APPENDIX 1

Tangential Cartridge geometry adjustment

Once the cartridge has been mounted, it is necessary to ensure that the cartridge is tangential to the record grooves in order to minimize tracking distortion during playing. As the cartridge moves in an arc across the record, tracking distortion occurs and is minimized by the tonearm geometry and the angle of the cartridge in the headshell.

With optimum tonearm geometry, very low distortion levels (below 1 %) can be obtained across the entire playing surface. Cartridges have zero distortion at two points on a record and these points are used when aligning the cartridge. In practice these points lie at 66 mm and 121 mm from the record centre (see protractor). Other protractors make use of different zero points due to the use of different parameters in calculation. In this case 60 mm has been chosen as the inner groove and 146 mm as the outer groove which still has optimum tracking distortion.

1. Ensure bias is on minimum or switch off.
2. Place protractor over spindle on platter.
Note:
If you have difficulty seeing the cantilever it may help to raise the arm a few mm, taking care that the protractor does not rotate. This also prevents tilting of the cantilever due to the effect of bias force. It may also be helpful to fix the platter by inserting a wedge between platter and plinth and by inserting a sheet of white paper to give a clear background while observing the cartridge. Use a strong light.

3. Alignment at zero point 66 mm (A):
Place tip of stylus on point A (ie. zero point 66 mm). With a strong light observe cartridge from front.
The cantilever and the line on protractor should be in perfect alignment.
If the cantilever is not, then the body of the cartridge will have to be rotated slightly.
Do not adjust cartridge by observing body of cartridge only. (Fig.14)

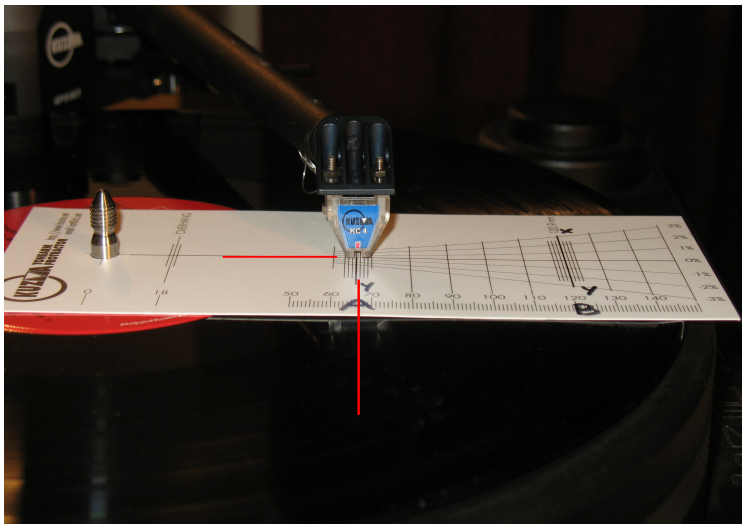


Fig. 14 Alignment at A

To rotate or readjust cartridge:

4. Slightly loosen the screws which attach the cartridge to the headshell.
5. Holding headshell in one hand slightly rotate the body of the cartridge.
6. Recheck alignment at position A and continue adjustment until line described in point 3 is achieved.
7. Alignment at zero point 121 mm (B):
Reposition protractor and check alignment at position B.

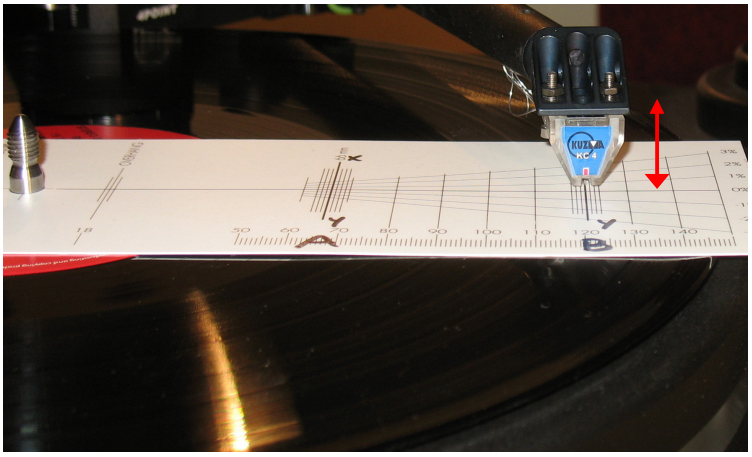


Fig. 15 Alignment at B

8. If the cantilever is not in alignment then rotate protractor until it is in alignment somewhere along the line "x-y" though stylus will probably not be at zero point B. Raise the cueing device a bit for better viewing. (Fig.15)

9. If stylus is in front of point B, pull the cartridge forward (along side) in the slots of the headshell for approximately the same distance "S" as stylus is overhanging zero point B. If it is behind point B, push cartridge backwards towards the pivots of the tonearm for distance "S" (Fig. 16)

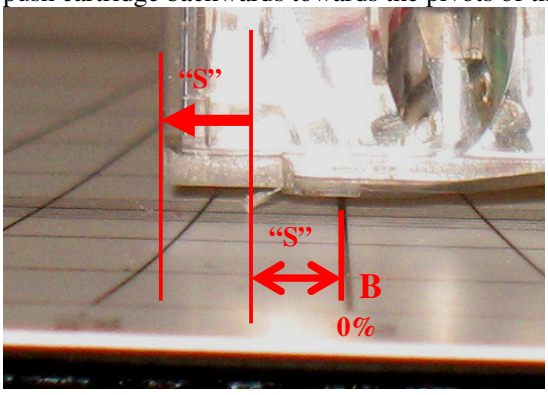


Fig.16 Stylus tip is in front of zero point B.

10. Now rotate protractor and again position stylus at zero point A as described in 5 and 6 above, ensuring that the position of the cartridge in the slots alongside is not changed but only rotated for alignment of the cantilever in zero point A. (Fig.17)

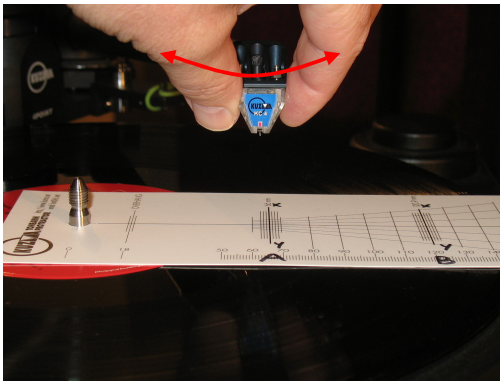


Fig.17 Rotation at A

11. Recheck alignment of the cantilever at zero point B. If cantilever is not aligned here, rotate protractor to find where on line "x- y" the cantilever is aligned again. (Fig.18&15)

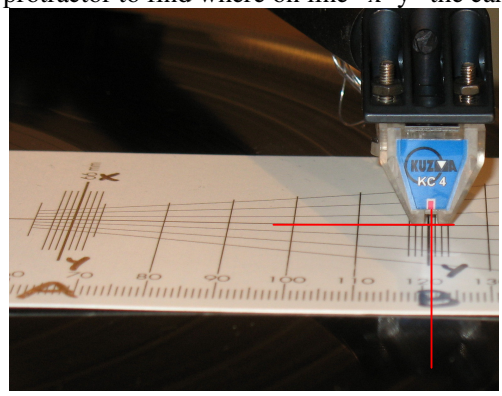


Fig. 18 Alongside line "X-Y" alignment at B

If the stylus is still in front of zero point B on the line "x-y" as before, but nearer to point B, then again pull cartridge slightly forward for distance "S" and repeat the whole process by aligning at zero point A until the stylus will be at zero point B.
If stylus end up behind the zero point B on line "x-y" then move cartridge in opposite direction to before, backwards and realign it at zero point A.
If stylus is still behind the B point, the cartridge should be pushed back and realign at zero point A and realigned again at zero point B.
12. Continue until the stylus is in alignment at both points.

REMEMBER STEPS:
a) Put stylus at zero point A and by rotation align cantilever along XY line.
b) Align cantilever along XY line at zero point B by rotating protractor and see where stylus is on the line XY- in front or behind zero point B.
c) Move cartridge along (not rotating it) for the same distance as stylus is overhanging zero point B for the same distance to increase the overhang.
d) Repeating these steps (a,b,c,a,b,c,…) will ensure that stylus& cantilever are in alignment at both zero points A&B.

NOTE: Ensure that cantilever is not twisted due to bias force.

Appendix 2

Fine Azimuth Adjustment

This can be done using an oscilloscope and a test record or by using good records in a good system and listening to the sound. Cartridges with fine profiles (VDH, Microline etc.) are more sensitive to this adjustment. On the other hand cheaper cartridges are not made so well, making fine adjustment more useful.

With an oscilloscope we measure the differences in crosstalk between both channel. The idea is that on both channels this is equally small. For that we need a test record with tracks recorded for left and right channels separately. Then we compare crosstalk from the left channel on the right channel- which is a very small signal, to the same type of signal from the other channel. By adjusting azimuth, crosstalk on both channels should be made equal.

Listening from LP:
Start listening with the tube in zero position, with the marking lines aligned. Listen to the sound-stage, the focus and the stability of the instruments. Release the two locking screws and rotate the Allen key so that tube rotates for approximately the width of the mark. Listen and then rotate tube for a similar amount in the opposite direction and again listen. Adjust the arm to the position in which the best sound was obtained. In this position make further adjustments by turning the Allen key for a quarter turn in one direction, listening and then turning a quarter turn in the other direction and listening.

Continue this process making ever decreasing adjustments, 1/8 of a turn, then 1/l6 and so on. When optimum results are obtained fix the locking screws. To remember the position of the azimuth, imagine that the inserted Allen key acts as a dial on the clock.

NOTE: During fine adjustment only gently fix locking screws during listening.

The adjustment screw is highly sensitive and the smallest pressure on the Allen key will alter the azimuth and sound.
Do not attempt any adjustment when the locking mechanism is locked. Although no damage can be done.
Significantly improved sound can be obtained by paying attention to azimuth adjustment prior to final VTA adjustment.

Appendix 3

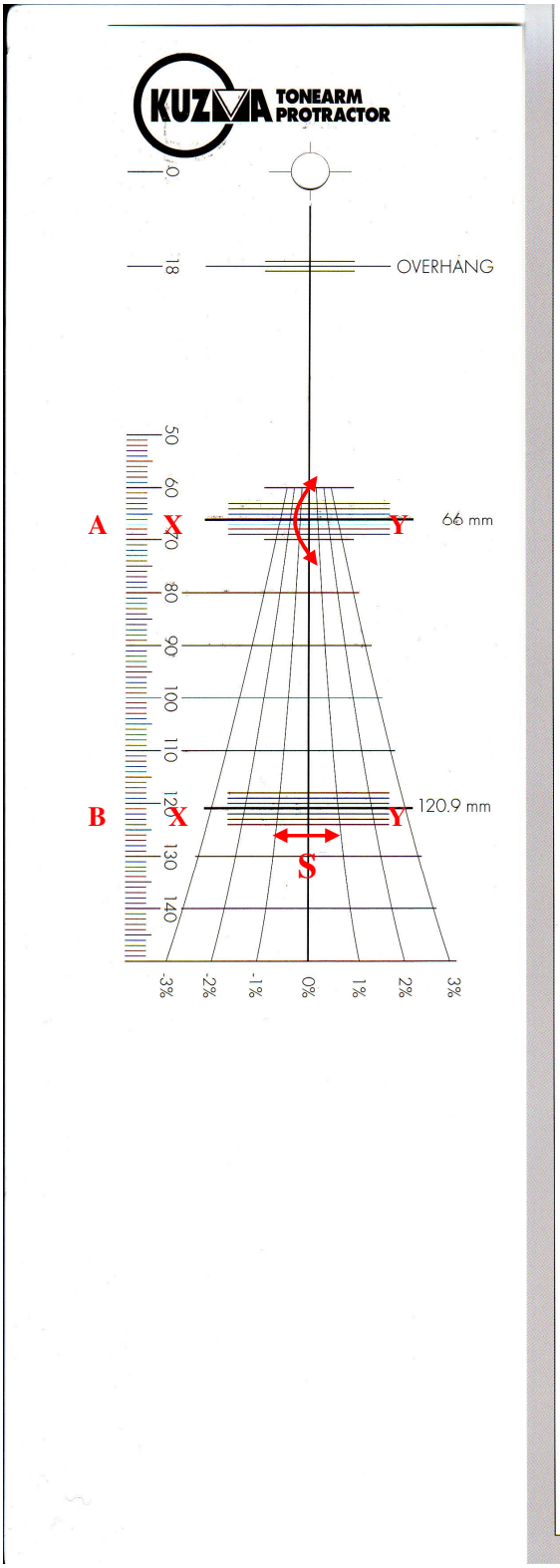
Fine bias adjustment

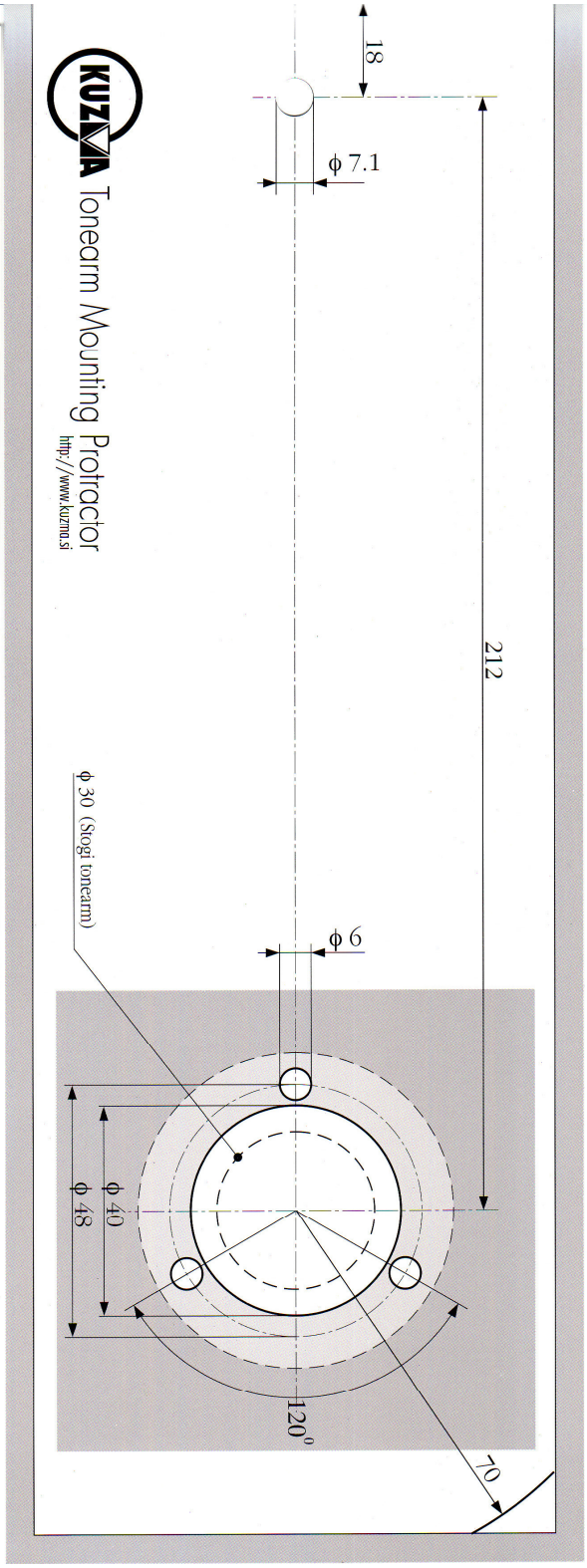
1. Set bias and tracking force as previously described and listen to mistracking on highly Modulated tracking bands on test record. On higher modulated bands mistracking can be heard as impure tones and there will be more overtones. (See instructions on test record)

2. If mistracking is apparent, increase or decrease bias until minimum mistracking is found. If mistracking is heard on the right channel only then the bias is too low, if on both channels the bias is too high or the trackability limit of the cartridge has been reached.

3. Finally further decrease mistracking by increasing tracking force to the maximum Recommended for the cartridge.

4. It is best to have the highest possible tracking force and low bias force.





Cartridge Protractor (Not in correct scale) Tonearm mounting protractor