Instruction manual

KUZMA STOGI REFERENCE TONEARM (with Stabi Ref turntable)

Serial Number: ….

2013-4

KUZMA LTD
INSTRUCTION MANUAL FOR STOGI REF tonearm

The **Stogi Ref** tonearm is very precisely engineered pieces of audio equipment. However the construction is robust and requires minimal maintenance for optimal performance.

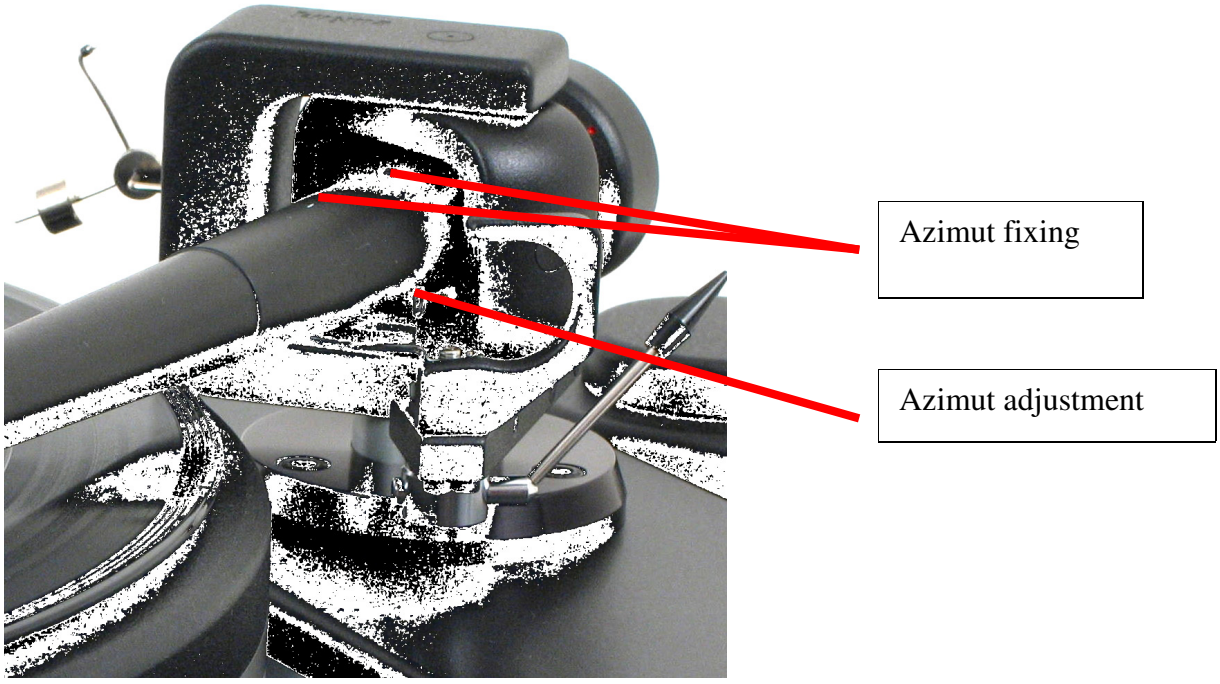

Fig 1.

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1.0. General description:

The Stogi Ref tonearm shares the same construction with Stogi arm. The main difference is that Stogi has a cylindrical and Stogi Ref a conical tube.
The Stogi Ref has a very sophisticated, precise and repeatable azimuth adjustment mechanism with zero play and a very rigid locking mechanism.
The main structure, conical tube and headshell are machined from solid aluminum blocks.
The quality ball bearings are carefully selected and individually checked and tested before assembly. They can each support 20 Kg and are mounted free of play with minimal friction in all planes.
Stogi Ref arms incorporate features such as an adjustable height cueing device, precisely calibrated counterweight and simply adjustable bias.
The arm is wired throughout with high quality Cardas wires and comes equipped with its own full accessories kit. It will accept all cartridges and can be fitted on most quality turntables.

Technical data:

Mass:	850 gr
Effective length :	230 mm (9 inch)
Mounting distance:	212 mm
Offset angle:	23 degrees
Effective mass:	13 g
VTA adjustment:	yes
Azimuth adjustment:	yes
Bias adjustment:	yes
Cables:	single
Arm mount:	Kuzma & Stogi

2.0.0. Unpacking:

2.1.0. Packing list:
Tonearm with fingerlift; counterweight; armbase; instruction manual; two protractors, one for mounting tonearm on turntable and the other for cartridge geometry adjustment and a bag.
Bag:
Sets of 3 socket head screws M6x16 mm, M6x20 mm, M6x25 (for Stabi Ref), M6x 30 mm, three washers, three spring washers (wooden armboards) for fixing base.

Allen keys: 5 mm for attaching armbase to armboard, 3 mm for height adjustment (VTA), 2mm for cartridge and azimuth, 1,5 mm for fixing counterweight, bias and cueing device adjustment.

Small bag containing 2 headsocket screws M2.5 x 5mm, M2.5x8 mm, M2.5x 12mm and nuts for fixing cartridge plus Allen key 0.7 mm for removing fingerlift.

Open the box carefully and remove the top cover. Ensure that the armboard on the turntable has the correct cut-out (main central hole must be 30- 40mm in diameter). Remove the armbase and prepare it for fixing onto the turntable.

Holding the pillar **not the tube**, lift the tonearm out. Observe bias and thread while so doing.
The tonearm can be rested upside down on C shape.
Remove all other parts.

3.0.0. Tonearm Setup:

3.1.0. Armbase Setup:

3.1.1. Armboard cutout:
Take the tonearm mounting protractor and place on spindle of turntable. The Stogi cut-out is similar to the standard Linn cut-out. You can also make a Kuzma cutout.

Mark position of holes on the tonearm mounting board as indicated on protractor. Ensure that there is adequate space in front for tube and headshell and behind for counterweight, in order to avoid problems of lid closure. Check also that screw positions will be over cut-out on subchassis, unless screws are to be sunk. It is wise before cutting to hold tonearm in position over marks and judge if position of tonearm on board will be correct, bearing in mind these criteria. Otherwise the precise position of tonearm is unimportant providing it lies on the protractor arc.
The height of tonearm with cartridge mounted is 55mm above record.
Remove tonearm board from turntable and check that thickness of board is between 6 mm and 22 mm, if so make cuts as marked.

3.1.2. Armbase mounting:

To fix armbase to armboard you will need the correct length of three socket head screws, washers and Alley key 5 mm. Fit washers on screws and insert into underside of tonearm board and up into tonearm base. Position base so that height adjustment (VTA adjustment) screw is at top right position, i. e. 2 o'clock and tighten screws using Allen key.
Remember that the screws are of harder material than the armbase (aluminum) so do not over tighten as this could damage base.

Note: if armboard is thicker then 22 mm:
Either obtain screws of a length that will go through the armboard and into the base to a depth of approximately 5mm, or sink the screw heads by first drilling a large hole of about 9 mm with drill and then drilling a hole of smaller dimension through this.

Put tonearm board back on turntable.

3.2. Tonearm mounting:

Note: Be sure that the tonearm is not too low.

Insert tonearm cable through hole in armbase, then the pillar and fix it at a suitable height using Allen key 3 mm at height adjustment screw in base.

Screw on counterweight so that the thread is covered.

It may now be necessary to adjust the suspension on the turntable due to the added weight of the tonearm.

Fix tonearm cable onto turntable ensuring that there is adequate cable to allow for height adjustment. If the turntable has a suspended subchassis, position cable in such a way that subchassis has freedom of movement.

The phono plugs are marked in the standard way: left - white, right - red, and should be inserted into phono inputs. The connector at the end of the grounding wire should be connected to GND on preamplifier.

Check that bias and thread are correctly positioned (it may have tangled during handling).

For optimum performance you may wish to forego the convenience of the finger lift. If so, this should now be removed using Allen key 0.7mm, loosening screw and easing out lift. Replace screw in hole.

Remove wire securing arm tube.

3.3. Setting up the tonearm:

3.3.1. Connecting tonearm:
Check the horizontal movement of the tube to ensure that the headshell will reach the inner grooves.
Due to the high tonearm mass, turntable leveling and suspension should be checked and adjusted according to the turntable manual.

3.3.2. Cartridge mounting:
You will need Allen key 2 mm plus the two screws and nuts M 2.5 (some cartridges has already threads, nuts will not be need it).

Mount the cartridge with the appropriate set of 2.5mm screws and check its travel above the record with the cueing device in the "up" position! Starting overhang is achieved, if the needle is in line with the front edge of the headshell.

Keeping the stylus guard on cartridge, insert screws from underneath the cartridge through the slots in the headshell. Screw on the two nuts manually. The tip of the cantilever should be level with the end of the headshell (viewed from side).

Fix by slightly tightening screws using Allen key. Ensure that nuts have fitted into the ledge around the slots.

Note: It may be found easier to remove tube from armrest to give a little more room below headshell.

Using tweezers push the pin connectors into cartridge according to code

Red - right
Green - right ground
White - left
Blue - left ground

The connectors will slip snugly onto pins of the majority of cartridges, but:
Pins too fat: with tweezers firmly push connector onto pin. Connector will open slightly. Do be careful, however, that tweezers do not slip and damage cantilever.
Pins too thin: connectors should be squeezed with tweezers to make hole slightly smaller. First squeeze as in A then as at B then slip connectors onto pins.

Put cueing device into 'play' position, ie. down, release tube from armrest and adjust counterweight until tube is balanced ie. floats in a horizontal position slowly back towards the armrest. Prior to final balancing remove stylus guard.

3.3.3. Balancing of the tonearm:
Balance the tonearm to zero tracking force by rotating counterweight along the thread. The instructions with your cartridge will recommend suitable tracking force. We recommend you choose the highest force given and set arm to that amount. A higher

tracking force causes less damage to the record as the stylus maintains more stable contact with the sides of the grooves.

The counterweight is marked with five red dots. One full rotation of the counterweight increases tracking force by 0.5grams, therefore distance from one dot to another corresponds to 0.1 grams.

With the cueing device in the 'up' position and tube in the armrest the counterweight is turned anticlockwise (from front view) to increase the tracking force.

4.0. Tonearm adjustments:

4.1. Adjustment of tracking force:

4.1.1. Balance scale:
Set up the cartridge tracking force with the balance scale, which must be at record height. Rotate the counterweight towards the tube to increase tracking force.

4.1.2. Manually:
Note: An inaccuracy of a few mm in the position of a dot is not critical.

Balance tonearm to zero. Then position of one dot should be noted and taken as zero, (any dot will do, so choose the most easily visible). Then simply turn the counterweight anticlockwise counting each dot that passes that position as an increased tracking force of 0.1gram. For example a tracking force of 1gram will necessitate turning the counterweight past 10 dots or two complete turns the counterweight.

4.1.3. Counterweight fixing:
The counterweight is secured by gently turning one of the three screws M3 with the Allen key 1.5mm. Do not, however fix securely at this stage until tangentional tonearm adjustments are completed.

4.2. Adjustment of tangential geometry:

4.2.1. Tonearm height adjustment (rough Vertical Tracking Angle-VTA):
Note: Do not drop tonearm in armbase.

Put a record on the platter and adjust height of the tonearm- VTA in such a way, that the central axis of the tube will be parallel to the record. This is only a starting point for VTA.
Position the needle carefully in the normal playing position above the record with the lift still "up", to ascertain how low or high the arm is.

If tonearm is too low, then the tonearm must be raised by releasing the screw in the base while holding the tonearm by the 'C' shape and lifting it up. Tighten VTA screw when the tonearm is in position, though do not over tighten.
Repeat process until arm is high enough to clear record.

The needle should be in the groove. If not the tonearm is too high and should be lowered.

Note: Ensure needle is properly in the groove; observe cartridge body reflection on record surface. This is more easily seen if the stylus is in the middle grooves of the record side.

4.2.2. Tangential geometry adjustment:

Note: Do not adjust cartridge by observing body of cartridge only. Observe cantilever.
Note: See appendix 1 for more details.

Once the cartridge has been mounted, it is necessary to ensure that the cartridge is tangentional 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 66mm and 121mm 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 60mm has been chosen as the inner groove and 146 mm as the outer groove which still has optimum tracking distortion.
For a distance of 212mm from record centre to centre of tonearms horizontal rotation the optimum overhang is 18mm and the effective length, ie. distance from the centre of tonearm horizontal to the tip of the cartridge is 230mm. This is gained with offset angle of 24°, and gives a maximum tracking error of less than 2° and distortion of less than 1 %. These are harmonics of the second order which are not as irritating as the third which are very common in amplifiers.

Ensure bias is on minimum and place protractor over spindle on platter.
Using the protractor, adjust geometry at two null points. Rough guidance is by the edges of the cartridge body, but accurate adjustment is by observing whether the cantilever and lines are parallel at the two null (zero) points.

Position A: Place tip of stylus on point **A (A-zero point 66mm).** 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 turned slightly.

To adjust cartridge slightly loosen the screws which attach the cartridge to the headshell. Holding headshell in one hand slightly rotate the body of the cartridge.
Recheck alignment at position A and continue adjustment until alignment is achieved.

Position B: Reposition protractor, place tip of stylus on point **B (B- zero point 121 mm)** and check alignment at position B in the same way as in position A.

If the cantilever is not in alignment then rotate protractor until it is in alignment somewhere along the line 'x y' though not necessarily at point B. Raise the cueing device to see better.
If needle is in front of point B, pull the cartridge forward in the slots of the headshell for approximately the same distance. If it is behind point B, push cartridge backwards for distance's'.

Position A: Now realign again at point A only by rotating cartridge body ensuring that the position of the cartridge in the slots alongside is not changed.

Position B: Recheck alignment at point B and if cartridge is not aligned here rotate protractor again to find where on line 'x y' the cantilever is aligned.
If it is in front as before, but nearer to point B, then again pull cartridge slightly forward and repeat by aligning at point A.
If stylus is further forward on line 'x y' then move cartridge in opposite direction to before, ie. backwards.
If stylus is behind the B point, the cartridge should be pushed back. Realign at point A and then at B.
Continue until stylus is in alignment at both points.

NOTE:
1. Align at A by rotation
2. Check at B and align on line 'x y' and move cartridge along.
3. Again align at A by rotation
4. Again check at B and align on line 'x y' and move cartridge along.

Repeat until cartridge is in alignment at both points.

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

4.2.3. Fixing cartridge:
The screws holding to the headshell must now be tightened and it is very important to avoid moving the position of the cartridge, so tighten in the following way: slowly, one screw at a time in extremely small stages. Before screws are completely tight check that cartridge is still in alignment at position B and then at position A. Then tighten screws firmly bearing in mind whether the cartridge body is made of metal or plastic!

Note: If you find it impossible to align the cartridge, ie. the cartridge cannot move far enough forward in the slots of the headshell, then the tonearm is incorrectly positioned on the armboard, being too far from the record centre. If the cartridge cannot be moved far enough back in the headshell, then the arm is too near the centre of the record.
In either case the tonearm will have to be repositioned on the armboard. It should be noted however, that different cartridges allow for more or less movement than others.

4.3. Adjustment of VTA:
VTA describes the angle between the record surface and the stylus. This angle changes as the height of the tonearm is altered. The standard angle is 15° but cartridge manufacturers work with degrees of anything between 10°- 30° so only by listening tests can one ascertain the correct angle for your particular cartridge. The VTA also varies according to the tracking force and thickness of records. An increase in tracking force is equivalent to lowering the tonearm and vice-versa.
For your information to change the angle by 1° means a change in height of approximately 3mm on the pillar. Some styluses need more precise adjustment of VTA than others.

Starting position is that the central axis of the tube is parallel to record surface.

With felt pen mark the position where the pillar meets the base as a point of reference.
Use a good recording, preferably acoustic instruments and listen.
If the tonearm is too low the sound has a tendency to have an overblown base and the stereo picture is imprecise.
If the tonearm is too high the sound tends to be too bright, ie. too aggressive, especially on acoustic strings.

Try moving the tonearm up and down in 2mm steps to judge where the arm sounds most balanced with a more precise stereo picture.
Fine adjustments can be made in the range of 0.5mm.

Now fix height firmly.

4.4. Adjustment of azimuth:
Azimuth describes the angle between the record surface and the stylus, viewed from the front of the cartridge. This should be 90° and can be checked by observing if the cartridge body is square with its mirror image on the blank part of a record or by putting a mirror under the stylus (taking care that the stylus does not slide). If using a mirror ensure that it is absolutely flat.

4.4.1. Rough Azimuth adjustment:
If the cartridge is not square, the tube can be rotated slightly to obtain the correct azimuth. Firstly the tube should be released by loosening the two screws on the top of the arm. Use Allen key 2mm and turn screw for only 90°. Then (being careful not to push the tube off the armrest) insert the Allen key into the screw on the right side of the arm (this screw is above the cueing device). Observing the position of the marks on the tonearm and the cartridge body, this screw should be turned for approximately 45° to alter the azimuth. A clockwise turn of the screw causes a clockwise rotation of the arm and vice-versa. When the cartridge body is square fixed the top two screws firmly but do not over tighten as the locking mechanism holds very quickly.

4.4.2. Fine Azimuth adjustment:
Note: See appendix 2.

The easiest way is to use an appropriate program with a test record and PC.

It can also be done using an oscilloscope with 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, so making fine adjustment is also useful.
Start listening with the tube in zero position, ie. 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 1/16 and so on. When optimum results are obtained fix the locking screws.

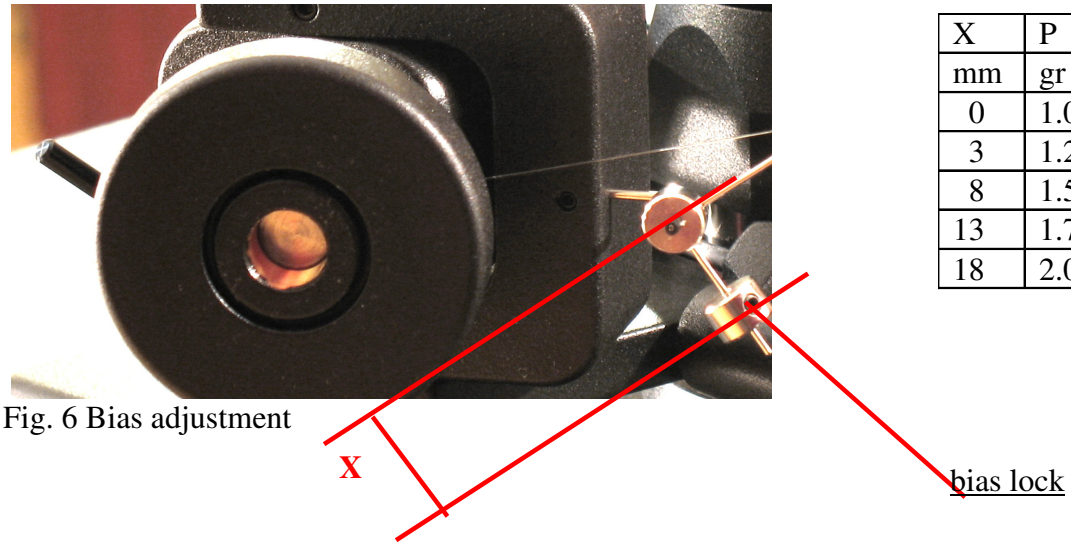
Note: During fine adjustment only gently fix locking screws during listening.

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.
To make azimuth adjustments, release the two screws locking the mechanism at the centre top of the main tonearm tube, with Allen key 2mm. Under the main tube is a tiny rod with a hexagonal screw. Insert the Allen key 2mm into the screw (it may feel loose), rotate it slightly and it will alter the azimuth. (Fig.1)

Rotating it back will bring azimuth to its previous position. Changes can be seen by misalignment of the white lines on the top of the centre of the tube. Even 15 degrees rotation of the Allen key will make a significant difference.

4.5. Bias adjustment:
Note: see Appendix 3.

The bias should be adjusted according to the tracking force. Using Allen key 1.5mm, until the position of the weight is equivalent to your chosen tracking force. Lock screw when in position.



X	P
mm	gr
0	1.00
3	1.25
8	1.50
13	1.75
18	2.00

Fig. 6 Bias adjustment

For maximum trackability, it is advisable to set the bias by use of an appropriate test record, ie. those with tracking bands. Please do not use test records with blank space where the tip of the needle sits on the surface rather than in the groove.
Set bias and tracking force as previously described and listen to mistracking on highly modulated tracking bands. On higher modulated bands mistracking can be heard as impure tones and there will be more overtones. (See instructions on test record)

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.
Finally further decrease mistracking by increasing tracking force to the maximum recommended for the cartridge.
Again try to optimize bias.

4.6. Cueing device adjustment:
Should you find that in the 'up' position the cartridge is too high or too low above the record then the cueing device can be raised or lowered. This can be done simply by using Allen key 1.5 mm:
Insert key into screw on side of arm rest.
Release screw, raise or lower device and retighten.
Rotation of cueing device can affect the drift of cartridge while traveling vertically down.

The cueing device may lift slightly as the screw is retightened. Do not over-tighten as this may cause the cueing device to stick in the 'up' position. Should this occur, slightly release the screw?

5.0. Maintenance:

5.1. General:
The bearing does not need maintenance. Dust only with a soft brush, do not blow away dust.
If the tonearm is mounted on a wooden armboard the base may need to be retightened to the board after a few weeks.

5.2. Checking bearings for play:
Holding the headshell, gently try to rotate tube of arm. There should be no movement or audible clicking. If there is, consult your dealer.

Note: Ensure that Azimuth and height adjustment screws are fixed before attempting the above.

5.3. Checking bearings friction:
Replace stylus guard and balance tonearm with bias at minimum. The arm should move slowly and smoothly from the inner groove towards the armrest.

Add tracking force of 0.1gram. The tonearm should now go slowly down and outwards towards the armrest.

Balance tonearm again and set tracking force to -0.1gram. Now the tonearm should move slowly up and out towards armrest.

If the tonearm does not behave in this way, repeat tests before consulting your dealer.

Note: Ensure that tube movement is unobstructed by the cueing device.

6.0. Transport:
During transport the tube should be locked in the armrest, secured with tape or wire and counterweight removed.

6.1. Tonearm with cartridge on turntable:
The tonearm can be left on the turntable when being transported short distances by:
Placing tonearm in armrest.
Secure the arm to armrest with elastic band or tape.
Removing counterweight
Securing movement of subchassis by insertion of wedges.

Many turntables, however, cannot be properly packed for longer transport with the tonearm in position and the tonearm, therefore, must be removed and repacked in original packing.

7.0. Troubleshooting:
If any problems occur with your tonearm please do not hesitate to contact your dealer. Many audiophiles do, however, find it convenient to try and solve small problems themselves and, therefore, the procedures outlined below may be followed if such difficulties should arise.

7.1. Pin connector broken off wire:
To repair this you will need a small soldering iron, non acid solder, tweezers, sharp knife, uncut end of drill or nail about 1.3mm dia. x 30mm long minimum (of unsolderable material), bluetac or plastecine.

Remove tonearm from turntable and place upside down. Remove cartridge.
Remove insulation plastic from pin connector.
Insert nail or drill into connector in the way cartridge pins would connect. This prevents the connector becoming overheated and also stops solder entering the connector. Fix nail in bluetac or other material to hold pin in position.
Gently pull out about 20 - 25mm or wire from tonearm and with sharp knife carefully strip insulation from wire for a length of about 3 - 4mm.

Note: It is important not to cut the wire conductor itself as this will weaken the wire.

With clean solder tip, melt any solder left on the pin connector and blow away from hole.
Put plastic insulation tube on wire.
Place stripped end of wire through hole in connector and bend back to form hook to secure.
From underneath place iron tip and from the top the solder.
Replace insulation tube over solder joint and gently remove connector from nail or drill.

7.2. Broken bias thread:
You will need about 100mm of thin nylon fishing line, Allen key 2.5mm and a sharp knife. You can get it as spare part from a dealer. Remove counterweight.

With Allen key remove screw at the point where nylon is coming out from metal part.

Note: This does not in any way affect the bearings.

At the end of the thread is a small plastic tube to which the thread is attached. Cut away the broken thread and tie and knot new thread around tube.
Pull thread through screw and replace screw with Allen key.
Remove broken thread at bias. It may be necessary to pull aside the black plastic slightly to do this.
Put new thread through and replace black plastic.
Position tonearm as if in inner groove position and pull thread until rod with weight

is in a horizontal position, ie. maximum bias.
Knot thread three times and trim surplus.
If absolutely necessary the length of thread can be shortened by loosening screw at point ‘x’ with Allen key 1.5mm and pulling rod out slightly from main C metal part.

7.3. Hum and buzz:
Check to ensure that grounding wire has been connected.

If using an MC transformer, try connecting ground wire to this or to the preamplifier.

Alternatively, connect grounding wire to preamplifier and run grounding wire from the MC transformer ground to the ground of the preamplifier.
This can be caused by the transformer in the power amplifier being situated too close to the cartridge or by the tonearm output cable being too close to the mains cable. If cables must be close together try to ensure that they cross at right angles.

7.4. Cartridge jumps in the grooves:
See if the tube can travel towards the centre of the record and check that tube is not restricted by cueing device height or holder.

See FAQ on our web site.

Kuzma Ltd
Hotemaze 17A
SI-4205 PREDDVOR
SLOVENIJA
P: +386 4 25 35 450
F: +386 4 25 35 454
E mail:kuzma@s5.net
www.kuzma.si

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. Note: Ensure bias is on minimum or switch off.
2. Note: Place protractor over spindle on platter.

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. <u>Alignment at zero point 66mm</u> (A):
Place tip of stylus on point A (ie. zero point 66mm). 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)

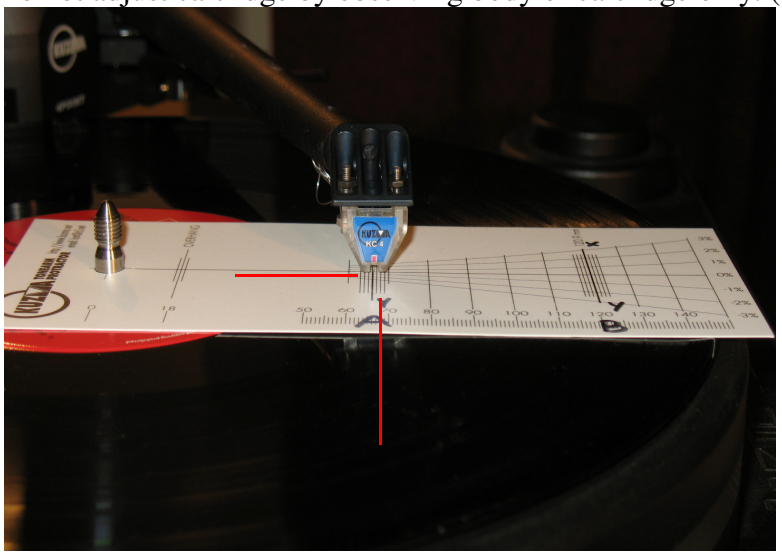


Fig. 14 Alignment at A

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 121mm (B):
Reposition protractor and check alignment at position B.

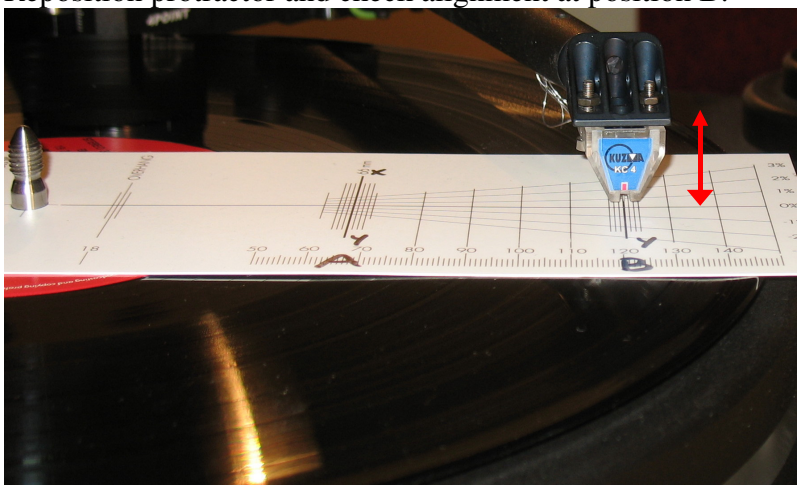


Fig. 15 Alignment at B

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 "S1" (Fig. 16)

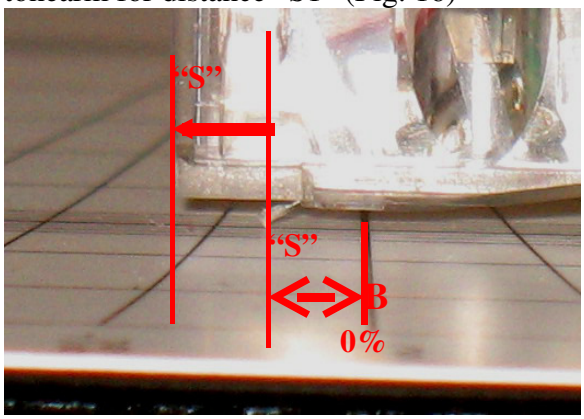


Fig.16 Stylus tip is in front of zero point B.

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)

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)

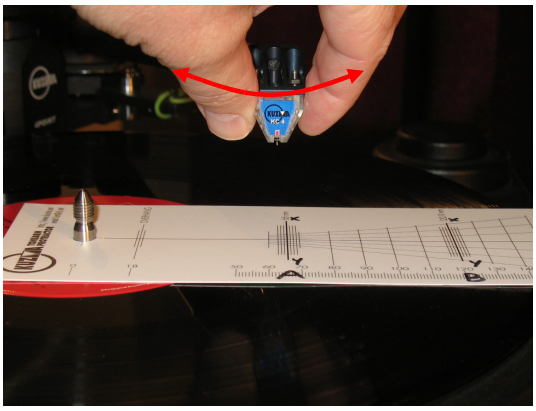


Fig.17 Rotation at A

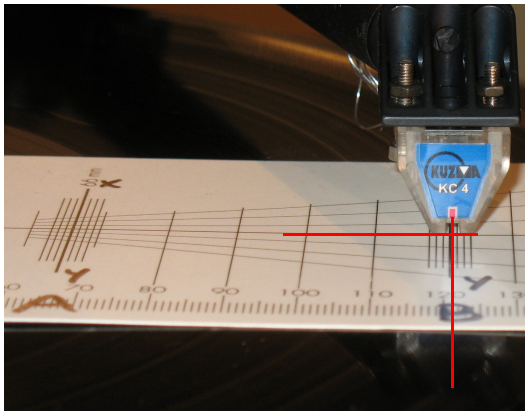


Fig.18 Along axis "X-Y"alignment at B

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 ends 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.

<u>NOTE:</u> 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 channels. 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

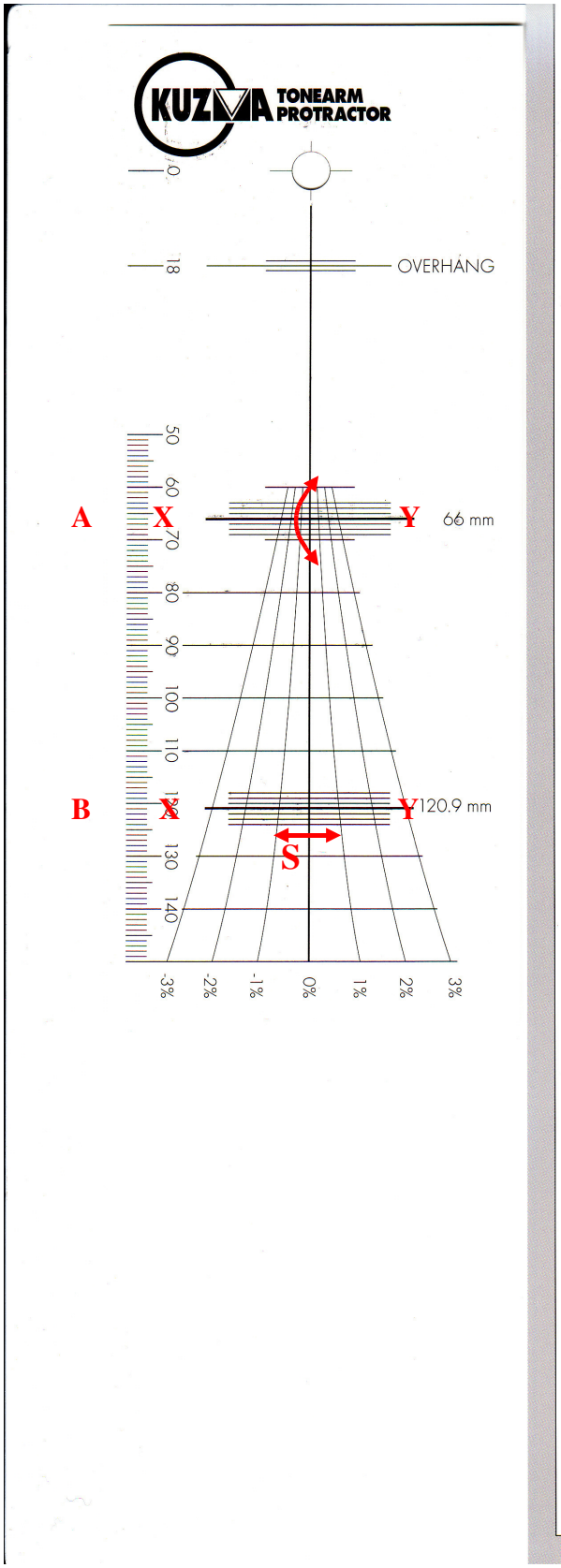
Fine bias adjustment

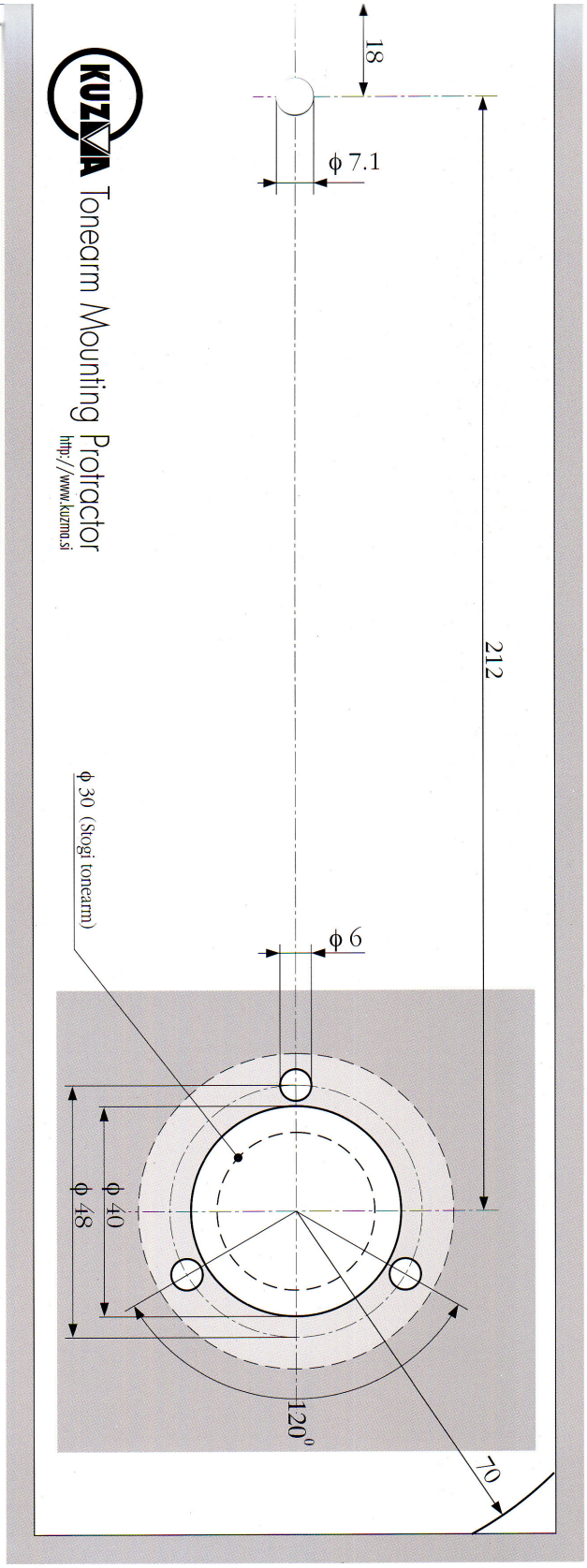
1. Set bias and tracking force as previously described and listen to mistracking on highly
Modulated tracking bands on test record. On higher modulated bands mistracking can be
heard as impure tones and there will be more overtones. (See instructions on test record)

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