



**PHONOPHILE
NUANCE TRACKING FORCE SCALE
OWNER'S MANUAL**

PERFORMANCE AND DESIGN

I. Optimum Downforce, Suspension SAG and The Need For Scale Accuracy: Nuance Design Concept

Need for Accuracy

A tracking force scale accurate to .01 gram is crucial for:

- Unleashing the real sonic potential of any turntable.
- Realizing the full 5 to 10 year life of the cartridge by periodic compensation for the steady sagging of its stylus suspension.

Why is such seemingly extreme downforce accuracy essential? For two intertwined reasons:

1. Tiny changes in the angle between the stylus and the record (stylus rake angle) can perfect or ruin your sound. Changes of $\frac{3}{100}$ of a degree (!) are clearly audible, by direct listening experiments.
2. Tiny changes in the cartridge tracking force make striking changes in stylus rake angle. Add one tenth of a penny's weight—only $\frac{1}{2}$ gram—and you change a typical cartridge stylus rake angle by $\frac{1}{4}$ degree, six times the threshold for clearly audible change. Or, more directly, a $\frac{4}{100}$ -gram increase in tracking force will clearly dull you cartridge's treble, as you can easily confirm for yourself.

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Cartridge Life and Suspension Sag

How does this tie in with cartridge lifespan? Again, quite simple:

- A typical stylus cantilever is held more or less stiffly at its pivot point by a tiny “doughnut” of foam—this is the stylus suspension.
- The softness of the stylus suspension (i.e., the compliance) is determined by the softness of the foam.
- With use—that is, with hours of continuous vibration of the stylus cantilever and its suspension—the foam softens. This happens rapidly when the cartridge is new and breaking in; the softening slows thereafter but never stops completely.
- As the foam suspension softens and sags, the cartridge rides lower and closer to the stylus—assuming, of course, that the downforce doesn’t change. Viewed another way, the cantilever’s angle relative to the cartridge body is becoming shallower. That’s the same as saying the stylus’s rake angle relative to the record is decreasing. That means duller sound overtime as the foam softens—if you fail to adjust for the suspension sag.
- The other bad thing that happens as the cantilever angle decreases is that, inside the cartridge body, the coil (or magnet, for moving magnet cartridges) at the other end of the cantilever from the stylus, starts riding lower in the magnet gap (or in the pole piece gap, for MMs), thus decreasing cartridge output and possibly the cartridge’s response linearity.

Clearly, it is essential to compensate for suspension sag to avoid having to replace the cartridge every 100 or 200 hours.

Compensating for Sag: A New Approach

The traditional universally accepted approach to keeping the stylus rake angle at its optimum as the suspension sags has been to periodically raise the back of the arm, that is, to periodically reset by ear the arm’s vertical tracking angle (VTA). This certainly addresses the stylus rake angle problem. It fails to address the

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problem of the moving coil (or moving magnet) riding lower in the magnet (or pole piece) gap as the suspension sags.

The new Mapleshade approach is to: a) start with a cartridge/arm with correctly adjusted stylus rake angle and correct in-the-gap position of the moving coil (or moving magnet); then b) periodically lighten the tracking force (by ear) to exactly offset the softening or sagging of the stylus suspension. Contrary to the traditional approach, this accomplishes both goals: keeping the stylus rake angle *and* keeping the moving coil (or magnet) in-the-gap position at their optimum.

Other advantages include:

- Adjusting tracking force is far easier than changing arm height, for most arms.
- As the suspension's compliance increases (i.e., as the suspension foam softens and sags) with age, lightening the downforce tends to keep the suspension's spring constant in a more linear range. Lightening will also slightly reduce the rate at which the foam sags.

All these benefits of the new approach are easily realized *provided* the tracking force scale used is accurate to .01 gram. They cannot be realized with a traditional tracking force scale good only to .1 or .2 grams.

II. Tracking Force Scale Requirements:

An adequate tracking force scale needs to do the following:

- Provide repeatable readings to +/- .01 grams over the range of 1 to 3 grams.
- Provide a stylus weighing platform at the height of an average LP, that is, about .075-inch above the turntable platter surface. This is essential because, for most arms, downforce varies significantly as the stylus height changes.

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- If possible, zero out automatically the weight of any extraneous substance adhering to the platform when the scale is turned on, i.e., an automatic tare function.
- Hold readings to +/- .01 gram, no matter where the stylus is placed on the weighing platform.

To achieve the above requirements without the prohibitive cost of a custom-designed, special purpose scale, we selected an in-production and accurate jeweler's digital scale from a reputable manufacturer. Like any such scale, it had an unacceptable platform height—about 3/4". To overcome this, we extend and lower the platform with an overhanging step-down stylus weighing stage, CNC-manufactured to +/- .002" height accuracy.

Because of the digital scale's automatic tare function, the weight of the extra stylus weighing stage is zeroed out and the scale's inherent accuracy is uncompromised. Thus, the Nuance meets all the tracking force stylus scale requirements listed above.

III. Using The Nuance Scale

1. MOST IMPORTANT: DO NOT SUBJECT THE SCALE'S WEIGHING PLATFORM TO SHOCKS OR TO FORCES—UPWARD OR DOWNWARD—OF MORE THAN THE SCALE'S 100 G WEIGHT LIMIT. BE PARTICULARLY CAREFUL OF HIGH FORCES ON THE PLATFORM'S STEP EXTENSION. SUCH FORCES CAN PERMANENTLY DAMAGE THE LOAD CELLS ATTACHED DIRECTLY TO THE BOTTOM OF THE PLATFORM.
2. Follow the instructions for turn-on, turnoff, selecting modes and weight units, etc. as printed on the inside of the Nuance cover.
3. There is no need to calibrate more often than once per quarter.

IV. Sag Compensation for New Cartridges:

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Using the Nuance, set the tracking force (TF) at the midpoint of the manufacturer's recommended range of tracking forces. Break in the cartridge for 24 hours by letting it play in the runout groove of a record. Now, you are ready to start the sag compensation procedure. For an initial, one-time only adjustment, set VTA in the usual way.

One –Time VTA Adjustment

Start with the cartridge-top horizontal, parallel to the record. Adjust TF (on most arms, TF changes every time you change arm angle). Use your favorite 1-minute VTA test track; I prefer a well-recorded breathy female vocal, e.g., Joni Mitchell's *Blue*. Make sure your test record's thickness is near the average thickness of your collection. Now raise the rear of the arm by, say, .5 mm or .02-inch. To make this easy for arms with VTA adjusters, ask your arm manufacturer how much the arm rises for each full turn of the adjustment screw or dial. Adjust TF. Listen again for improved dynamics, tighter bass, clearer and more extended treble. If sound has improved, raise the arm's rear by another .5mm, set TF and listen again. Keep on raising the arm until you hear the first signs of treble harshness: new edginess in the singer's top register, sibilance that starts to sound like tearing paper, and/or a new steeliness in the top octave of the violin. When harshness sets in, drop the arm by half the step you raised it, say .25 mm. Set TF and listen. If the harshness has disappeared raise the arm by half the previous step, say .13 mm. If the harshness has not disappeared, lower the arm by the same half step, e.g., .13mm. If you are a perfectionist, continue this half-step process until you are down to steps of .07mm (.003-inch).

On arms without VTA adjusters, this process can be daunting; for instance, on Regas it requires raising the VTA with shims of varying thickness under the arm base. If you have a dealer who you trust to do carry out entire procedure by ear, let him do this one-time VTA setting. If the dealer just sets the VTA to some pre-determined angle that he thinks is "right" for your arm-cartridge combination, find someone who has the patience to set the VTA correctly.

Mapleshade Sag Compensation Method

1. Having arrived at the correct first-time VTA, use your cartridge for 100 hours or so. At this point, you are likely to have experienced audible

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- cartridge suspension sag, that is, slightly dulling of the treble and loss of dynamics. Now use the Nuance to measure the TF. Whatever that TF is, lower it by .06 gram (for the impatient, .1 gram at most) and listen. If sound improves, repeat. When harshness sets in raise the TF by half the weight step size, say .03 gram.
2. Repeat step 2 every 200 to 400 hours for the remainder of the life of the cartridge. As the cartridge suspension “softens” or sags with age—and as you lighten your TF to compensate—you should find bass response to be improving slightly over time (because the arm’s resonant frequency lowers as the foam softens). And, assuming you are careful about record and stylus cleaning, your cartridge should continue to produce superb sound for at least 5 to 10 years.

IV. Sag Compensation For A Used Cartridge:

1. If you are starting with a cartridge that’s been used for much more than 100 hours, then you cannot start on the assumption that the midpoint of the manufacturer’s range of recommended TFs is close to optimum at that point in the cartridge’s life and sag history. You can either a) start with setting the TF to the low end of the manufacturer’s recommended range (which is, at best, a guess); or b) determine the optimum TF for the cartridge at that point in its sag history (which is time-consuming).
2. To set your own optimum TF for a used cartridge, you need to go through the full VTA setting procedure (section II.1, above) for as much as three or four different trial TFs, starting with the highest trial TF set equal to the midpoint of the manufacturer recommended range. Use downward weight steps of .1 to .15 gram for each succeeding trial TF. For each trial TF, you must remember what it sounded like at its final optimum VTA setting and compare it to the last heavier trial TF to see whether sound has improved. If, at the second trial TF, optimum VTA sound has worsened then there’s no need to continue to lighter trial TFs; instead, add back one half the weight increment you’ve been removing. If sound improves, lighten the trial TF by the same increment as before and repeat the same procedure.

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If your cartridge is new, but you want set your own optimum TF, start with a trial TF at the manufacturer's maximum recommended TF. Use downward increments of approximately .1 to .15 g for subsequent trial TFs. If you think the manufacturer is enamored of light tracking forces (to advertise allegedly reduced record wear, as Shure used to do), then there is good reason to start with a trial TF above the manufacturer's recommended maximum.

V. Using the Nuance Scale: Initial Set-Up and General Use

Initial Set-Up: Calibrating the Scale

Before using the Nuance Scale, calibrate it to ensure accurate readings. The Nuance includes (2) steel 50-gram calibration weights. These weights are only used for the calibration set-up. DO NOT use the weights when reading tracking force. Once calibrated, there is no need to recalibrate for several months unless you drop the scale or bump the stylus shelf.

1. Place the scale on any smooth, level surface.
2. Press the ON/OFF button for 1 second to turn on the scale and let it stabilize. When stabilized, the scale will read 0.00 and the word 'ZERO' will appear in the lower left corner of the display.
3. Press the UCAL button once; the scale will briefly display CAL, and then read 00.
4. Press the UCAL button a second time; the scale will now read 100.00.
5. Gently place both of the 50-gram calibration weights on the center of the scale platform.
6. Press the UCAL button a third time; the scale should read PASS *.

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7. Remove weights, and then turn scale off by holding down the ON/OFF button for 3 seconds. The Nuance Scale is now calibrated.

* If the scale displays FAIL or F--H, turn it off by holding down the ON/OFF button for 3 seconds. Double check to ensure the scale is sitting flat and that nothing is touching the bottom of the stylus shelf by passing a piece of paper under the shelf. Then, start again at Calibration Step 1.

General Use: Reading Tracking Force

To ensure accuracy, be sure to calibrate your scale before first use.

1. Place the scale on any smooth, level portion of the turntable platter or platter mat *.
2. Press the ON/OFF button for 1 second. (If the scale displays 'UnSE', simply turn the scale off and then on again.)
3. Make sure that the symbol "g" (for grams) is showing in the upper right corner. If not, press the MODE button repeatedly until "g" displays at the top.
4. Let the scale stabilize for 15 seconds. When stabilized, the scale will read 0.00 and the word 'ZERO' will appear in the lower left corner of the display.
5. Place the stylus anywhere on the low aluminum stylus shelf.
6. Take reading after the scale settles.
7. Turn off the scale by holding down the ON/OFF button for 3 seconds—or, it will turn off automatically if idle for 60 seconds.

* The Nuance Scale WILL NOT function properly if your platter mat is soft felt. The scale will sink into the felt, interfering with the stylus shelf and causing inaccurate readings. Even worse, felt always muddies sound. For best turntable

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performance and to ensure accurate scale readings, we recommend removing felt mats (or mats made from similar soft materials). Simply replace it with a disc cut from an office manila folder or very thin, hard cork for an instant sonic upgrade.