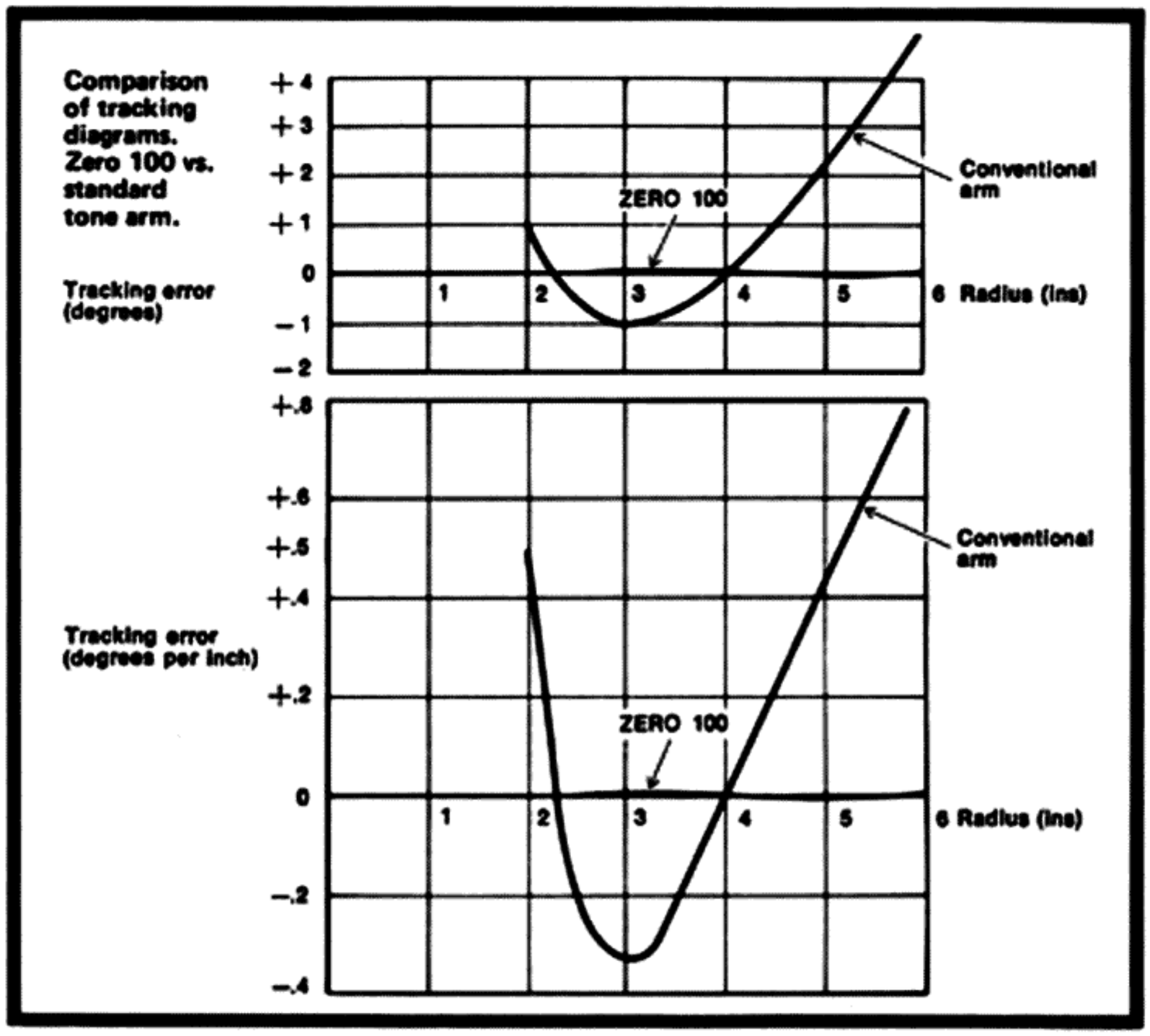


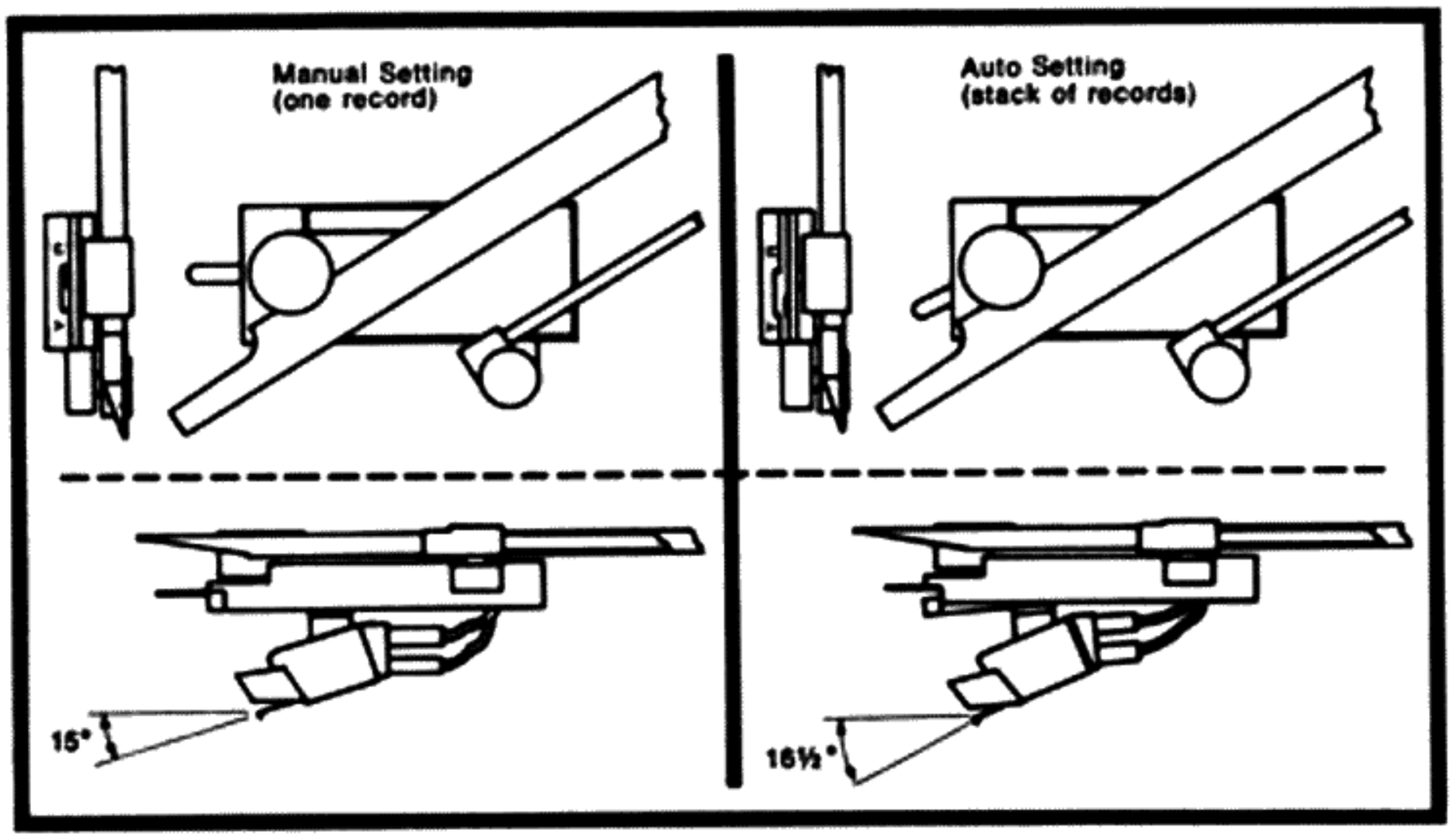
Tracking error up to 160 times as low per inch as standard tone arm!
A comparison of the tracking error measurements of any conventionally pivoted tone arm with those of the Zero 100, indicates the magnitude of the breakthrough which Garrard has achieved.

Consider that there are 3,600 seconds of arc in a degree . . . and that a conventional tone arm may produce tracking error as high as 4 degrees, or 14,400 seconds at its full playing radius. The tracking error of the Zero 100 tone arm is calculated to measure a remarkable 90 seconds, placing it in the area of 160 times as small per inch as the error of conventional tone arms.

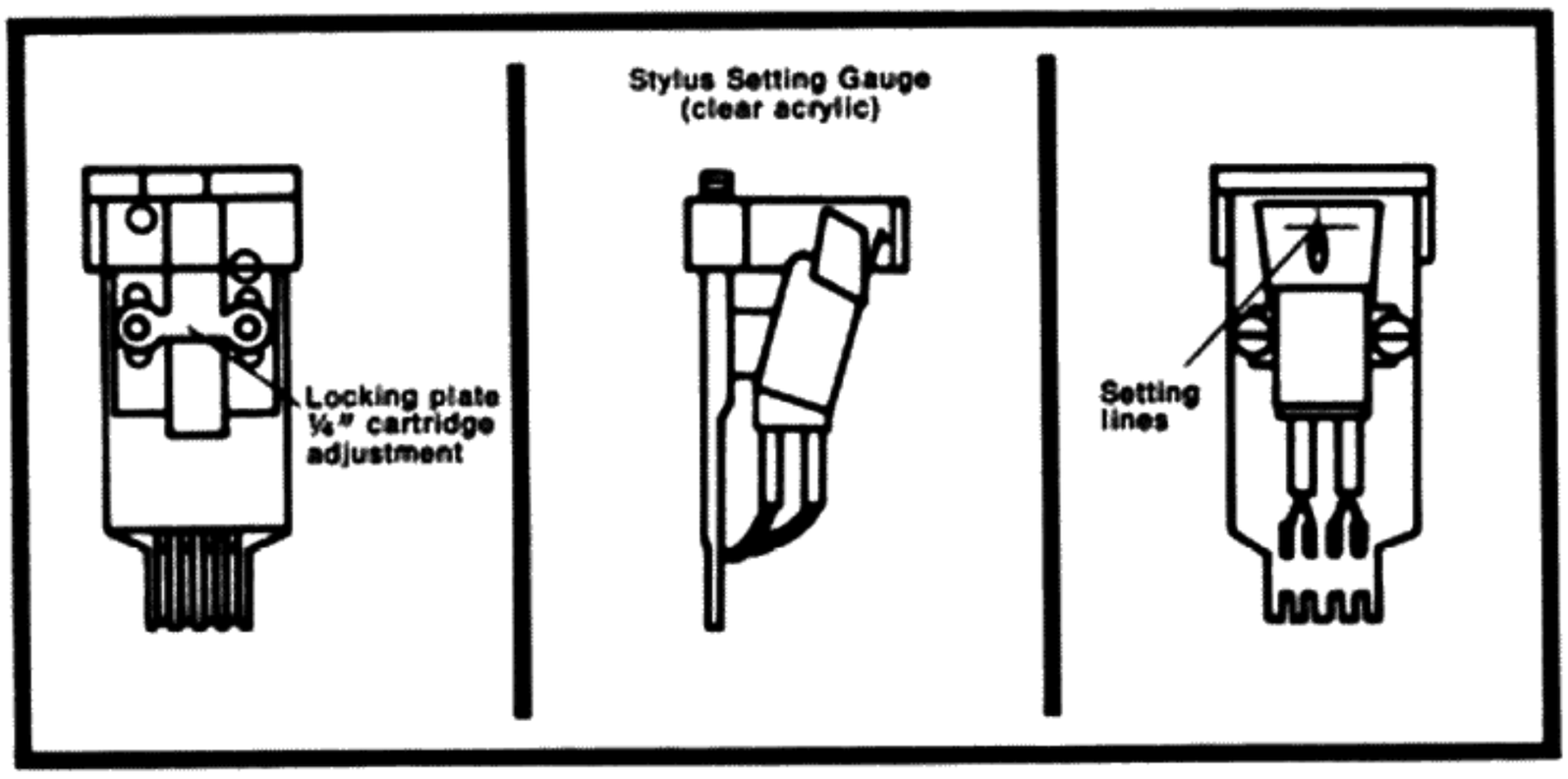
The true tangent tone arm clearly establishes the Zero 100 as a revolutionary development of the first order.

Conversely, above and beyond the tone arm, the features described on the following pages place the Zero 100 in a class by itself, at the very forefront of all automatic turntables available today.





15° Vertical tracking adjustment
Discs are recorded with the cutter set at 15°. Therefore, for the finest reproduction, the stylus should approach this angle as closely as possible. The Zero 100 tone arm shell provides an adjustment lever for this purpose. When single records are played, a flick of the lever to "Manual" sets the cartridge and stylus angle at precisely 15°. When a stack of records is played, the lever is moved to "Automatic," and the angle of the stylus will be precisely 15° at the third record. □

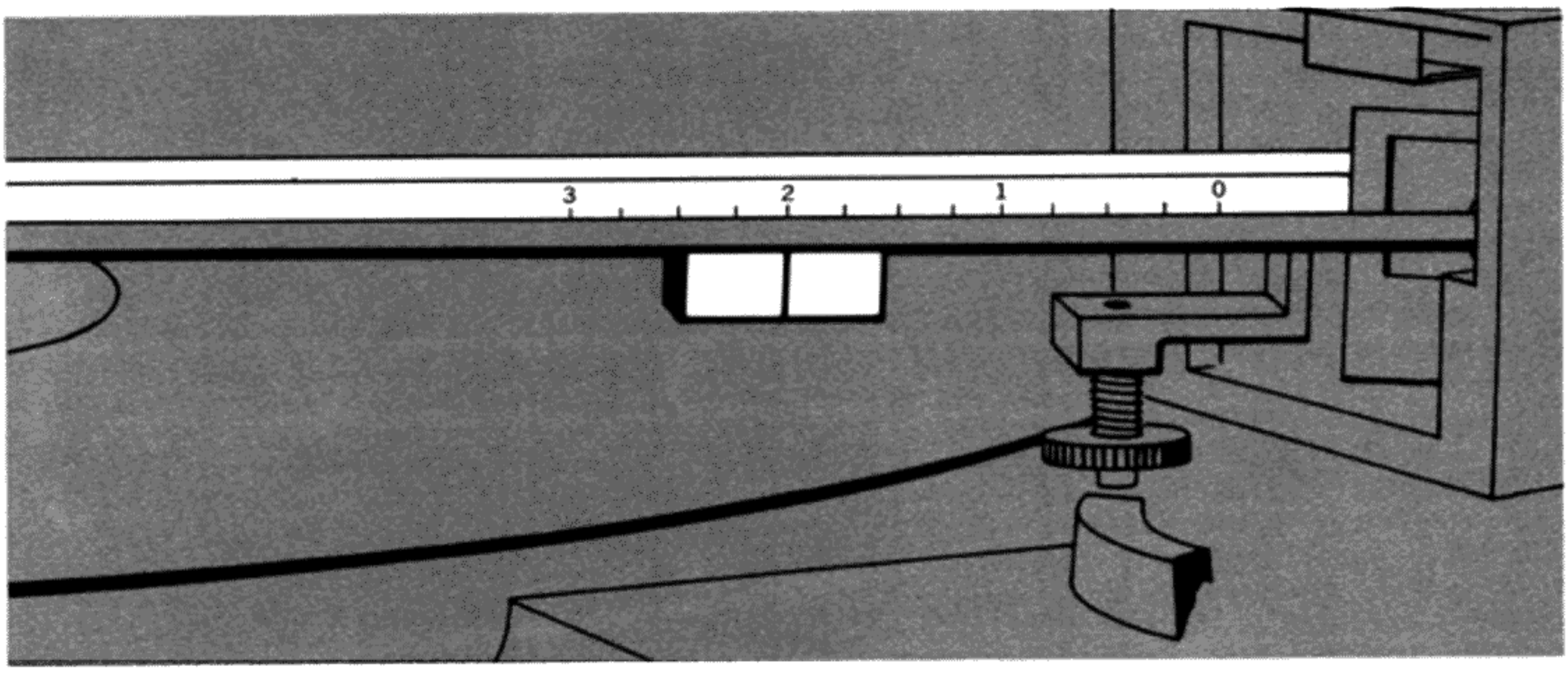


Cartridge overhang adjustment
In order to assure the full benefits of zero degrees tracking error, and the 15° adjustment, the stylus tip must be positioned with absolute accuracy. The slotted cartridge carrier of the Zero 100 is provided with a lucite gauge, used when the cartridge is mounted. The cartridge carrier is inserted into the gauge, and the cartridge is accurately positioned for mounting by simply moving it to the point where the stylus tip lines up with the two cross hairs on the gauge. □

Sliding weight for setting stylus force along an extended scale
In order to impart stability and precision to the increasingly important stylus force setting, the Zero 100 tone arm utilizes a brass weight which slides under the arm.

With the weight set at "Zero", the arm is balanced to a neutral "see-saw" position. The weight is then moved forward under the arm to set in the correct stylus force. It is frictionally engaged to the tone arm, to retain its exact position; yet it can be easily moved when desired.

Since it requires a movement of 1⅛" to change the stylus force by one gram, a fraction of a gram can be set with extreme accuracy. This carries through the concept of the Zero 100 tone arm, which is designed to track the most sensitive cartridges at the precise fractional forces required for their optimum performance. □



Magnetic anti-skating control

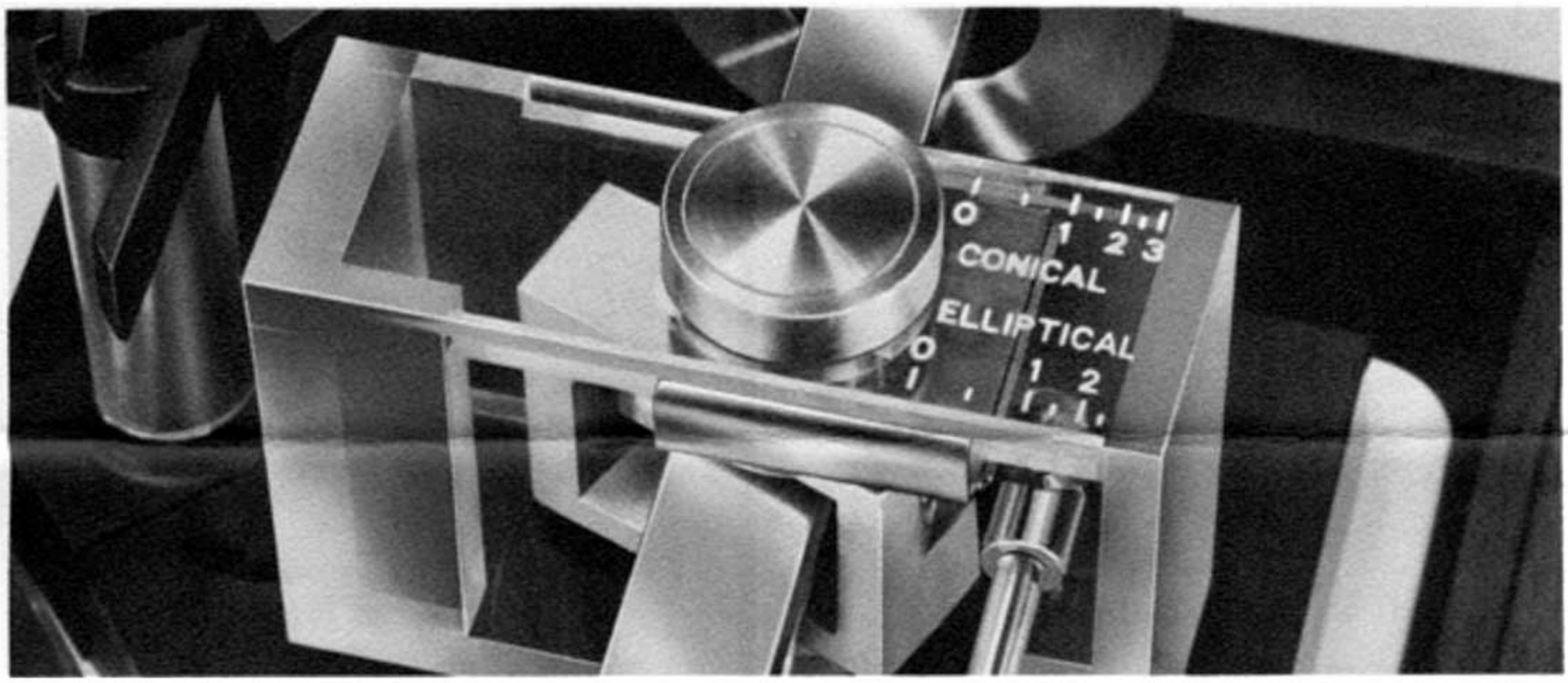
Garrard introduced the first anti-skating device in an automatic turntable with its patented sliding weight design, which is still used in the (up-to-now) 3 top Garrard models.

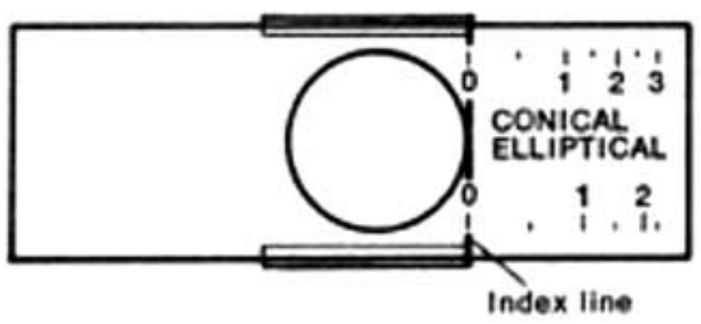
An anti-skating control is necessary to offset the normal tendency of the tone arm to move (skate) across the record toward the center. As the disc revolves, with the arm tracking, an inward skating force is created which must be counteracted and neutralized by an equal force in the opposite direction. This prevents wear on the inner side of the groove, premature damage to the record, and distortion.

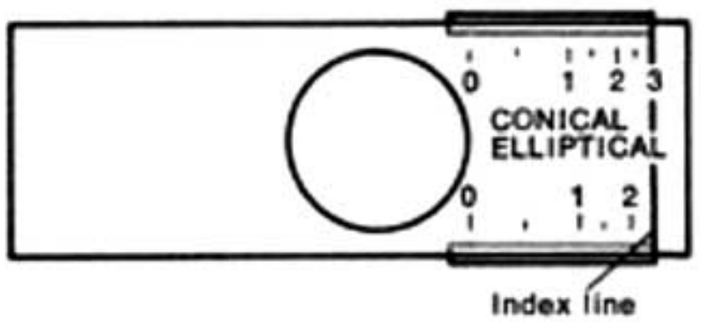
Now, a unique and exceptionally precise anti-skating control has been designed for the Zero 100 and built into the tone arm assembly. A precision sliding scale, calibrated in fractions of a gram and reading conveniently from the top, shows the exact amount of anti-skating force being applied. The scale has two settings: one for elliptical; the other for conical stylii.

The simple but ingenious Zero 100 anti-skating control utilizes the well-known magnetic principle that like poles repel each other. Built differently than any previous device of its kind, it is frictionless; not mechanically connected to the tone arm; and requires neither springs nor weights.

A ceramic disc magnet is mounted on the pivoting tone arm gimbal; and another affixed above it on the rigid plexiglas tone arm housing. A ferrous metal shield, with the precision reading scale mounted on it, slides between the two magnets, to set the anti-skating force desired. When the shield is between the total areas of the magnets, they have no effect on each other, since the shield blocks the magnetic flux. However, as the shield is moved outward, it exposes the magnetic field, creating an infinitely variable amount of magnetic repulsion. This, in turn, exerts a controllable and measurable twisting force on the tone arm, as the two magnetic poles push apart, establishing the correct starting amount of anti-skating force desired, as indicated on the reading scale; and varying to the correct force required at every distance from the center of the record as the stylus moves inward along the radius. □

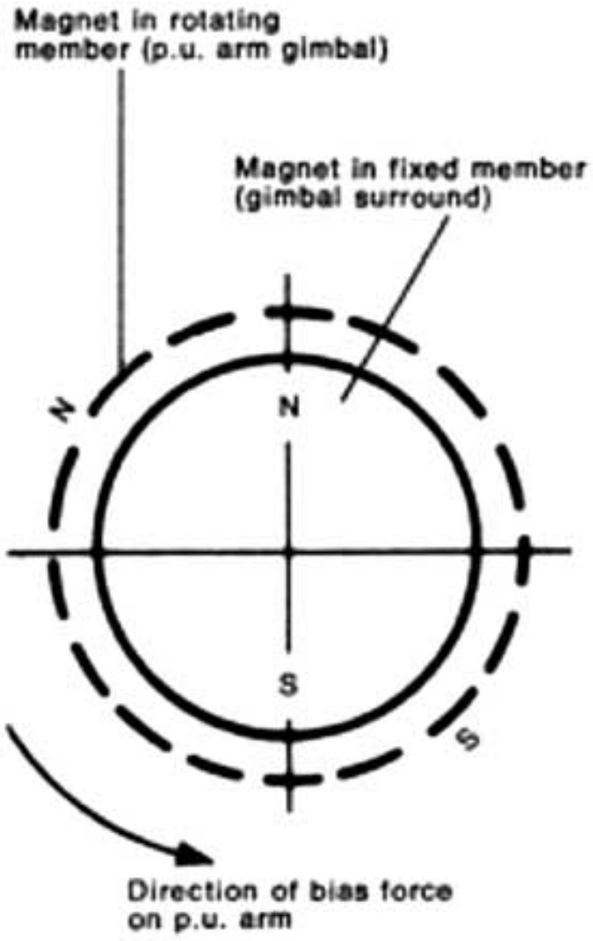






Zero Bias Compensation

Maximum Bias Compensation

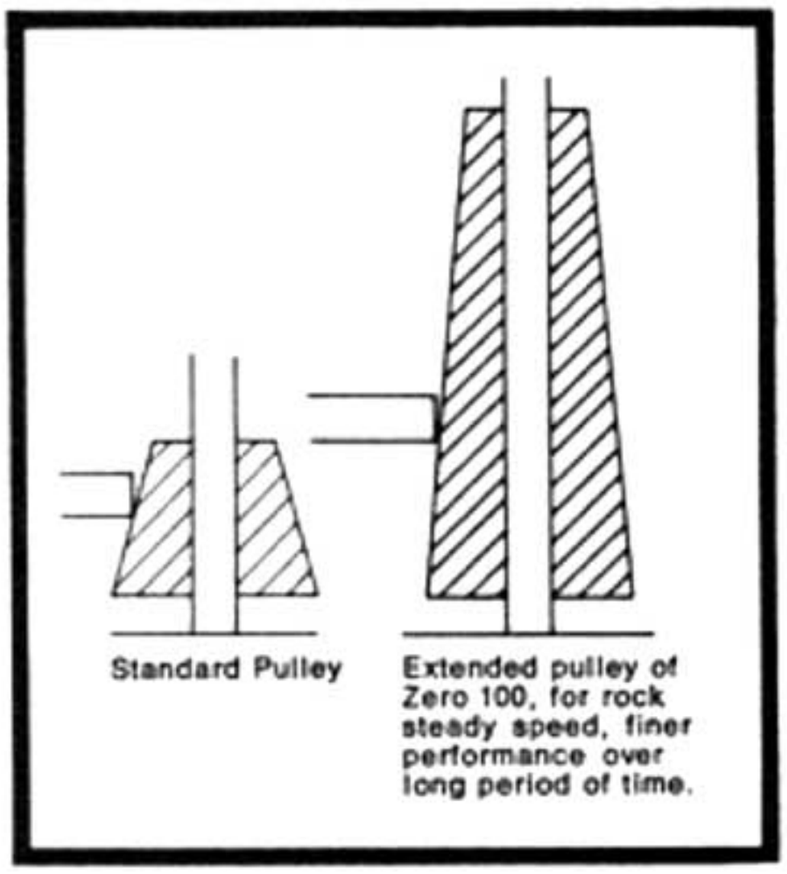


Relative Polarity of Magnets

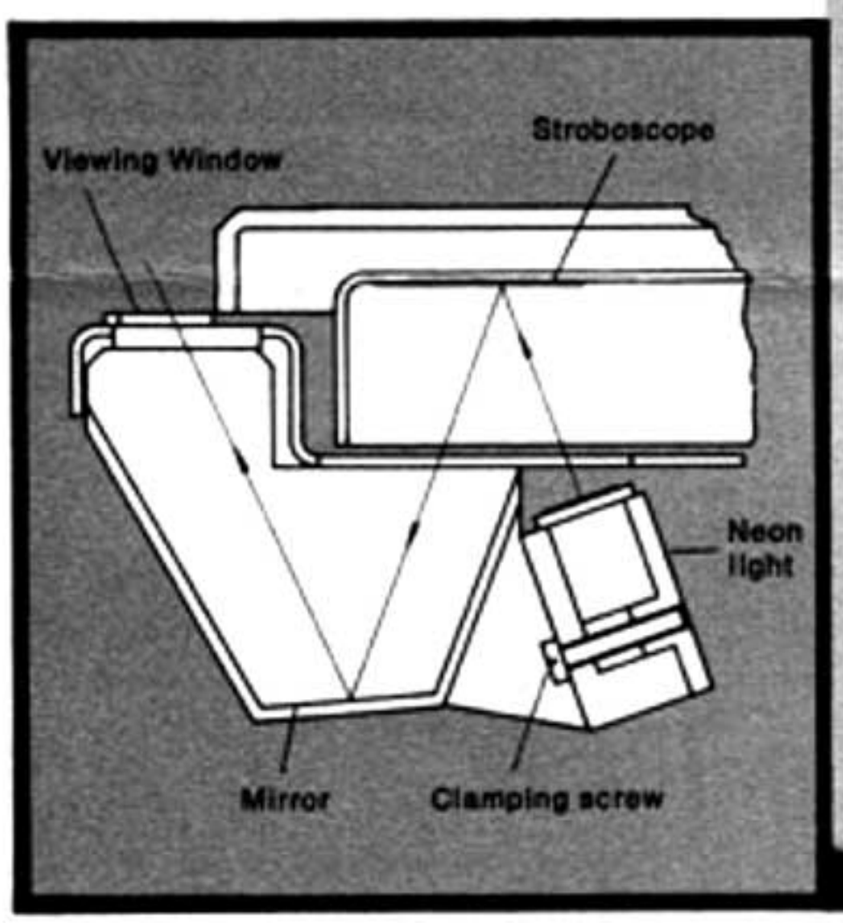
Variable speed control
(±3½% @ 33⅓ ±2½% @ 45 rpm)
Variable speed is actually non-essential for the usual listening purposes when the record playing unit is equipped with a synchronous motor, since the motor insures accurate, stable speed. However, it is a welcome convenience for critical listeners with perfect pitch who prefer to play recordings at the exact speed they select; for others who simply enjoy records best at speeds they determine themselves; and for musicians who wish to "tune" the record player in order to accompany a musical instrument.

Variable speed units are not new. For satisfactory performance, the inherent requirements are to have a completely stable motor, and a minimal taper on the pulley which controls the speed variation, so that it does not introduce wow or flutter. Now, with Garrard's proven synchronous motor, and with the development of a long, very slightly tapered pulley, the speed control in the Zero 100 has achieved the necessary degree of perfection.

Speed variation in the Zero 100 is approximately ±3%. This creates an adjustment in pitch equivalent to one semi-tone. □

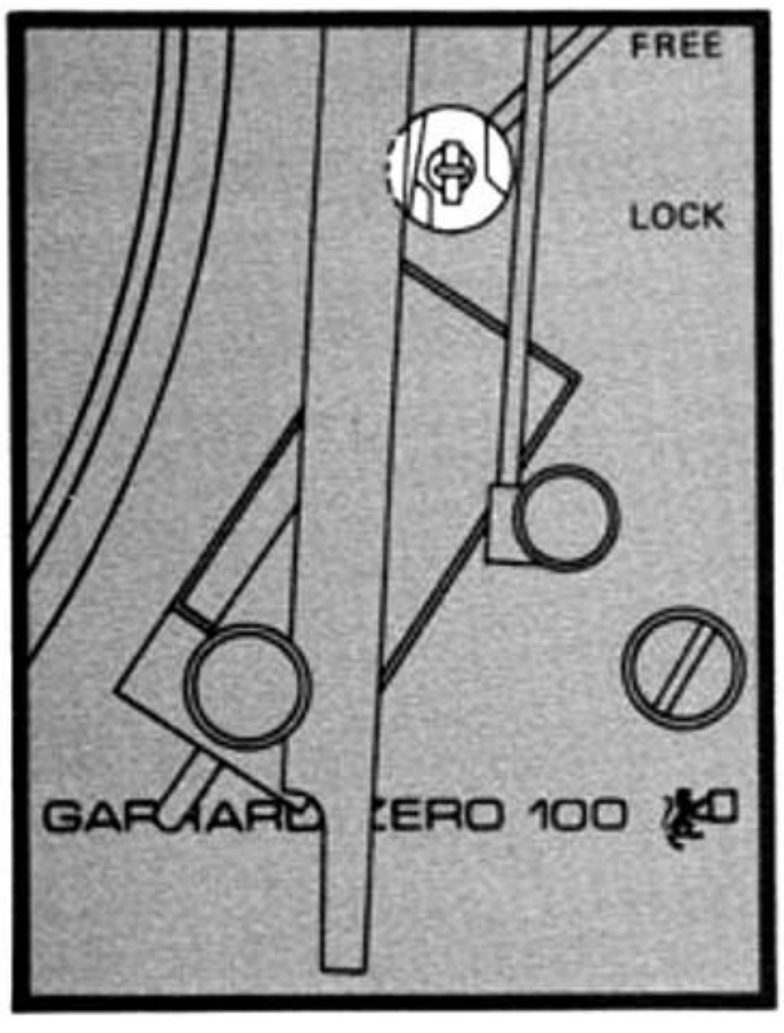


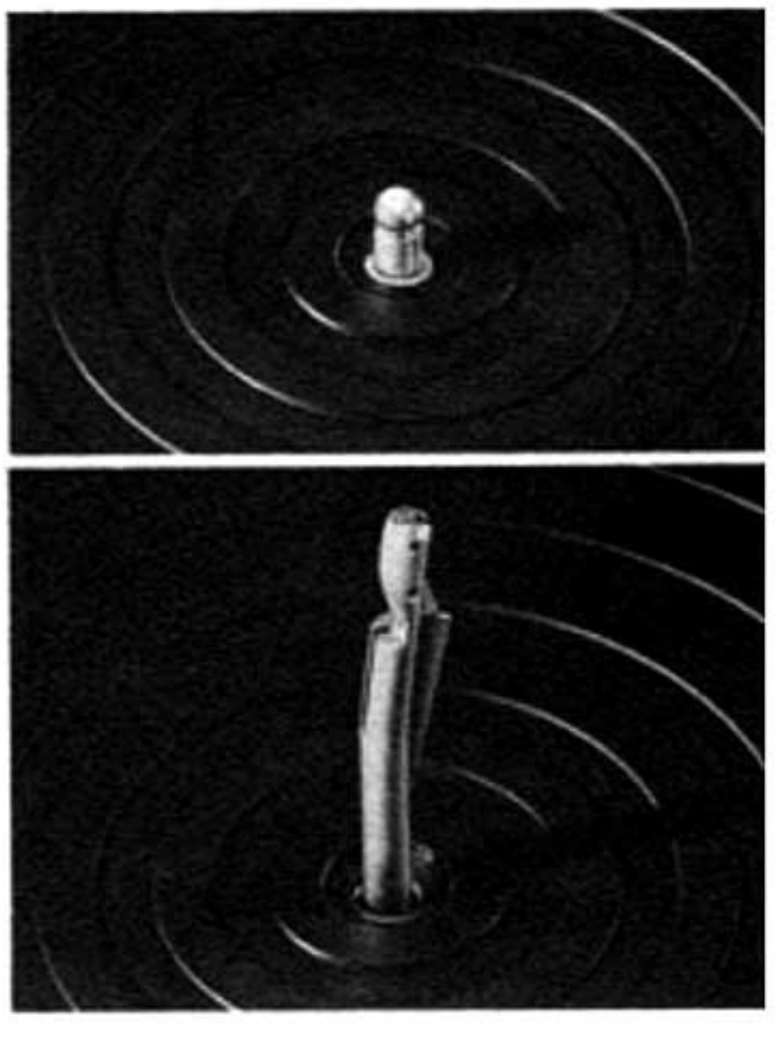
Illuminated stroboscope
(Essential with variable speed.)
The speed of the turntable is easily and accurately adjusted by moving a ring around the control knob which sets speed and record size. It can be monitored continuously through the stroboscope window, by watching the highly visible, illuminated line. □



Tone arm safety restrictor
No effort has been spared by the Garrard Laboratories to insure enjoyment by the owner. One example is the tone arm safety restrictor built into the Zero 100 tone arm to prevent it from being set down on the unit plate outside the edge of the record. A positive stop prevents accidental damage to the stylus. □

Interchangeable spindles
There are two instantly removable spindles. The short one, for single play, rotates in the same manner as spindles on manual turntables. The long spindle accommodates a stack of six records for automatic play at 33⅓ rpm. An optional automatic spindle is available for wide hole, 45 rpm records. □



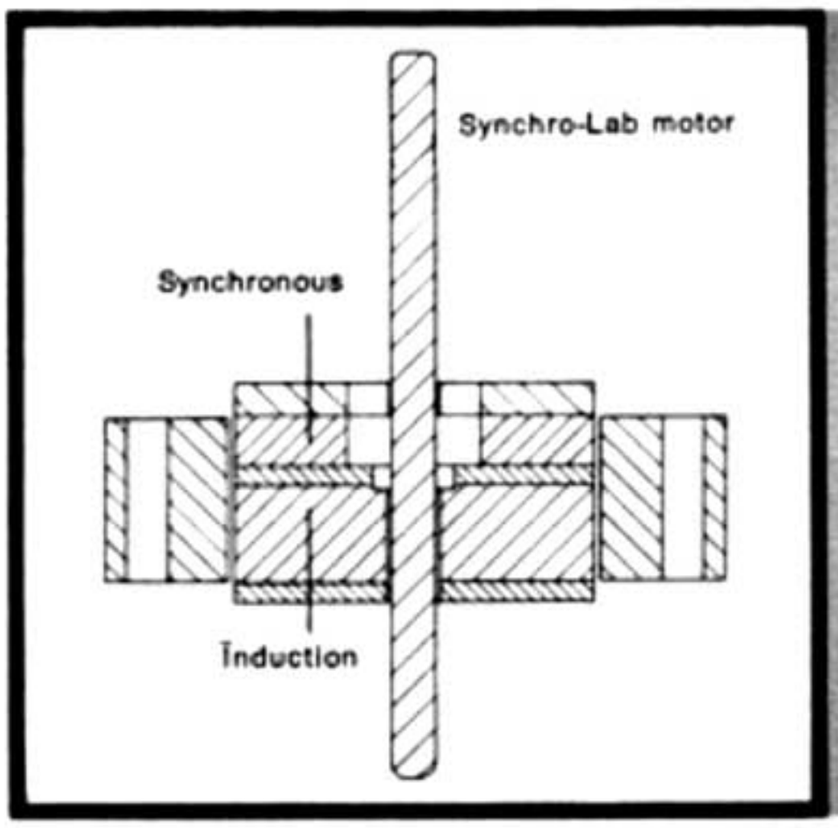


GARRARD ZERO 100

SPECIFICATIONS: 2 speed, 33⅓ and 45 rpm. 100-130 volts, 60 cycles AC (50 cycle kit available).
MINIMUM CABINET DIMENSIONS: Left to right, 15⅝". Front to rear, 14⅛". Above motor board, 4⅛". Below motor board, 2⅛".
MINIMUM CABINET DIMENSIONS (Turntable on Base with Dust Cover): Left to right, 16¾". Front to rear, 15¾". Top to bottom, 8¼".

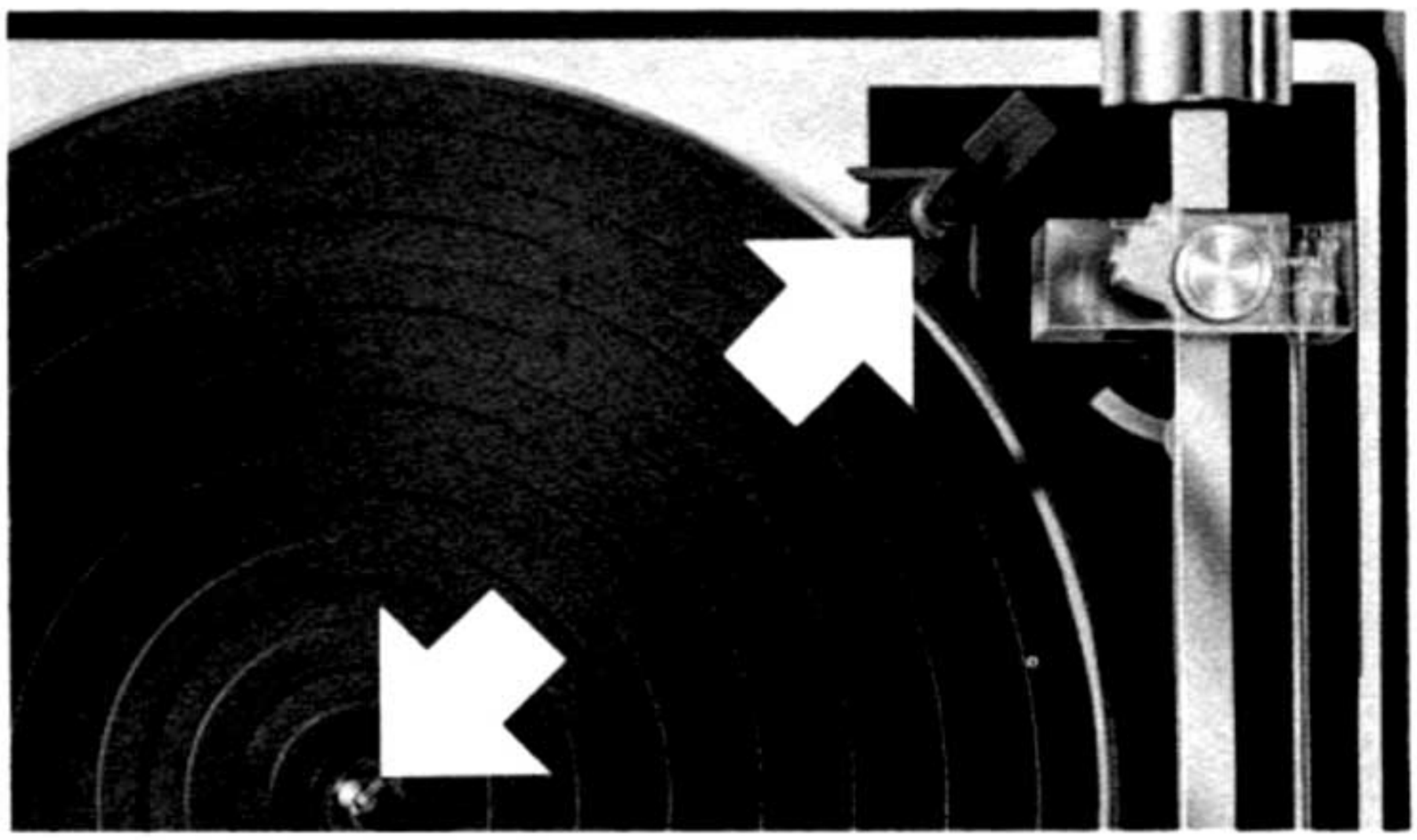
Proven features retained

The innovations described on the previous pages are all introduced for the first time on the Zero 100. In addition, it retains the fully-tested major features of the advanced series of Garrard automatic turntables, which it now heads.

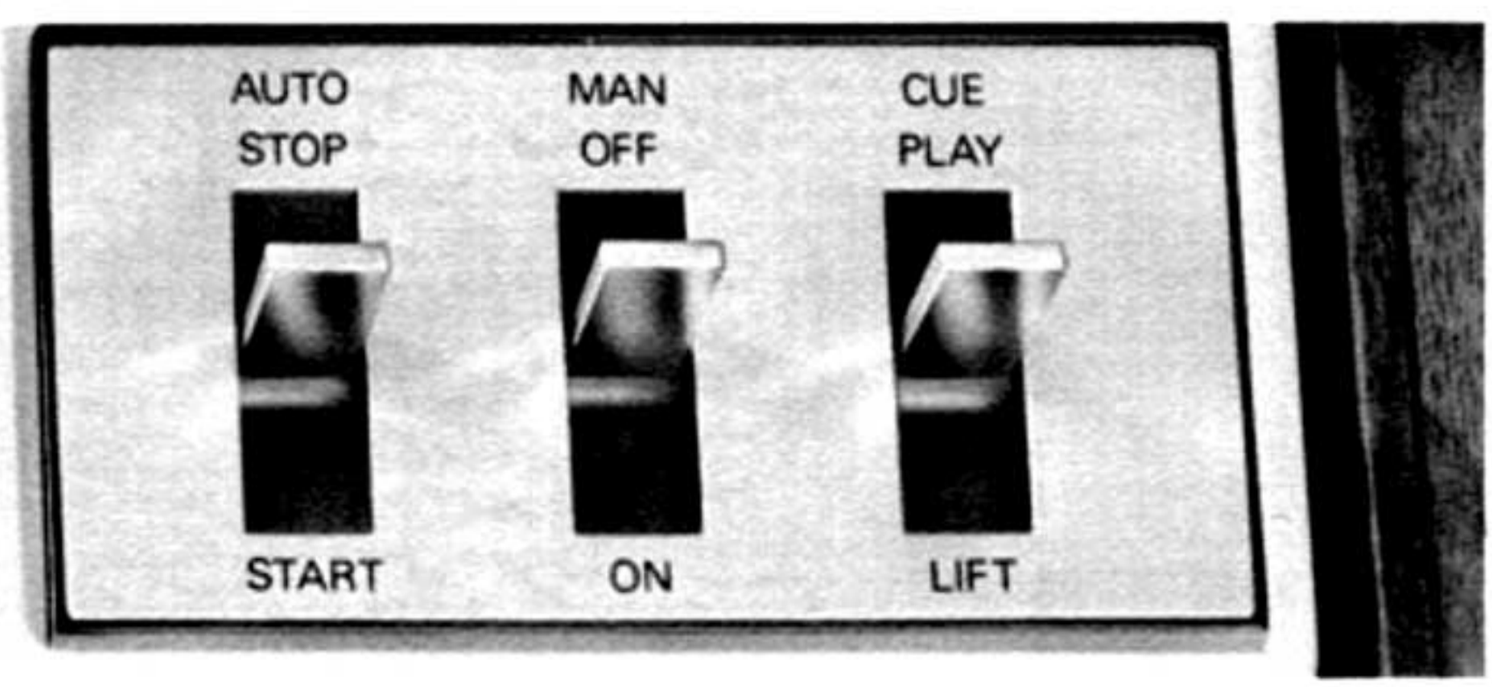


Retained— The Garrard Synchro-Lab Motor, an ingenious concept based upon split-rotor design. It combines the powerful torque and instant acceleration of the traditional induction motor; with the unwavering, perfect speed of a synchronous motor, locked into the accurately controlled 60-cycle frequency of the electric current. With the Synchro-Lab Motor, there are no changes in musical pitch caused by drops in voltage due to appliances or other heavy loads on the line at the same time. □

Retained—The Garrard full-diameter turntable. One of the advantages of the synchronously driven Zero 100 is that it does not require a heavy turntable to act as a flywheel, as would an induction motor. Instead, there's a full-sized aluminum turntable, carefully balanced and matched to the kinetic energy of the Synchro-Lab Motor. The turntable mat is heavily ribbed for easy cleaning and safe support of the record through its full diameter. □



Retained—Two point record support. Garrard's exclusive record support system guarantees utmost safety and reliability. Records on the Zero 100 are handled automatically with the care and delicacy they require for long life and fine performance. The record stack is supported at the outer edge by a sturdy platform. The oversized clip at the top of the platform is easily grasped, quickly raised over the stack, where it acts as an effective stabilizer. Records are supported positively, and drop into place on a micro-cushion of air. □



Retained — Unitized escutcheon with finger-tab, cue/pause control. Putting the right controls, in the right form, in the right place (a concept known as "human engineering") is an important Garrard feature. The Zero 100 incorporates a handsome control panel with three customized finger-tab controls: one to run the machine on automatic; one for manual operation; and the third for viscous damped cue and pause control. □

The incomparable ZERO 100 and the entire Garrard Series.

The Zero 100 is the newest model number to bear the proudest name in high fidelity record playing equipment. Garrard's reputation has been re-earned year after year for over half a century by pedigree performance. Now, once again, Garrard lives up to its reputation with an automatic unit advanced beyond any others now available in performance and convenience . . . yet it is offered at a realistic price.

Now, more than ever before, there's a Garrard Automatic Turntable for every component music system.

Zero 100
$189.50

Component Series

Automatic turntable only

SL95B
$139.50

SL72B
$99.50

SL65B
$74.50

SL55B
$59.50

40B
$44.50

30
$39.50

SP20B
$37.50

Module Series

Complete with cartridge, base and dust cover

SLX-3
$99.50

SLX-2
$69.50

X-10
$52.50

X-11 "Demi"
$39.95

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WORLD'S FINEST AUTOMATIC TURNTABLES

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Retain for Reference

Equipment Profiles

Garrard "Zero-100" Automatic Transcription Turntable

MANUFACTURER'S SPECIFICATIONS

Speeds: Two—33⅓ and 45 RPM, each variable approx. ± 3%. **Wow:** Better than 0.10% rms. **Flutter:** Better than 0.05% rms. **Rumble:** Negligible. **Motor:** Two-sections—4-pole induction for starting torque and synchronous for constant running speed. **Pickup Arm:** Counterbalanced, with sliding weight to adjust stylus force; head pivots laterally as it tracks a record to maintain negligible tracking error; magnetic anti-skating system calibrated for both conical and elliptical styli; head adjustable for 15-deg. vertical tracking angle for either 1 or 3 records; lever-controlled lift, with viscous-damped lowering. **Power consumption:** approx. 9 watts. **Dimensions:** 14¾" w., 13¼" d., 6¾" h. **Weight:** 11½ lbs. **Price:** $189.50. Optional extras: mounting base with or without cover; record-platform extension to play six 7-in. small-hole records; record spindle adapter to play up to six records with large center holes automatically.

Incorporating practically every known plus feature in one automatic turntable, the new Garrard Zero-100 unit introduces for the first time in an automatic a zero-tracking-angle device on the arm which causes the head to maintain practically perfect tangency to the record groove at all diameters. It is well known that a minimum tracking angle is one of the desiderata in any record-playing mechanism, but on all conventional arms, the tracking angle will vary from a value of as much as +4 deg. at the outer grooves to -1 or -2 deg. somewhere between the start and the finish, then rise again to a value of perhaps +1 or +2 deg. at the innermost grooves.

Arms have been introduced that corrected this problem, but they were only for single-play turntables—never before on automatics. The importance of a near-zero tracking error is attested to by the number of such arms that have been on the market in the past and which no longer are. A little study of the problem of perfect tangency will convince anyone that a solution by the parallelogram method is possible. The principal reason the earlier "parallelogram" types were not successful is that the increased number of bearings caused too much friction. Now with the availability of improved types of free-rolling bearings, the same principle has been worked out with complete satisfaction.

A simple list of all the "Zero-100" features should serve to spotlight the changes that have been incorporated in this model of the Garrard. We will elaborate on them later on:

15-deg. vertical tracking angle adjustment.
Sliding-weight stylus-force adjustment—easy to adjust as little as one-tenth of a gram.
Magnetic anti-skating control.
Spring-loaded tonearm safety restrictor (lock).
Long-taper variable speed control.
Illuminated stroboscope, with two bands of lines, one for each speed.
Rotating manual spindle.
Proven "Synchro-Lab" motor—combination of induction and synchronous types.
Lightweight, balanced, full-diameter platter.
Safe 2-point record support.
Handsome combination of chrome, brass, and plexiglas for tonearm mounting.
Adjustments for arm lowering position, lifting height, and lifting-height restriction.

All of these features combined into one automatic turntable make news, even though some are found on other units. Only in the Zero-100 are they all put together. Taking them individually, we first come to the vertical tracking-angle adjustment. This is a simple lever which has two positions marked "M" and "A". In the "M" position, the cartridge head is set for a 15-deg. tracking angle on a single record, played Manually. In the "A" position, the cartridge is tilted slightly so it is at the proper 15-deg. angle for the third record of a stack of six, the maximum number that may be stacked on the machine.

The stylus-force adjustment is by means of a sliding weight on the arm, which is first balanced with the weight at "0" and then the weight is moved to the desired stylus force. A movement of 1⅛ in. varies the stylus force by only one gram, so an accurate setting can be made to any desired amount up to three grams or even down to one-quarter of a gram.

The anti-skating control involves no mechanical linkage to the arm. A simple slide on the fixed arm mounting serves to place a shield between a fixed magnet and one mounted on the movable gimbal which supports the arm. Separate calibrations are provided for conical and elliptical styli.

While most turntables have a lock to hold the arm on its rest, it is usually a solid one, and lifting the arm could cause damage when it is supposedly locked. On the Zero-100, the lock is sufficiently firm, yet if the arm is lifted when locked, a restraining spring gives slightly to remind you that it was locked, suggesting that you release it.

The variable-speed device on modern turntables usually employs a tapered spindle on the motor shaft against which the idler wheel is moved up or down to provide the speed change. If the taper is steep, the idler contact with the shaft can vary, causing an unwanted wow. In the new Garrard, the tapered shaft is long, with a gradual taper that ensures good contact and allows a more accurate setting of the speed. The two speeds are indicated by a built-in stroboscope—a series of lines in the usual fashion, but placed on the underside of the platter, illuminated by a neon bulb, and viewed by a series of mirrors from the top of the unit. The two bands of lines allow accurate setting for either speed. We consider a built-in strobe highly important when variable speed is offered.

The rotating manual spindle is now common on high-quality turntables and is now a part of the Garrard. The "Synchro-Lab" motor, a unit which employs both an induction section and a synchronous section, makes for the best of two worlds—quick starting, and constant speed. The platter is non-ferrous, and is

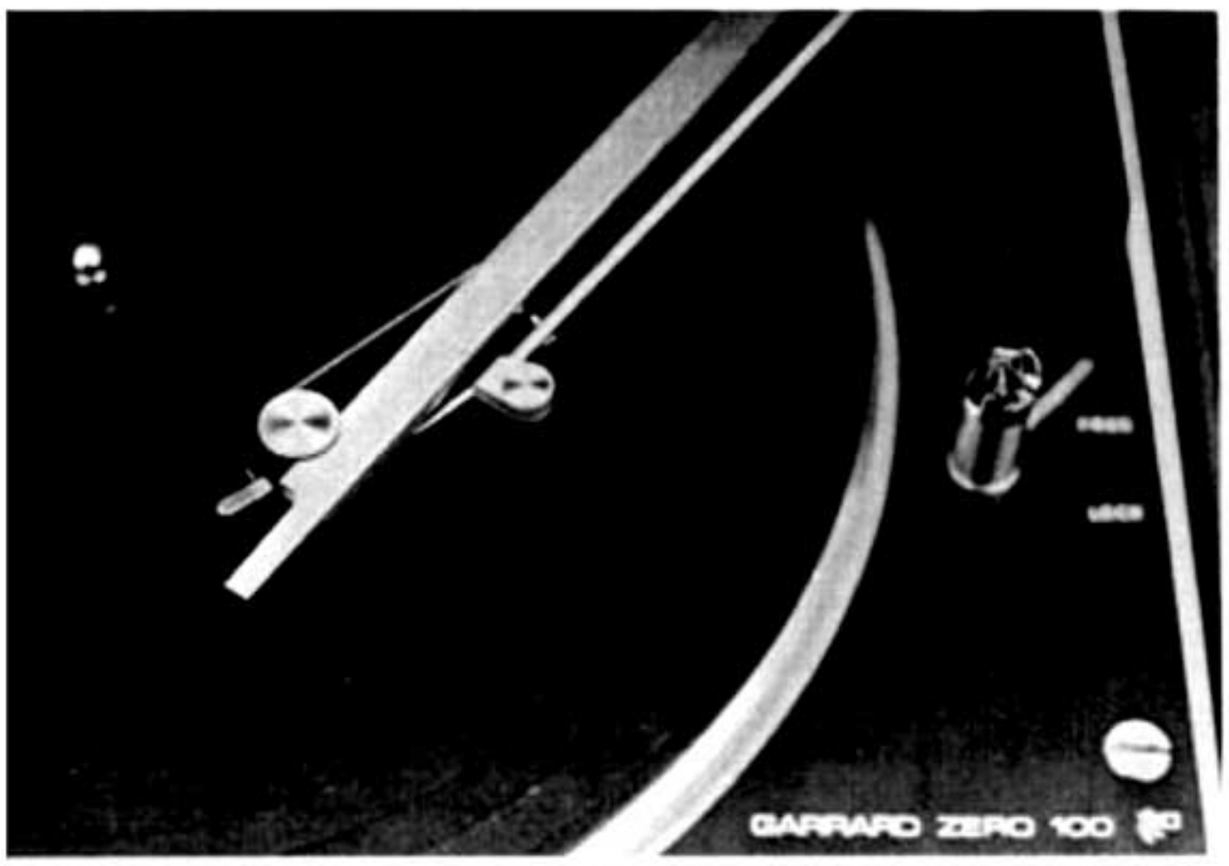

Fig. 1—When the arm is near the center grooves of the record, the angle is changed by the controlling tubular component at the right. This part is pivoted on the rear of the head and provides practically perfect tangency throughout the entire record.

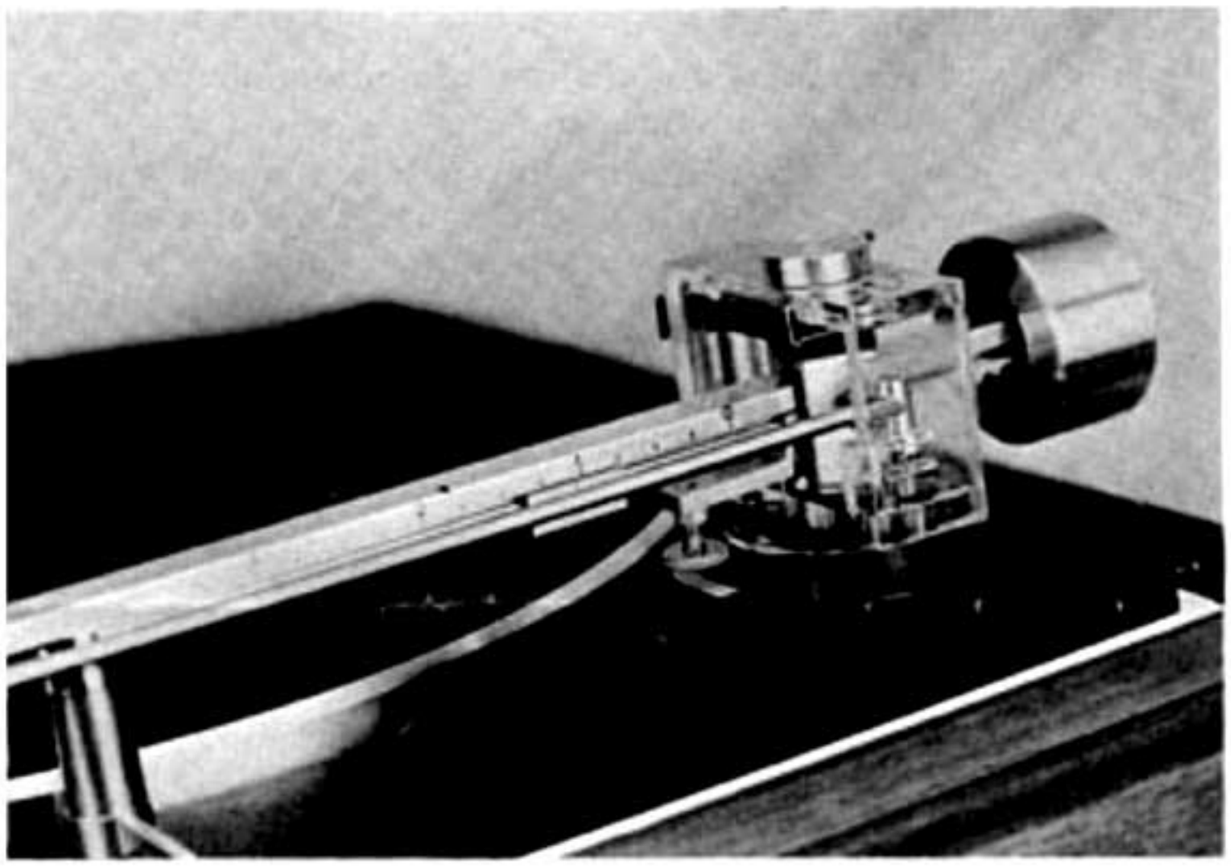

Fig. 2—The plexiglas arm-mounting structure accommodates the anti-skating magnets and the indicator for proper setting. The sliding weight under the arm moves 1⅛ in. for a change of 1 gram in stylus force. The counterweight is brass.

Fig. 3—With the platter removed and inverted, the two bands of stroboscope lines are seen on the underside of the platter. They are illuminated by a neon bulb and viewed through a mirror visible through the opening directly in front of the platter.

a lightweight component with a full rubber surface for the disc, providing damping needed to support the entire record surface.

In the Zero-100, Garrard retains the reliable two-point support for the stack of records. Once the stack is placed on the automatic spindle, a plastic clip steadies the stack, yet allows the bottom record to drop gently to the platter on a cushion of air.

The tonearm pivot mounting uses a gimbal for the two bearings, and it is in a strong plexiglas structure which mounts the anti-skating magnet. Another magnet is mounted on the gimbal, and a shield may be interposed variably between the two magnets to adjust the amount of compensation applied. An indicator on the shield shows the settings suggested for both conical and spherical styli, with the calibration such that the setting is made to the value of stylus force applied by means of sliding weight on the arm. The arm structure accommodates a variety of adjustments for setdown position and for lifting height, together with another to permit adjustment of the amount of lift so as to clear records remaining on the spindle.

The speed control remains similar to that on the SL-95 series, in that the control has four positions—one for 45 rpm, 7-inch records, and three for 33⅓, with setdown positions for 12-, 10-, and 7-in. discs. Under the knob is the vernier speed adjustment which provides approximately 3 per cent increase or decrease in the normal speed.

The operating controls also are similar to the SL-95B—three tabs: automatic start, stop and reject; manual motor start; and cue, for lifting and lowering the arm.

Performance

The Zero-100 performed just about as we expected after reading the specifications. Wow measured .08 per cent—that is in the band from 0.5 to 6 Hz. Flutter, in the band from 6 to 250 Hz, measured .03 per cent, both of which are excellent. The variable-speed control gave a range of a little better than ±3 per cent on 33⅓ rpm, and a little less than that on 45 rpm. No change in speed was noted over a line-voltage range from 85 to 135 volts, but the expected change came when the line frequency was varied, due to the synchronous section of the drive motor.

While the skating of the arm should be much less pronounced with the near-zero tracking error, it can be shown that some skating tends to exist, but the amount is certainly less than that with conventional arms. This is probably the reason why the magnetic anti-skating feature works so well, and we could certainly see for ourselves that there is a difference in the sine wave shown on the scope when the anti-skating compensation is set properly. Similarly, using the same cartridge on a conventional arm and on the Zero-100 arm, a difference could also be observed on the scope. For all our performance measurements, we fitted a Stanton 681-EE cartridge which tracked perfectly at ½ gram, less than the pressure Stanton recommends. At 1 gram, it was less sensitive to floor vibrations, and at 1½ grams, not at all. Signal to noise ratio measured 41 dB unweighted, or with the standard "A" weighting, 56 dB, using the CBS BTR-150 broadcast test record, which also supplied the 3000-Hz signal for the wow and flutter measurements. Arm resonance was measured at just under 10 Hz, and the change cycle required only 10 seconds from the completion of the last groove on one record to the setdown on the outer grooves of the next. Thus the Garrard Zero-100 is certainly the finest in a long line of automatic turntables which have been around for over 50 years. And as usual, each new model contains improvements over its predecessors, with constant research which strives to better performance, appearance, and reliability. We think you will like it.

C.G. McP.

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