

Azimuth & Fine Balance Adjustment

A stylus that is perfectly centered in the record groove - when viewed from the front - and not leaning one way or the other can give us optimal stereo separation and is one of those keys for big soundstage. This angle of the stylus is called azimuth.

You'll need a test record with a mono reference signal at a steady output level. I use Track 1 of Side 1 of The Ultimate Analogue Test LP.

Have the Puffin set up with your favorite cartridge and your typical settings. Then adjust as follows:

Mode: Stereo

Magic: OFF

Fine Balance +00

Phase: Null

Go to the Levels VU in Average mode, paying attention to the second line, "*D av -XX.X -XX.X*". Go ahead and play the test signal. You can even have your system volume muted so that you don't have to hear the obnoxious test tone, as we are just monitoring the levels.

Since we are in Null mode, we want this to be as low a negative number as possible (e.g. -50.7 is better than -48.5). In Null mode we are subtracting the two signals from each other, so if the two channels are perfectly aligned, theoretically we'd get absolutely nothing (-99.9 on the Puffin). Since there are many factors, for our adjustment we are just looking for a relative minimum, and every tenth of a dB we can drop is good.

Adjust the stylus azimuth by rotating head shell, shimming the cart, or making the adjustment that you have on your tonearm. You'll have to research that elsewhere. For me, I have an SME type removable headshell with a little slop, so I can manually adjust a few degrees one way or the other easily. If the detected nulling average drops lower, then you are adjusting in the right direction.

After you get that number as low as possible (i.e. stylus azimuth is now perfect), you can adjust the gain mismatch in your cartridge. Just adjust the Fine Balance for even more rejection (go one step at a time, and change directions if it gets worse).

The only real trick is to constantly keep monitoring that you are playing the same track, so you may need to needle drop it a few times. But after you do it once or twice, the whole process is fast and easy. In my case, I usually use bubble levels, but all my carts required a few more degrees tilts inward, which indicates I need to adjust my main tonearm shaft. But now that I know the error, I can compensate easily.

I improved all my carts 3dB to 6dB separation in this method, so this fine adjustment is highly recommended.

Azimuth Adjustment, Part Two

The previous post - using a mono reference signal - seems to be the fastest and most accurate method of adjusting your azimuth. But what about channel separation specs, you say? Knowing the actual channel separation in dB would be so very cool, as well as letting us know the improvement and how close we've maxed out the cartridge potential (i.e. many carts will have channel separation as a spec on their datasheets).

Now use Track 2 and Track 3 of Side 1 of The Ultimate Analogue Test LP. These are the same 1kHz reference signal, but just left or right. You can do this as soon after you've adjusted the azimuth, using the same settings:

Mode: Stereo

Magic: OFF

Fine Balance +00 (or if adjusted for Azimuth already leave alone)

Phase: Normal

Go to the Levels VU in Average mode, paying attention to the second line, "*D av -XX.X -XX.X*". Go ahead and play the Track 2. You can even have your system volume muted so that you don't have to hear the obnoxious test tone, as we are just monitoring the levels.

Give it a little time to settle the averaging then write down the difference between the two values. The numbers will bounce around a little and this is normal. You can easily do the math with your calculator by subtracting the lower value without the sign by the higher value without the sign. For example, if the left channel is -15.5 and the right channel is -37.6, just subtract 15.5 from 37.6 for 22.1dB of channel separation (eg $37.6 - 15.5 = 22.1$). Then do this same test on the other channel with Track 3.

If you've already done your azimuth alignment, then you are just getting that separation data here for bragging rights and doing no further adjustments. But if your test record only has left and right signals (like the Ortofon test LP), then you'll just use these to hop back and forth to adjust your azimuth. You first adjust azimuth so that the levels match (eg -15.5 on left and -15.5 on right), but then do a very small adjustment to get maximum separation (for both channels). At that point you might be a couple tenths of a dB apart and you'd use Fine Balance.

I think this method is a bit slower and frustrating than the mono method, but if that is all you have on your test LP, then that's the best method you have available.

Epilogue

Here's my azimuth set up by eye and with my bubble levels for a standard Audio-Technica MM cart (yellow):

Right Channel 26.0dB separation

Left Channel 22.4dB separation

Here's the same cart after doing the azimuth adjustments:

Post Azimuth Adjustment

Right Channel 32.0dB separation

Left Channel 32.0dB separation

Hey, hey, hey! Not bad at all.

After all these azimuth tweaks I ended up just playing a bunch of mono LPs. Seems silly instead of testing out the Super Stereo Separation, but guess what - they sounded amazing! The noise cancellation was the best I have ever experienced. It all makes sense, as with the azimuth as perfect as possible we basically have the stereo cart behave like a true mono cart. No out of phase components get summed. So those vinyl tweaking graybeards speak the truth: paying attention to your cartridge setup really pays big dividends.

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