

Subject: General Soundsmith Cartridge alignment Version 4.33 ~ How to align your NEW or Soundsmith rebuilt cartridge – **COPYRIGHT SOUNDSMITH**

To properly enjoy the best performance possible from your cartridge, proper care and alignment are required.

This includes:

Cleaning
Vertical Tracking Force (VTF)
Overhang Adjustment
Anti-skating Adjustment
Azimuth

CLEANING:

How do I clean the stylus?? Do I use a wet cleaner each time, or often? NO!!!

A DRY soft brush is somewhere between good and "OK", **but it is far better is to use some "Blue Stik"** – this is the blue clay-like stuff you get in the hardware store stationery department that is used to stick papers and light things to the wall without damaging the wall surface. Use it just before or after every play. Squash a small ball flat onto a heavy coin – such as a quarter. Then place THAT coin on the platter. Then cue DOWN and up on the Blue-Stik several times. Be VERY care full not to DRAG the coin or turn the platter when the stylus is down on the Blue-Stik or you risk damaging the stylus or cartridge.

Do this several times, each time slightly moving the Blue Stik to a new spot when the stylus is raised, so that when it comes down it hits a new spot.

Using this method every record should eliminate the need to wet clean ever, BUT if this doesn't cure a distortion problem due to debris build up, THEN either use the supplied brush and some RUBBING alcohol (minimum 70% - NO COLORING OR FRAGRANCE) and gently stroke the stylus back to front only. Only wet clean when the dry clean doesn't work.

DO NOT WET CLEAN OFTEN - TO DO SO WILL POTENTIALLY CAUSE SEVERE DAMAGE TO THE STYLUS MOUNTING AND CAUSE THE DIAMOND TO COME OFF. USE THE ABOVE BLUE-STIK METHOD.

If you don't have a good VERY SOFT brush, purchase a WATERCOLOR brush with non-synthetic fibers, one that has bristles that are about 1/8" in cross section. CUT the bristles straight across with a small scissors, making them about 1/8" long. Break or cut

off the wood handle so the brush is VERY SHORT, and has very little wood handle. This will minimize accidents and reduce jitter when handling and using.

RECORD CLEANING:

DO NOT TALK towards your records. They are neither listening, nor do they need a talking to. You need to listen to them. The reason is this: when you talk, you spit. Yes, even you. Fine drops. You cannot see them because the record is textured with grooves. When the stylus hits the dried spit, this GLUE then sticks to all the dirt and dust in the grooves. It only takes a few revolutions for this to happen, and so much debris can build up on the stylus, **you will have worse than distortion** – The stylus may not even track the record...as below.....



<< BEFORE CLEANING.... AFTER



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What do I suggest?? A record cleaner – It's a MUST HAVE item for any record enthusiast. How much do you invest in one?? As much as you are able – the return will be many times its cost.

Cleaning your records well is the BEST investment you can make in protecting that great sound of your analog system.

VTF – Vertical Tracking Force

As far as vertical tracking force (VTF), always start with the recommended vertical tracking force from the manufacturer for a particular make and model of cartridge. It may be possible to lower it after we have repaired or rebuilt your cartridge, but there are so many factors, including variations in tone arm design and condition, that we urge our customers to invest in a test record that will aid them in finding the correct VTF. Too low a VTF will damage both record and stylus, and too high will cause too much wear.

The proper amount of VTF will vary from cartridge to cartridge, EVEN within a single model, due to manufacturing tolerances. One who plays loudly recorded music will need a bit more, and visa-versa.

After adjusting your VTF, do NOT use a test record to set the antiskating. Adjust the antiskating as described below.

Overhang Adjustment

This adjustment provides a best compromise for your “pivoting” arm – it will minimize distortion if done correctly. Please open the attachment and print out free overhang gauge – instructions are fairly easy and on the print out itself – PLEASE note the metric grid at the bottom of the gauge, and make sure you have printed it out sized correctly. If not, you may have to enlarge or reduce a bit. I use photo quality paper for my final print out, which make a durable gauge!

Bear in mind that one should always align the CANTIELVER with the grid; the body angle is irrelevant, as is the stylus guard slot, which can be off a bit.

Notice that when down on the record, stiction may “pull” the cantilever slightly to one side or the other, so after the antiskating is set correctly, you may want to adjust the body/cantilever alignment a bit to more accurately try to agree with the alignment of the grid lines.

ANTI-SKATING –

YES – you DO need antiskating. It is just plain simple physics. BUT.....the industry has gotten it WRONG. (see my notes at the end of this anti-skating message for more details)

Make sure that the anti-skating is well set; there are many ways to tell, but this is a method suggested by Frank Schroder, with which we heartily agree. PLEASE NOTE – this will not agree or work with test records which are almost invariably designed for higher amounts of anti-skating. The reasoning from Frank Schroder for this method and level of anti-skating is as follows: the level of antiskating used should create EQUAL forces on each groove wall for ***most*** of the record. Since this force is dependent on the level of recorded modulation (how loud the recorded music is on the disk) setting it for a “worst case” “loud music passage” level is totally inappropriate. Setting it where it provides equal force per groove wall for where music spend 80-90% of its time (30-40% modulation) makes FAR more sense, both from the standpoint of listening, and wear.

Procedure:

When you have it adjusted right, the arm will track on the SURFACE of the record (not in the groove) at the end of the record on the un-pressed flat space where the run-out groove is – it should track SLOWLY INWARDS toward the center at a MUCH SLOWER RATE than IF IT WERE ACTUALLY in the end groove. If you do that, then the best average Anti-Skating is set correctly.

The following is useful, but not all-telling. With medium or high compliance cartridges (NOT with most moving coil designs) - LOOK at the position of the cantilever when it is up in the air, and when it is on the record, both at the beginning, and at the end. Look for a change in position both initially upon set-down, as well as after 1-2 minutes. If you DO THIS BEFORE adjusting as above, you will have a gross method to verify that you have problems with skating forces, as it should not change position - if it does, the A-S is VERY wrong. The best way to tell if it is very wrong is to look how the cartridge behaves on the flat surface, as described above.

DETAILS.....DETAILS.....

Almost always, most tables are set so they have too much Antiskating, or an adjustment that cannot be turned down enough, OR the range and fine control is terrible, or you have none.

Usually, most folks use far too much antiskating, as evidenced by the thousands of cartridges I have rebuilt over the last 40+ years – as evidenced by observation of the outer edge (right channel) of the diamond to be worn far more than the inner, or left channel.

Frank Schroder and I are of the same opinion about antiskating – and that renders MOST records that provide an anti-skating track **totally in error** – they are recorded at about 80-90% modulation – or HIGHER - and expect you to set the A-S force so that there is no distortion (or equal amounts on both channels if the cartridge tracks poorly).

The problem with these tracks is that since the required level of A-S force is a dependent of the amount of modulation, **it has you adjust antiskating at far too high a level.** This would be OK, if you are listening to music that is (by nature of the music) at constant maximum crescendo, without normal musical dynamics - going from loud to soft. Very few genres of music are like this. When you adjust for this level on a “test record”, that means that you are very much overcompensated with far too much antiskating as you have adjusted it for where music does NOT spend most of its time. It spends it at about 30-40% modulation levels, and adjusting the A-S with these “test” records results in far too much A-S force; too much stylus force on the right channel, and far too little on the left.

Since there is no properly recorded track that allows proper setting of A-S (there will be such on our new Soundsmith adjustment record), the method that Frank Schroder

discovered through careful reverse engineering **works without tools, and without a special record.**

Why does this method work for all styli? It is because the bottom tip of all styli are designed to be of a certain radius so they don't touch the bottom of the record groove. With this understanding as a "first order" effect, Frank Schroeder calculated the correct amount of anti-skating, and observed how every styli behaved on the surface of vinyl. That is why it works for every stylus shape, and all tracking forces; the drag on the surface is nearly identical due to "force per unit area" with consideration of the rheology of the material – vinyl.

Suffice it to say that it is "similar" enough for all styli that allows this method to work well, **especially since the method was reverse engineered/calibrated properly by Frank Schroder to be correct for 30-40% record modulation.** It then becomes an easy matter to set the A-S and observe the movement of the arm. For a given VTF (any amount of VTF) – set the A-S so that the arm VERY SLOWLY drifts inwards when placed on the SURFACE (NOT IN A GROOVE) at the end of a record. You will have a moment to do this until the stylus "pops" into the run-out groove.

Again, this works for ANY amount of VTF required, for ANY cartridge. It will set the A-S for EQUAL force per groove wall for 30-40% groove modulation levels, at ANY VTF, for ANY cartridge.

Azimuth adjustment;

Azimuth adjustment is important – We realize that some arms do not allow for such, so we have some suggestions how one can accomplish this with a non-adjustable arm – see the end of this section

Although I go into great detail (below) for those interested, the simplest way to set azimuth is to always start with the cartridge as physically neutral as possible as viewed from the front. It should be as flat as possible. View it from the front, looking at the gap between the bottom of the cartridge and the surface of the record. Sometimes placing the stylus on a thin mirror (same thickness as a record) and viewing the cartridge and reflection from the front can aid in getting the azimuth close. Your "best setting" is not more than 3 degrees plus or minus from this position, either clockwise or counterclockwise.

Now I need to get a bit technical.....everyone understands that the stylus MUST be in proper mechanical alignment with the record in order to trace the groove wall correctly. That is paramount, regardless of anything else as regards azimuth. As viewed from the front, the stylus must be perfectly vertical in the groove. But.....here are the problems.

When any cartridge is made, it is difficult at best to set the stylus in perfect vertical alignment. This is also true for a cartridge repair. Many MC (not Soundsmith) cartridge designs also “drift” or can have azimuth changes with use, or because of an accident. But the bottom line is that right out of the box, there is a good chance that the stylus will be off by a few degrees from being perfectly vertical.

The other problem is that inside the cartridge there is a magnetic generating system of one type or another. Although one likely assumes that this generator is also perfectly aligned to be in its exact perfect position, many are simply not at the time of manufacture. They are difficult to align, and because they are aligned by eye at the time of manufacture since there is no cantilever and stylus attached to test them to be in the exactly perfect position. As a result, they can be off by plus or minus 4 degrees, or even more.

What is most important to understand is that Azimuth electrical measurement devices and software designed to set the azimuth do NOT measure the stylus azimuth. They measure the generator azimuth – an alignment **which affects the levels of channel separation and channel output balance**, and directs you to adjust the azimuth to get the **generator** only in proper alignment. That’s fine, assuming that the stylus has been aligned perfectly to the exactly perfect azimuth alignment of the generator during manufacture, and IT has been aligned perfectly to the body of the cartridge. But as indicated above, that generator alignment may not be done well, and in fact, everything about all three aspects of azimuth above can be off.

You begin to see the problem. Using these devices can sometimes result in setting the stylus off by as much as 5 degrees – or more! We have had plenty of reports of use of these devices resulting in the cartridge tipped off at a severe angle, resulting in obvious distortions. When customers set them back to visually “normal” – all is well.

This situation is compounded by using these methods for Soundsmith cartridges which often, as a result of their unique performance and design, have unusually high levels of channel separation. Cartridges which have extremely high levels of channel separation can **sometimes** have different channel to channel maximum separation measurements even when the generator is perfectly aligned. That, by the way, does NOT indicate a defective cartridge – it only demonstrates what happens when you manufacture a design that hits extremely high levels of channel separation. Sometimes there are, at those levels, some asymmetry in channel separation.

So – how is one to know when the azimuth is correct with a Soundsmith cartridge ?

The best method is to assume that the stylus has been mounted in correct alignment to the body, and know that we have done our utmost to align the internal generator to both of those alignments. So...always start by setting the cartridge neutral as viewed from the front.

What happens if it generator has not been aligned absolutely “perfectly” for a Soundsmith cartridge? Because our designs INHERENTLY have high levels of separation, you will lose a small amount of channel separation and maybe some very slight channel balance (<1 dB).

Since MOST non-Soundsmith cartridges have separation in the range of 25- 30, there is a reasonably broad range of the “best” azimuth alignment with these so that electrical measurement techniques will often get you close. This is good for folks with poor eyesight, or those who cannot look easily for mechanical alignment, for varied reasons. If the stylus, generator and body **happen** to be in perfect alignment, these devices will get you exactly there.

But if you use these devices of this technique with a Soundsmith design, you MAY find that cartridge body tipped off by some amount, which is improper stylus azimuth alignment. With cartridges that have extremely high levels of separation (Soundsmith), you must be even more cautious about these measurement devices.

Assuming the cartridge is perfectly built, you can verify the best position using a test record (**Acoustic Sounds test record is fine – Side 1, tracks 2&3**) where one channel is modulated at a time, and LISTEN (or measure properly) the **OTHER** channel **for crosstalk or bleed through**. Do the same thing vice-versa with the other channel. When the crosstalk, or bleed through is roughly the same, **and the cartridge appears neutral – that is the gap between the bottom of the body and the record surface is even – as viewed from the front**, that is **generally** the best azimuth. While fine tweaks from there based on listening tests (you will find many comments on the web about preferences) can improve performance, it is critical that the antiskating be set first, exactly as described in this article. Many cartridges can be azimuth adjusted in this manner, because the bleed through for each channel will be roughly the same **for most cartridges when the azimuth is correct**.

Again, it is important to note that cartridge azimuth alignment devices that rely on equal channel balance and identical channel separation to make this adjustment will work reasonably well with some cartridges, but absolutely not with others. They are great tools, but can have limits, and often with a Soundsmith cartridge will not work in the attempt to adjust AZIMUTH to achieve best azimuth adjustment. In fact, as mentioned above, some will actually provide a far worse azimuth recommendation than using a mirror, or an equal reflection in the surface of the record while playing as viewed from the front. As a result, there is a caveat with these devices that rely on identical cartridge channel characteristics. While it is true that a truly defective cartridge may have channel asymmetry from the standpoint of one channel having far worse separation than the other, it is also quite common with Soundsmith cartridges – which often have unusually high levels of separation - to have one channel that has better separation than the other.

For example, one channel may be 6dB "worse" for separation than the other at the BEST stylus azimuth MECHANICAL alignment (viewed flat from front). In other words, one channel may have extremely good separation or crosstalk when compared with the other, which may "only" be very good. These differences do not indicate a defective cartridge, they simply point out how difficult it is to make a cartridge with identical separation when the separation figures get unusually high, as Soundsmith's often do. So, how does one adjust Azimuth under this situation?? Go for flat or parallel as viewed from the front, and do some minor tweaking if desired as described above.

In the near future, a device called the CartRight, available in both hardware and software forms from Soundsmith will be available to resolve this azimuth issue. This device will permit accurate adjustments to be performed even by the most novice of audiophiles, and will allow perfect azimuth adjustment for any and all cartridges - especially those with any asymmetrical performance.

<http://www.sound-smith.com/cartright/index.html>

To summarize: If you are using instrumentation to measure crosstalk or channel separation, azimuth adjustment for asymmetrical Soundsmith cartridges with high levels of separation may be done as follows: the best method here is to ignore channel separation issues, set the cartridge to neutral, and then find the critical azimuth point for the WORST channel where it JUST achieves **best separation** and to stop there. This can be done by listening to the channel with the most bleed through. It is likely that you will find that continued adjustment in the direction that minimized the bleed through or crosstalk will NOT result in improvement of separation for that channel.

In other words, if one channel is always much better in terms of less crosstalk than the other, tune the azimuth by using the worse of the two channels. Again, the best way to tune the "worst" channel is to find the point where the crosstalk "just" becomes minimized and go no farther. Verify that the other channel is still better in that it has less crosstalk. **If you NOW FIND that you have NOT gone more than a tiny bit off the neutral position to do this, you have probably hit the best azimuth.** **If you find you are way off neutral, that is wrong, and you must start over.**

FOR ARMS that do not allow azimuth: Our new ES series of cartridge designs allow azimuth adjustment by virtue of a full round alumina rod. Please refer to the ES addendum for details.

For all other cartridges: One may cut two fine strips of business card, about 1/4 the width of the cartridge, and place them on top of one another, and then on top of the cartridge, running FRONT TO BACK to create a pivot or fulcrum. Then, by alternately slightly tightening and loosening each of the mounting screws a tiny bit each, one may "tilt" or rock the cartridge as viewed from the front to achieve a slight azimuth adjustment, which should be all that is required to achieve top performance. When the

proper point is found, tighten both screws by the same amount to "lock" the setting in place.



The SoundSmith "Strain Gauge" cartridge system...
Photograph by Ross Bennett

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