the LOCI tonearm

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Articulated vertical motion
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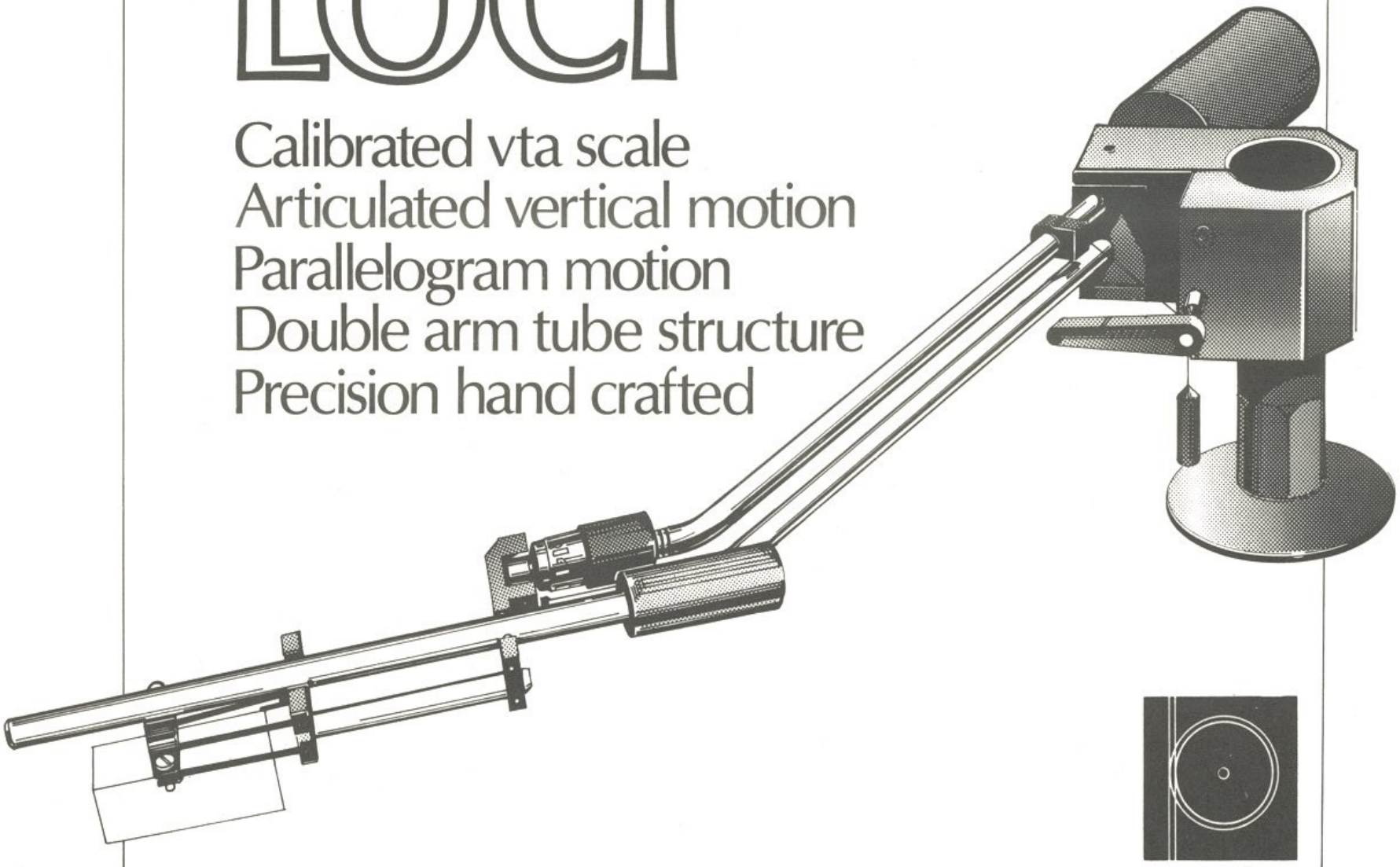
Double arm tube structure
Precision hand crafted



PSIONIC CORPORATION, P.O. BOX 186, WEST LONG BRANCH, NEW JERSEY 07764

The Psionic Corporation is pleased to announce the development of a new tonearm: the **LOCI**. This reasonably priced tonearm owes its extraordinary performance to several features.

Calibrated Vertical Tracking Angle Adjustment. Since it is difficult to cut the vertical component of a record groove's oscillation straight up and down, it is cut at an angle called the vertical tracking angle (VTA). Many tonearms can be adjusted to change the VTA because small errors in VTA cause significant deterioration of sonic accuracy. Different record labels, alas, use different VTA settings, so the **LOCI** adjustment for VTA is calibrated: it can be reset to a specific VTA for each record. Only the **LOCI** catalogs the correct VTA settings for over 100 different record labels.

Articulated Vertical Motion. Low bass reproduction requires that a tonearm have high mass in the horizontal direction of motion. Tracking all the big and little warps on a record requires that a tonearm have low mass in the vertical direction of motion. The articulated vertical motion of the **LOCI** allows the light front portion of the tonearm to move to accommodate vertical motion but enables the entire tonearm to move to accommodate horizontal motion.

Parallelogram Linkage. Previous attempts at articulated vertical motion in tonearms have suffered from speed changes as the cartridge moves up and down small warps. This annoying phenomenon is called ***warp-wow*** and does not occur when the **LOCI** tonearm is used because the cartridge motion is vertical when warped records are played. The parallelogram linkage also maintains a constant VTA as a record is played so the sound does not vary in quality as the record turns.

Double Arm Tube Structure. The laws of physics tell us that any single support mechanism, such as the arm tube, will have some frequencies at which it will resonate and color the sound. The **LOCI** has two arm tubes of differing characteristics, so that the colorations of one tube will be cancelled out by the other. Two arm tubes also provide a more rigid support for the cartridge mounting posts.

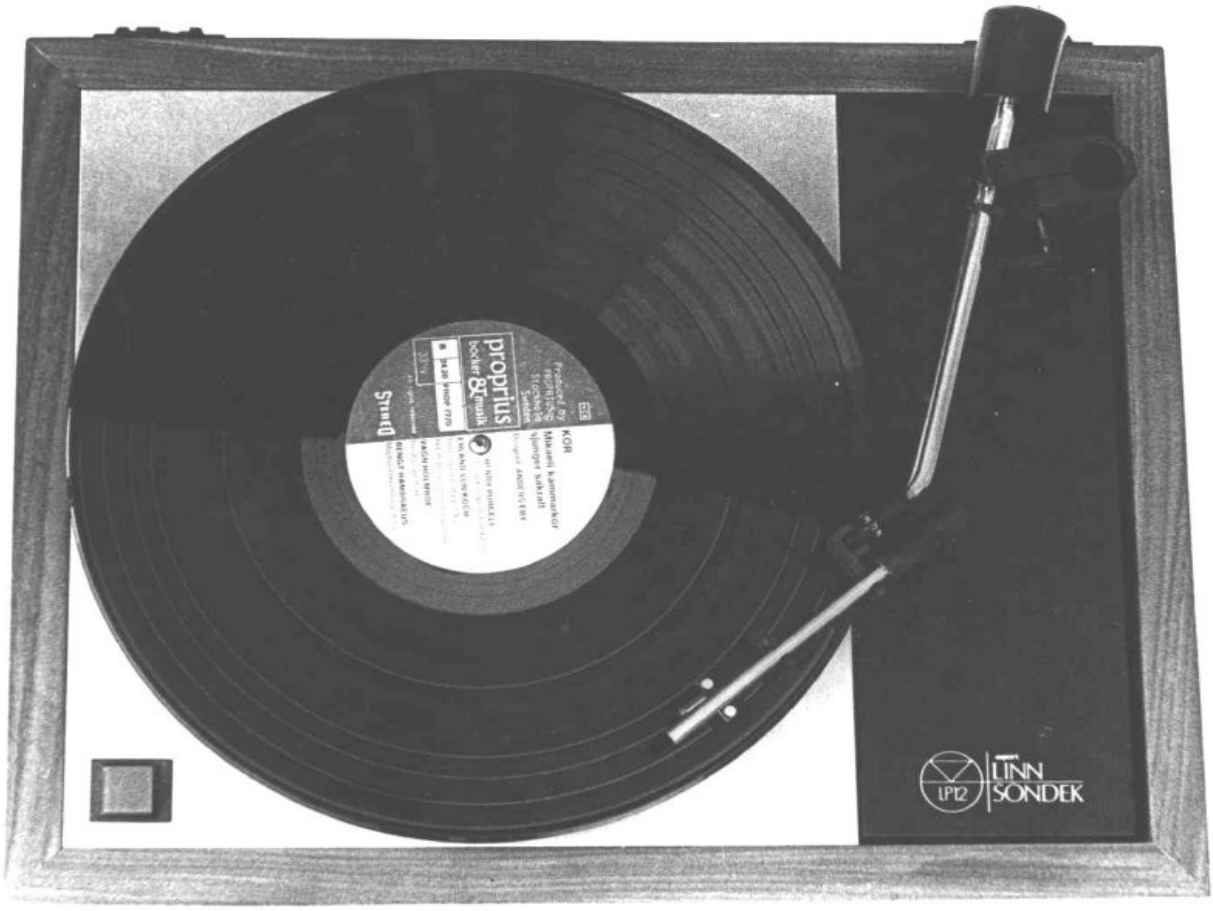
Individually Hand Crafted. Each **LOCI** tonearm is machined by hand to tolerances of 10 microns (.0005 inches). Materials are chosen on the basis of listening tests as well as handbook data and machining experience. The RW-MS1 cable used in the **LOCI** has the lowest sonic coloration of any interconnect cable available to date.

The **LOCI** can be installed on standard armless turntables available today. It is designed to elicit maximum performance from any quality cartridge and turntable on the market.

The LOCI Tonearm

The Psionic Corporation has developed a new tonearm: the **LOCI**. The creation of the **LOCI** was based on three things: knowledge of the realities concerning records, knowledge of the laws of nature, and knowledge of the sound of live music.

This booklet briefly describes the result of our experiments, which is a tonearm very different from those currently available. The **LOCI** has an articulated vertical motion to allow cartridges to play low bass frequencies and still cope with warps, a parallelogram linkage to eliminate warp-wow, an adjustable vertical tracking angle with a scale to enable the listener to hear each record in his collection at its optimum setting, and fine craftsmanship to preserve the integrity of the sonic signal.



Articulated Motion

The relation between the effective mass of a tonearm and the resulting sound is more complicated than most audiophiles realize. The perfect tonearm will hold the cartridge body rock steady while the stylus is tracking musical information in a record groove but will move the cartridge in perfect unison with the stylus while it is tracking warps or other low frequency noise. In order to design a conventional single-pivot tonearm, compromises must be made between accuracy of low bass response and reducing the effect of the small warps that are present on almost all records. The articulated vertical motion of the **LOCI** alleviates the need for this compromise.

At lower frequencies, the signal from a good cartridge is supposed to be proportional to the stylus deflection from its rest position. This signal can be predicted from knowledge of the motion of the stylus in the groove and the physical parameters of the tonearm-cartridge combination. These parameters include the compliance (or springiness) of the stylus cantilever in the cartridge, the effective mass of the cartridge-tonearm combination, and the damping of the tonearm motion.

The laws of physics tell us that motion of the stylus at relatively high frequencies will leave the tonearm and cartridge body virtually motionless so that the signal will match the stylus motion. Motion of the stylus at very low frequencies will allow the tonearm and cartridge to follow the stylus so no signal at all will be transmitted. Motion at frequencies in a certain range will cause the cartridge and tonearm to resonate, so the signal is actually much greater than the stylus motion itself. The frequency at which this is most severe is called the *resonance* frequency.

Musical information can be heard at frequencies as low as 21 Hertz (low "F" on a Bosendorfer piano) and little warps can excite great nastiness at frequencies as high as six Hertz unless the tonearm and cartridge move along with the stylus as it follow the warp. Since the amplifying effect of resonance on both music and warps is harmful, the tonearm mass and cartridge compliance are usually chosen so that the resonant frequency is about 12 Hertz to compromise between bass problems and warp problems.

There is another way to discriminate between the lowest frequency musical vibrations and the highest frequency warp vibrations which results from the way records are made. The left and right channels of a stereo record are cut at 45

degree angles to the surface of the record and at right angles with each other. This means that the horizontal motion of the stylus represents the sum of the two channels while the vertical motion of the stylus represents the difference between them.

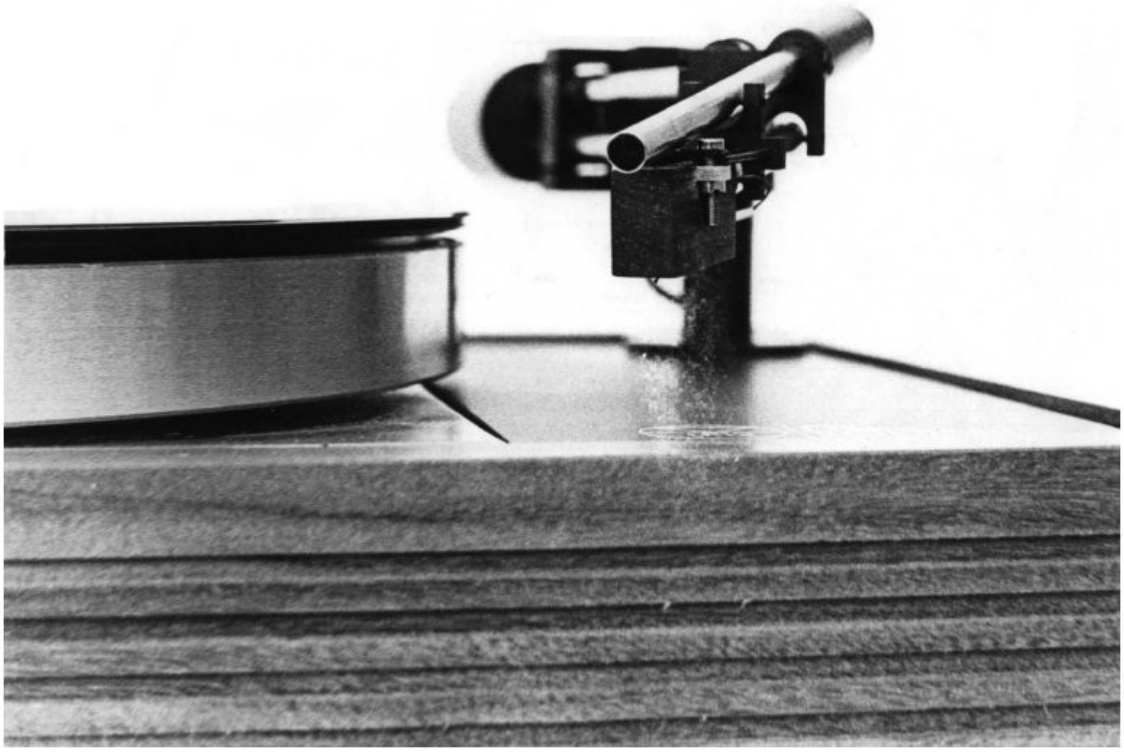
Since the lowest frequency that a listener can locate in space is about 80 Hertz, there is no reason to separate left and right channels below that frequency so there is no reason to record vertical vibration at very low frequencies. Records have very little musical vibration in the vertical direction below 80 Hertz. So the frequency band of resonant activity of the tonearm system in the vertical direction must fit between six Hertz and 80 Hertz, which is a wide enough range to contain the entire problem. Since warps are almost always vertical rather than horizontal, the highest frequency that the tonearm has to follow in the horizontal direction is about two Hertz, so the frequency band of resonant activity in the horizontal direction must fit between two Hertz and 21 Hertz, which is also a wide enough range to contain the entire problem.

The articulated vertical motion of the LOCI reduces the vertical mass which raises the vertical resonance frequency and the horizontal mass of the **LOCI** is higher than most other tonearms which lowers the horizontal resonance frequency so no compromise need be made in sound quality.

Warp Wow

The idea of articulated vertical motion has been tried before, but the results have not been accepted by audiophiles. When a moderately warped record was played on these tonearms, the sound changed in speed because the motion of the cartridge as a warp was played was not straight up and down, but was at an angle to the vertical, so the stylus moved forward and backward in the direction of the groove's motion. The music was heard to slow down as the stylus rose and speed up as the stylus fell. This effect is called *warp-wow.* People who have just spent a lot of money on a turntable with no wow or flutter do not want their music to waver as if it were being played on a cheap cassette player!

The parallelogram linkage in the LOCI constrains the cartridge motion so there is negligible forward-backward motion as the cartridge moves up and down over a warp. This way the speed and pitch of the music stay constant as the record is played.



Vertical Tracking Angle

On most good cartridges, a small error in vertical tracking angle (VTA) causes significant sonic deterioration. Therefore, it is imperative that the VTA of the cartridge not change as a record is played. Other tonearms have the cartridge mounted so that it rotates as it moves up and down. The effect of this is a slight angle change, but a slight angle change can bring about major sonic consequences. The parallelogram linkage of the **LOCI** keeps the cartridge angle constant as a record is played.

The different record companies have not, alas, agreed on a standard VTA. (And even if they do set a standard now, what about all those treasured older disks?) Therefore, it is also imperative that the VTA be adjustable. Some tonearms have VTA adjustable during play under the assumption that the listener will carefully adjust each record *by ear* before he plays it. But do they expect any listener to have the patience to fine-tune his sound system by ear each and every time he settles down to listen to a record?

The VTA adjustment should be calibrated with a scale so that the listener can set the VTA to the optimum setting for a record based on earlier listening. The **LOCI** comes with a list of record labels and their optimum VTA settings so that the listener can set the VTA based on *our* listening. (The record labels tend to have been very consistent over the years.)

The dealer can adjust VTA on one record to calibrate the **LOCI** for almost every label rather than just pointing to a VTA knob and telling the owner what it does!

Quality of Manufacture

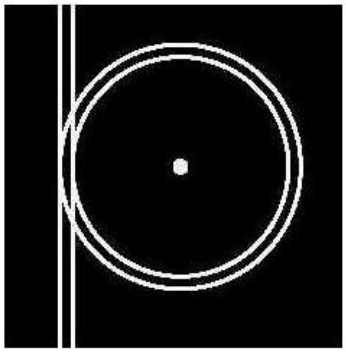
The ultimate purpose of any tonearm is to hold the cartridge body firmly in place. Any vibration in the cartridge body will color the electronic signal that leaves the cartridge.

The mechanical integrity of the **LOCI** is insured by having each arm hand machined, hand assembled, and hand tested before it is shipped to the dealer. Materials were chosen based on listening tests, not just handbook data. Parts are machined to 10 microns (.0005 inch) throughout the tonearm.

The electrical integrity of the **LOCI** is also a prime concern. The electrical connection between the tonearm body and the pillar is made through a Swiss-made **LEMO** connector. Mel Schilling R\V-MS-1 co-axial cable is used for minimum energy storage and maximum signal transmission.

We are proud of the LOCI. We choose our dealers on the basis of their ability to treat their customers and our product with the respect they deserve. We will repair or replace any LOCI that fails to perform as it should. Of course there will be no charge if this is due to our negligence. If cats or children find the tonearm irresistible, we can almost certainly fix it for less than the cost of a new tonearm. We are not trying to make our living in the tonearm repair business!

We value our product and dealers and our customers. If anyone has questions, problems, or suggestions, then we are anxious to hear them.



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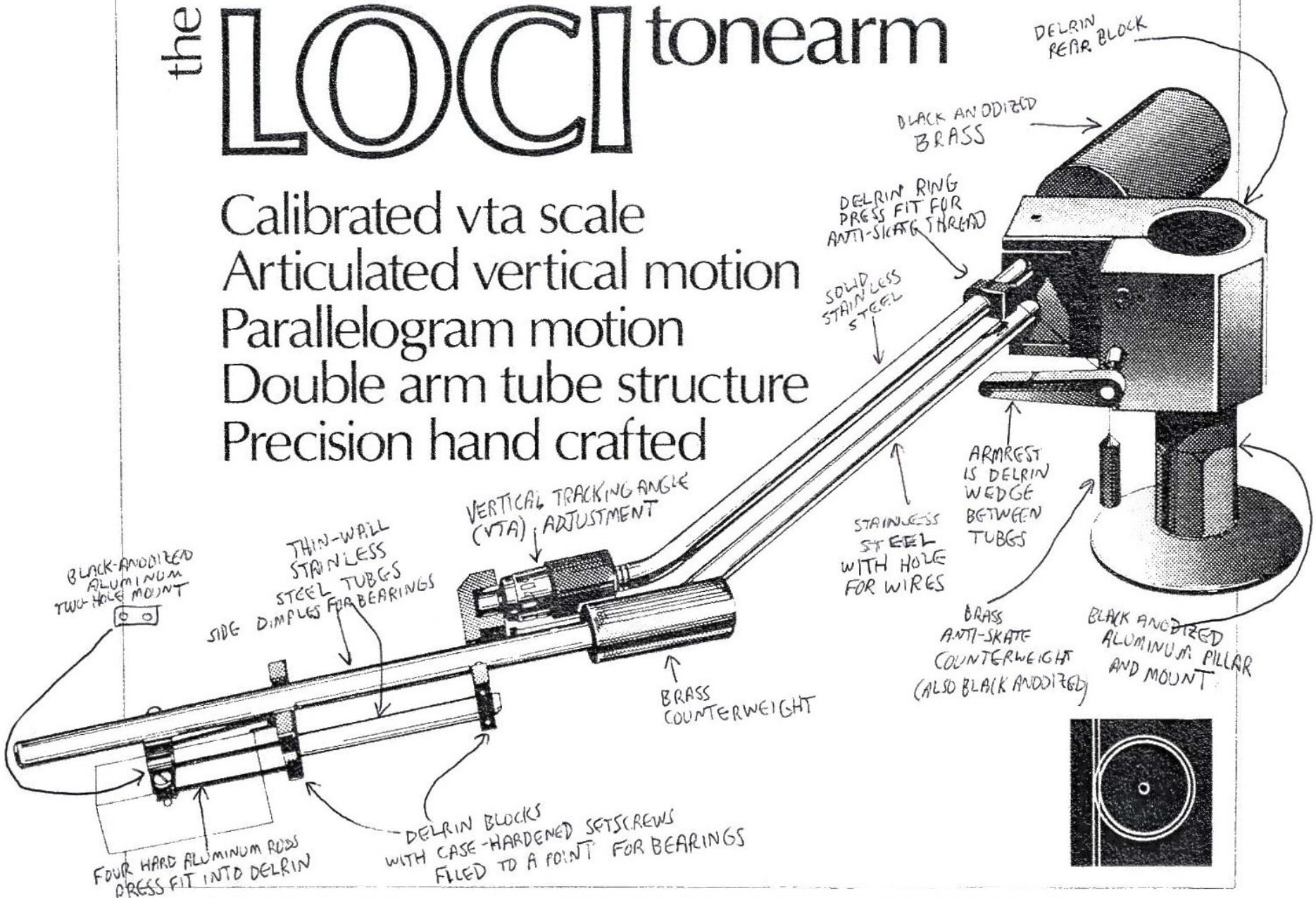

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HOW TO INSTALL THE LOCI TONEARM

Decide where to place the pillar. The center of the pillar should be 24.5 cm ($9\frac{5}{8}$ inches) away from the spindle at the center of the record. It should also be 2.5 cm (1 inch) to the right (as you face the turntable) of where you want the pivot point of the tonearm to be.

Install the pillar. Drill a hole 2.5 cm (1 inch) in diameter for the pillar. Push the phono plugs through the top washer, the armboard, the bottom washer, the nut, and the bottom or back of the turntable. Push the pillar through the top washer, the armboard, and the bottom washer. Then thread the nut onto the pillar and tighten it hard, making sure that the top wire comes out of the pillar facing the back of the turntable.

Mount the cartridge. Push the mounting screws of the cartridge through both of the small black aluminum plates and then through the mounting holes on the cartridge. Put the nuts on, but leave them very loose. Attach the pins to the cartridge according to the standard code:

WHITE = LEFT HOT	RED = RIGHT HOT
BLUE = LEFT GROUND	GREEN = RIGHT GROUND

Then slide the cartridge onto the four black aluminum rods so that the rods fit between the two black plates. Make the screws snug but not tight.

Set dynamic balance. With the small counterweight attached to the upper tube of the front portion of the tonearm, attach the large counterweight to the very rear of the tonearm. Adjust it back and forth until the arm approximately balances when it is tilted in any direction. (Note: Some turntables may require this weight to be placed further forward than this for it to fit under the dust cover. In that case, place it as far back as it will go and still fit under the dust cover.)

Place tonearm on pillar. Slide the tonearm onto the pillar and tighten the large allen screw just enough so that the tonearm does not slide around. Then insert the male LEMO connector from the pillar into the female LEMO connector in the arm. Move the tonearm up or down on the pillar so that the front tubes are level when the stylus is at the level of a record. Then use the LOCI TONEARM ALIGNMENT GUIDE or the Dennison Sound-Tractor or any other method to minimize lateral tracking error by setting the cartridge squarely in the groove when it is 121 mm and when it is 66 mm away from the center of the record. This

can be done by rotating the tonearm on the pillar and by adjusting the position of the cartridge on the four black rods.

Set tracking force. Adjust the small counterweight on the upper front tube by sliding it forward or backward so that the vertical tracking force is optimum for the cartridge employed. This should be done with a good scale, so no markings are provided. The small allen screw should only be tight enough so that counterweight does not move.

Set antiskating. The anti-skating weight hangs on a thread just in front of the pillar. Make sure the thread hangs in the groove cut for it in the assembly which holds the tonearm in the rest position. Slide the small piece which holds the thread onto the top tube of the tonearm forward or backward so that the stylus shows no deflection sideways when it is lowered onto a moving record. With some cartridges which have very low compliance, it may be necessary to adjust this by ear, listening for optimum left-right balance on a familiar record. Then tighten the small allen screw on the piece to hold it in place. (The varying frictional coefficients of different manufacturer's stylus shapes makes any general rule of thumb wrong most of the time. This is the easiest way to get anti-skating right most of the time.)

Set vertical tracking angle. This is a tough one. Rotate the black plastic cylinder just behind the numbered wheel so that the cartridge front is higher than the back. Find a familiar recording with *lots* of spatial information (such as Philips, BIS, Proprius, *et cetera*) and listen to a short passage near the center of the record again and again turning the black cylinder between each repetition so that the numbered wheel advances one number each time. The sound should become progressively more and more spacious and real and then less so. If one position sounds noticeably best, then set the black cylinder to that position. If two positions sound equally good, then set the black cylinder between the two positions. Set the numbered wheel without moving the black cylinder so that this position has the number indicated for this record label on the enclosed list. If the selections all sound the same, set the cartridge level and set the numbered wheel at number five (5). If the first setting sounds best, turn the black cylinder downward one full turn and progress up the numbers one at a time. This task is much easier with a good tape deck because one can just record all the positions sequencially and hear the differences much more quickly.

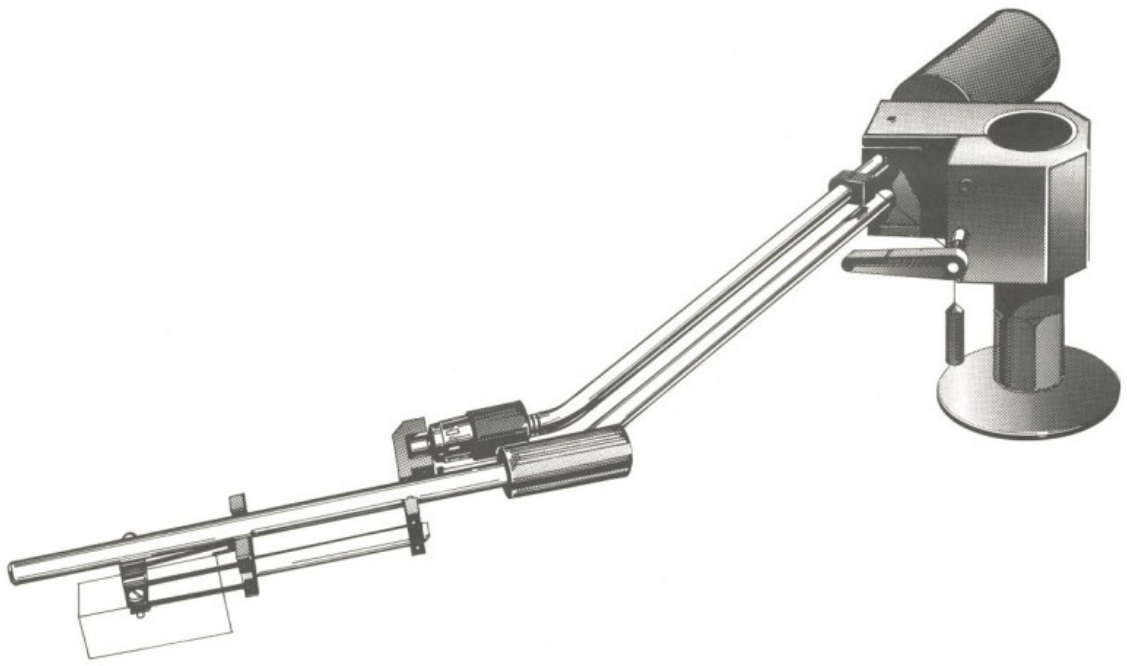
Do the final tweaking. The height of the tonearm should be readjusted so that the front tubes are level when the black cylinder is rotated to position number

five (5). Also, the tonearm should be rechecked for lateral tracking error using the LOCI TONEARM ALIGNMENT GUIDE or whatever other method was employed earlier. If the cartridge is tipped sideways in the groove (azimuth error), then loosen the two small allen screws in the pivot block that holds the two rear tubes in place and rotate the plastic block where all four tubes meet to straighten the cartridge. Please, only loosen the small allen screws enough to move the tubes and make sure they are very tight when the job is finished. Finally,, make sure the large allen screw is somewhat tight and that the cartridge screws are very tight.

HOW TO USE THE LOCI TONEARM

Once the dealer has set up and installed the **LOCI** Tonearm, nothing should need adjustment except for the vertical tracking angle. With most good cartridges, the sonic benefit of adjust VTA is significant. Adjusting the black cylinder (being careful *not* to touch the numbered wheel) to the correct number for the label of the record being played on the provided list can become as automatic as cleaning a record before playing it. These numbers are not from heaven, they come from listening to a lot of records with several different cartridges. So the list may be incomplete or even have mistakes. If you encounter a good recording on a label that is not on the list, just set the black cylinder to optimize the accuracy of reproduction and please do not hesitate to tell us about it.

When travelling short distances with the tonearm, it is a good idea to fasten the tonearm to its holder with a wire "twistee" and on longer (rougher) trips, it might be wise to learn how to use the **LOCI TONEARM ALIGNMENT GUIDE** and remove the tonearm from the pillar for the duration of its travel.



LOCI Vertical Tracking Angle Settings
according to label.

A&M/6.5
ABC/4.0
Acanta/7.5
Accent/5.0
America/5.5
American Gramophone/4.5
Analogue Recordings/4.5
Angel/5.5
Apple/3.0
Arabesque/6.0
Archive/3.0
Argo/4.0
Arista/5.0
ARK/4.5
Astree/8.0
Asylum/3.5
ATCO/4.0
Attic/5.0
Audiogram/4.5
AVI/4.5
BASF/5.0
BIS/4.5
Black Lion/6.0
Blue Note/5.0
Blue Thumb/3.0
Calliope/5.5
Canadian-American/4.5
Candide/4.0
Capitol/3.0
Caprice/2.0
Capricorn/5.5
Cara/5.5
CBS/5.5
Chandis/5.0
Charisma/5.5
Chesky/4.5
Chrysalis (WB)/3.5
Circle/6.0
City Lights/6.5
Classic/5.0
C+da/3.0

Colgems/3.5
Columbia/5.5
Concord/5.0
Connoisseur/5.0
Corona/2.5
Coronado/3.5
Cryonic/4.0
Crystal Clear/5.0
Crystal/2.5
CTI/2.5
Da Camera Magna/4.0
Danacord/4.0
DCC/4.0
Decca/5.0
Delerium/6.0
Delos/4.5
Deutsche Grammophone/3.0
DJM/5.0
DRG/7.0
Dunhill/4.0
ECM (Germany)/4.5
Elektra/3.5
EMI/6.0
Enja/4.5
Epic/5.5
Eterna/4.0
Euphoria/4.0
Eurodisk/6.0
Everest/4.0
Fermata/5.5
Festivo/5.0
Flying Fish/4.5
Fontana/4.5
Fourth Stream/6.0
Franklin Mint/4.0
FSM/4.5
Full Moon/5.5
Genesis/3.5
GNP Crecendo/5.0
Grapevine/5.0
Green Linnet/5.0
Harmonia Mundi/2.5
Harmony/5.5
Harvest/3.5
Haydn Society/7.5
Heliodor/5.5

HNH/5.0
Horzu/4.5
Hungaraton/4.0
INA/5.0
In Concert/6.0
Inner City/6.0
Intercord/4.0
Interplay/4.5
I.R.S./3.5
Island/3.0
Ivory/5.0
Janus/4.0
Japo/3.0
JEM/4.5
JRB/3.0
Jugaton/4.5
Kebec/4.0
Kaleidoscope/4.5
Kicking Mule/4.5
Klavier/2.5
L'oiseau-Lyre/4.5
Le Chant Du Monde/8.0
Little David/2.5
London/6.0
Lyrachord/6.0
M&K/4.5
Mainstream/4.0
Mark Levinson/7.0
Matador/3.0
MBM/6.5
MCA/3.0
Melodia/5.5
Mercury/4.5
MF Records/5.0
MGM/4.5
Milestone/4.0
Minos/3.0
Mobile Fidelity/5.0
Monitor/5.5
MPS/5.5
Muse/3.0
Musical Heritage Society/4.5
Narada/5.5
Nautilus/6.0
Nimbus/4.0
Nippon/5.0

NKF/6.0
Nonesuch/7.5
Novus/4.0
Odyssey/5.5
Olivia/3.0
Olympic/5.0
Opus/3.0
Orion/5.0
Ornx/4.5
PA-USA/3.0
Pablo/5.0
Pandora/4.5
Panton/5.0
Passport/4.5
PA USA/5.5
Pearl/6.0
Peerless/4.5
Pelican/6.0
Peters International/4.5
Philips/5.0
Philo/5.0
Polydor/5.0
Poseidon/3.5
Prestige/4.5
Privilege/3.0
Proprius/6.5
PVC/4.5
Qualiton/4.0
Quest (WB)/3.5
Quintessance/6.0
RCA/5.5
Reference Recordings/4.0
Reprise (WB)/3.5
Rounder/6.0
Schwann/7.5
Seraphim/5.5
Shanachie/6.0
Sheffield/5.0
Sine Qua Non/4.5
Sire/4.0
Sonet/5.0
Steeple Chase/4.5
Summit/6.5
Supraphon/5.0
Sutra/2.5
Takoma/3.5

TBS/4.5
Telefunken/6.0
Temple/3.5
Three Blind Mice/5.0
Titanic/3.0
Transatlantic/3.5
Trip/5.5
Turnabout/3.0
Umbrella/6.0
Unicorn/4.0
United Artists/4.0
Universal City (MCA)/3.0
Vanguard/6.5
Varrick/6.0
Vertigo/4.0
Verve/5.0
Virgin/4.0
Vista/4.5
Vox/3.0
Warner Brothers/3.5
Wergo/4.0
Windham Hill/3.0
Wright and Perry/7.5
Xanadu/7.0