UNI Protractor©

precision phono alignment instrument

owner's manual

General note:

Technical data, minor design and specifications are subject to change without prior notice.

version 16.02

A brief introducton

The UNI-Protractor is a versatile alignment and positioning instrument for use with phono tonearms and cartridges. It allows precise alignment of any given tonearm to any tangential curve desired.

Furthermore the user can determine whether a given mounted tonearm does meet any correct calculated tangential curve – i.e. whether it is correct mounted or aligned.

This applies to all tonearms – no matter what effective length, mounting distance or specific geometry a given tonearm may ask for.

The user can measure, align and determine all positioning parameters related to the geometrical/mechanical alignment of a cartridge-tonearm combination.

The UNI-Protractor set consists of the following parts:

- the UNI-Protractor metal main frame with the micrometer linear drive
- 3 POM tt-spindle adapters for diameters 7.10, 7.15 and 7.20 mm
- clear acrylic positioning arm for mounting distance 8“ - 14“
- 1 locator to be mount in positioning arm – 1 round reticle - with white haircross lines
- metal frame magnifier
- a selection of 3 mm mirrored parallax templates for tangential curve alignment
- clear acrylic 8 mm vertical azimuth template
- overhang gauge
- stainless steel metric ruler w/.5mm scale to determine the mounting distance P2S
- cold light LED lamp

Please check your UNI-Protractor set. All the above parts must be included to ensure perfect function.

Each UNI-Protractor was carefully checked and tested prior to shipment.

Please do get yourself familiar to the handling and use of the UNI-Protractor.

While it is a mechanical positioning instrument, it needs a minimum of attention to detail by the user to obtain the maximum precise results it ensures if handled correctly.

To get access to all possible features of the UNI-Protractor it is inevitable to read this manual. But most important please study the step-by-step pictured instruction to learn how to set-up the UNI-Protractor correctly.

Attention

Due to the very tight tolerances - some are indeed tight fit – some parts of the UNI-Protractor have to be put in place in a certain sequence. These tight tolerances are mandatory to achive true precision. When you receive the UNI-Protractor, make sure to give it enough time to adapt to room temparature.

This is important for perfect function.

!

DISCLAIMER

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Please use all parts with care - especially when your cartridge sits on the template.

The azimuth template is particular sensitive to fall due to mechanic shock.

The use of the UNI-Protractor is on your own risk. The manufacturer and the designer do not take any respon-sibility for damage due to operate or handle the UNI-Protractor or any of it’s parts.

Keep out of reach of children !!

Gulliver's journey - the microcosmos in cartridge set-up

Microgroove records are exactly what they are named – microgroove.
The ever so tiny mechanical modulations in the groove's wall are really small.

When a phono front end shall be „optimized", it all starts here in the groove of the record.
Any cartridge's stylus should track the groove with as little error as possible.
The UNI-Protractor was designed to ensure exactly that.

Now what then is so difficult in setting the „record straight" - i.e. aligning the cartridge's stylus and the tonearm to do its job ?

The difficulty lies in the dimensions.
We are entering the first microcosmos here and reach the boundaries of human visibility.
Smallest errors – hardly noticeable to the mere eye – have huge impacts here.
A good phono front end shall produce clear sound, reveal the most tiny detail in a recorded performance and by doing so can create a fascinating sonic and emotional experience.
Tracking distortions, blurred dynamics, aggressive yet thin highs and a constrained soundstage do not add positive to that experience.
But it is not that much about huge and immediately apparent sonic dissonances resulting from set-up faults .

It is about getting the very best possible from a given cartridge/tonearm combination.
To get that, the best possible geometrical set-up and alignment is the very first step.
What is lost here to imperfect alignment can't be recovered anywhere else in the audio chain.

I want to illustrate the point by adapting the dimensions to our every-day world.

A modern stylus does feature a polished area – and it is actually that area alone which should have contact to the groove's wall – of 1-2 µm to 5-6 µm.

A 12" tonearm is approximately 300 mm effective length.

Now what if we have an error of say one tiny 0.5 mm away from the calculated point of zero tangential error? No big deal and well within the tolerances of many alignment templates.
Most „sweet spots" on templates are already double that figure in diameter.

Now let me transform those dimensions to our scale.

We amplify every figure in the tonearm and stylus by 1000x.

Now the tonearm is 300 meter long.
The cartridge now has the size of a big family house.

And the polished area of the cartridge ?
It is now 1-2 mm to 5-6 mm.
And hanging at the tip of a 300 meter long tonearm.....

That 0.5 mm error we were talking about is now 50 cm - or ½ meter - off the perfect line.

In analog phono reproduction great expenses are made to get perfect sound. Starting with the most precise and correct possible alignment – a pure mechanical issue – seems not only advisable, but vital for true high-end sonic performance.

The UNI-Protractor was designed to ensure the most precise alignment of any given tonearm.

Choosing the right geometry for a given tonearm

The UNI-Protractor system features a wide selection of templates and each of these UNI-templates does offer an unique tonearm alignment.

Some templates are individualized for a given tonearm with specific geometry and are either following manufacturer's specifications or - if I found the manufacturer's specifications not suitable to optimize the tonearms perfromance - a special calculation by myself.

Then there are "universal alignments" following the standard calculations made by Löfgren, Baerwald and Stevenson for either DIN or IEC standard.

A brief summary of what to expect from either of these 3 universal alignments:

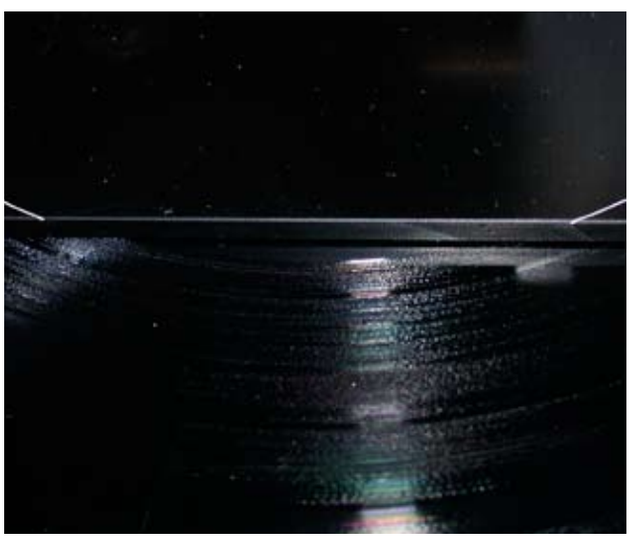
- Baerwald / Löfgren A gives a low and equalized distortion in the three weighted tracking error peaks. This results in fairly moderate distortion level and is most suitable for modern records with a medium long lead-out groove.

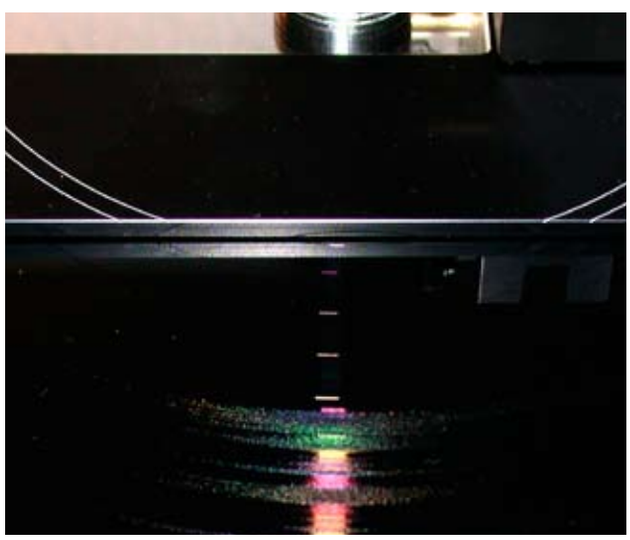
- Löfgren B gives considerably lower distortions in a wide area of the groove compared to Löfgren A / Baerwald. It does so however to the expense of very high distortion figures towards the inner groove. This can result - especially in records cut close to the inner label - in high distortion figures towards the end of the records. This alignment is best suited for modern records which are not cut close to the inner label. The longer the lead-out groove - the better (i.e. longest area with lowest tracking error) Löfgren B works on that particular record.

- Stevenson tries to optimize - in contradiction to the former two alignments - tonearm performance in the most inner part of the groove. Thus one has very little to zero tracking error towards the inner label. Resulting in very smooth and lowest possible distortion sonic performance in the most critical passages towards the end of a record. This of the expense of comparatively higher distortions over most of the groove.

To illustrate the point, you see two examples here - one a Mercury SR-90310 "Balalaika Favourites" in the original RFR-1 pressing from 1963 (left picture) and the very same recording pressed 20 years later in the "Golden Imports" reissue (right picture) made in the mid-eighties.

Please note, how the original is cut so close to the paper label, that it even exceeds the DIN cutting standard. While the later reissue features a groove which stops 2 inches earlier !!





This - BTW ... - is an option to use the UNI-Protractor to determine the cutting limit of your record(s). It is nothing but a “helper” or “indicator” whether your record(s) are rather cut following DIN or IEC standard
(or none of both ...).

Just put the UNI-Protractor main frame - w/a UNI-template + spindle adapter inserted - on a record you are fancy about. Now look whether the run-out groove is closer to the DIN or to the IEC groove marked ending at “11 o’clock” and “1 o’clock” on the northern rim of the UNI-Protractor. This may give you an idea about what geometry to choose and/or to what cutting standard to adjust your tonearm.

It may be advisable actually to make a cross-check with the majority or the most important (i.e. most frequently listened to..) records in your collection to determine whether the majority of your records features rather long lead-out groove (most modern pressings since 1980 following IEC standard) or whether a good portion of your collection are early stereo pressings from the fifties to mid-seventies which quite often even exceed DIN cutting standard.

Stevenson DIN for example might give better results on the later, while Löfgren B IEC will give optimal results with very long lead-out grooved records. These two “standard calculations” do mark the two opposite extremes of the options how to align a tonearm for a 12” record.

The inidvidualized UNI-templates do in most cases follow the manufacturer’s recommendations.

With most tonearms of japanese origin this means in most cases that they follow DIN and the inner null will be more towards the inner label (following Stevenson or Baerwald DIN).

With most modern “western” tonearms the situation is rather vice versa, as many if not all are designed following Löfgren A or B and IEC standard (since most of them were designed past 1982).

There are some specific tonearms however for which I have calculated an unique alignment taking into account their specific geometry and my personal ideas about weighted tracking distortion.

This most notably applies to the Fidelity Research FR-60 series of tonearms, the SAEC and Dynavector tonearms.

It is impossible to discuss all aspects of tonearm alignment here in this manual - especially since there are so many different tonearms out there and the situation is a bit different in any single set-up.

I am happy to answer any specific questions you may have about aligning your specific tonearm(s) with the UNI-Protractor.

Please feel free to contact us whenever you have a question.

Using the UNI-Protractor - a step-by-step pictured instruction

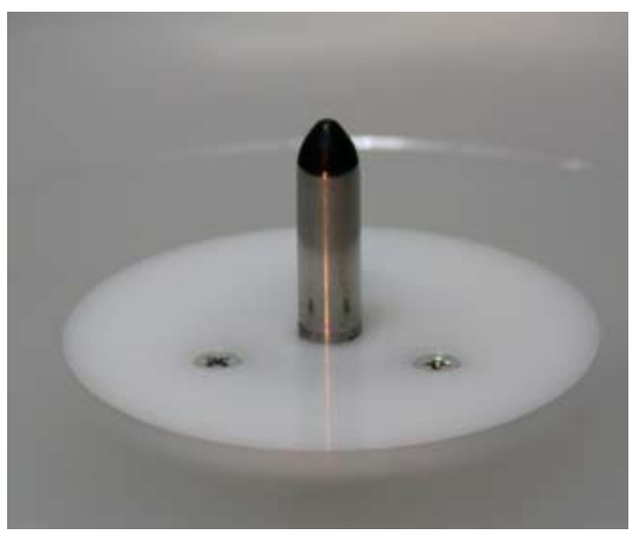
Please note:

Mounting of cartridge, balancing of the tonearm and setting of recommended tracking force - VTF- for the given cartridge ***MUST*** be made ***before starting*** setting up the UNI-Protractor.

Step 1

Check whether your turntable's platter does have a indention around the spindle to accommodate the slightly thicker inner label section of a record.

If you do not detect such an indention, proceed direct to **Step 3.**

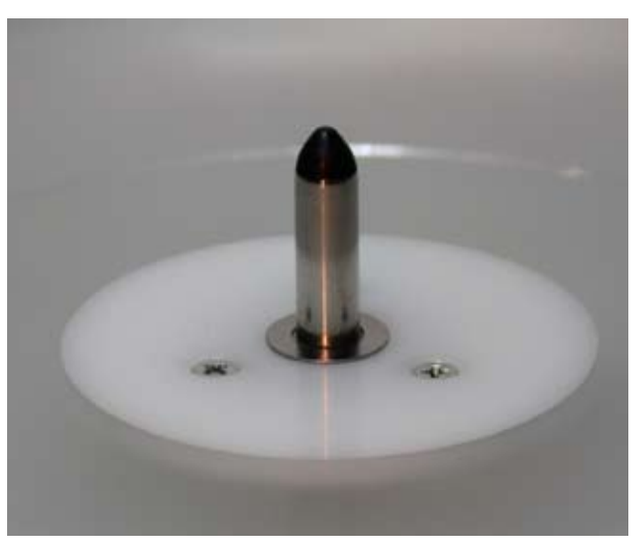


Step 2

If your tt does have an indention – like pictured – please use 1 or 2 thin stainless stell washers and put them around the spindle.

Do check whether the indention is now equalized compared to the rest of the platter's surface.

Please use the blade of the stainless steel metric P2S scale ruler coming with your UNI-Protractor to check this precisely.



Step 3

Now do take the three black POM tt-spindle-adapters.

They do only differ in the diameter of their central hole.

Each has a different number of circular rings at the grip-top.

- 1 ring = 7.10 mm spindle diameter

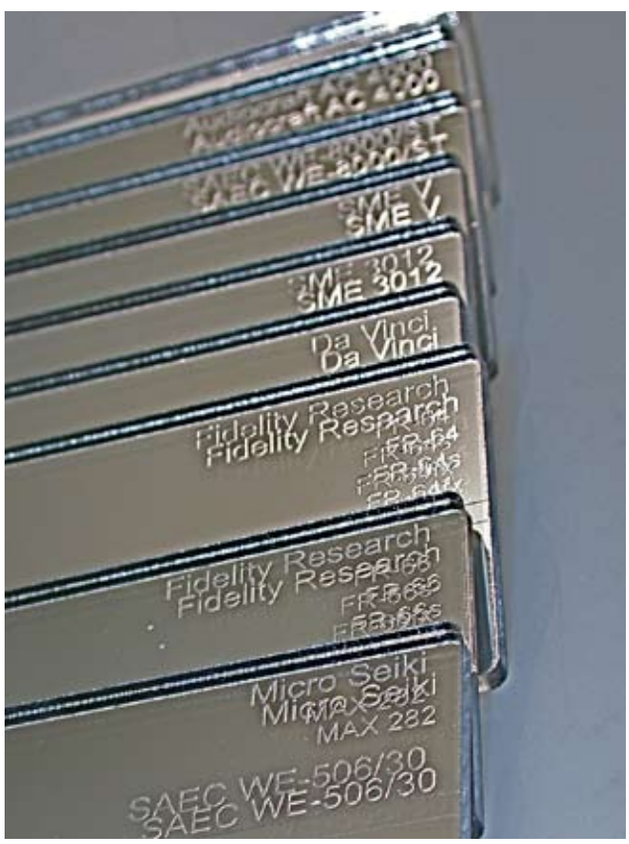
- 2 rings = 7.15 mm spindle diameter

- 3 rings = 7.20 mm spindle diameter

One – only one of them – will fit fairly easy but without any play around your turntable's spindle. It will give a nice semi-tight fit.

Choose that one spindle-adapter.

Please do put the other 2 tt-spindle adapters back into the UNI-Protractor's package – you will not need them with this specific turntable.



Step 4

Now choose the template you wish to align your tonearm with.

Step 5

Insert the tt-spindle adapter you have found fitting your spindle into the 20 mm cut-out hole in the template of choice.

Do insert the tt-spindle adapter like pictured. Due to the special concave cut of the mirrored template it will give a light, tight fit.

The grip-line(s) of the tt-spindle adapter will be on top and clearly visible. Do not try to insert the tt-spindle adapter the other way round or from underneath into the template's cut-out hole. It won't work and it will require considerable force to do so - and it might damage your template and adapter!

Now take the template/tt-spindle adapter combo and ....

Step 6

.... put the template with the spindle adapter already attached on a flat surface - a desk/table, NOT on your TURNTABLE's PLATTER !!!

Now do take the UNI-Protractors main frame and lower the main frame over the template as shown in the pictures.

Step 7

The template will fit tight into the long rectangular cut frame in the UNI-Protractor.

This works best, when you fix the template with one finger as pictured and lower the main frame starting at the outer rim.

You might need a little pressure to firmly fix the main frame down along the outer rim of the UNI-template.

Do ONLY insert the UNI-Protractor's main frame in the way shown in the pictures.

Please note

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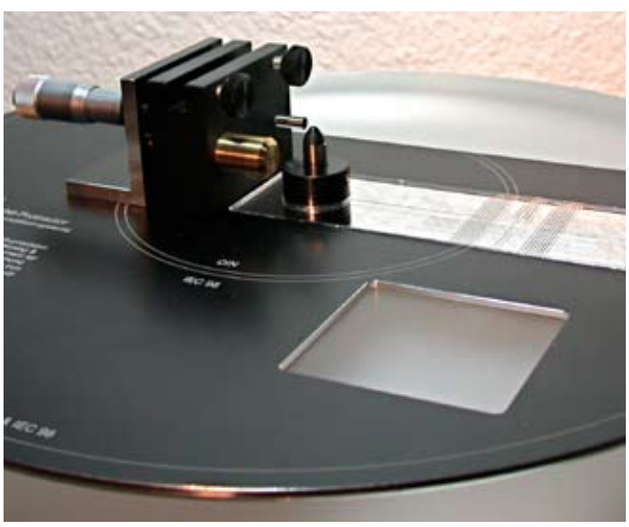
Due to the concave cut of the rims, it will only work that way. But this ensures tight fit without any play. This tight fit is absolutly essential for the precision desired.

Now take the UNI-Protractor main frame - with the UNI-template and tt-spindle which are now firmly attached to the main frame - and put them onto your turntable's platter with the center spindle gliding into the spindle adapter.

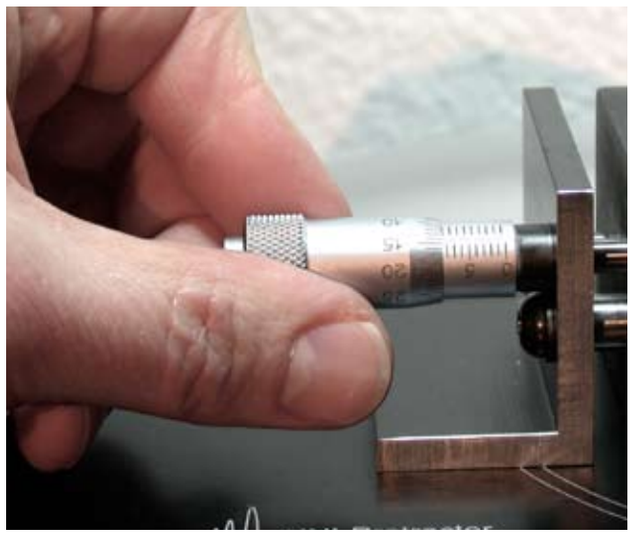


Step 8

Next please adjust the micrometer to the value figure given on your UNI-template.

You can read down the value on the micrometer's scale.

The linear drive will move while you do adjust the micrometer. It will be moved to the exact position required for the specific template's tangential error curve.

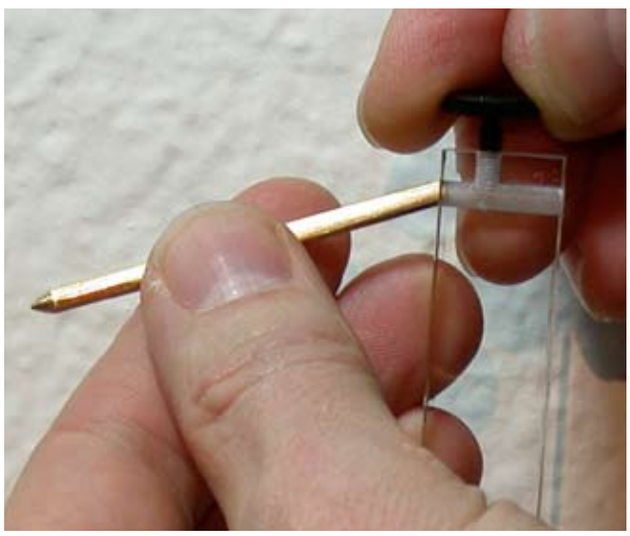


Step 9

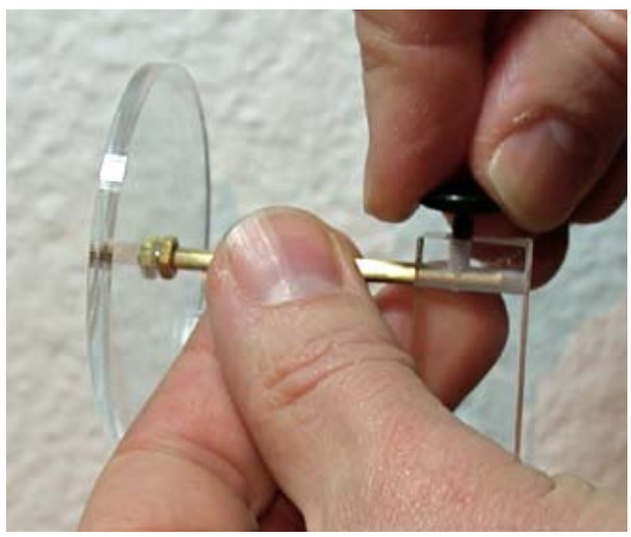
Now please take the long clear acrylic positioning arm. Insert either the straight pin or the pin with the round reticle into the far narrow end of the clear acrylic positioning arm. Tight the pin in place lightly.

If your tonearm does feature a round bearing house and/or if you are not sure where the actual pivot point of your tonearm is, please use the pin w/round reticle to adjust to the outer dimensions of the bearing.

In general the pin w/reticle is the better way to locate the pivot point of your tonearm.



straight pin

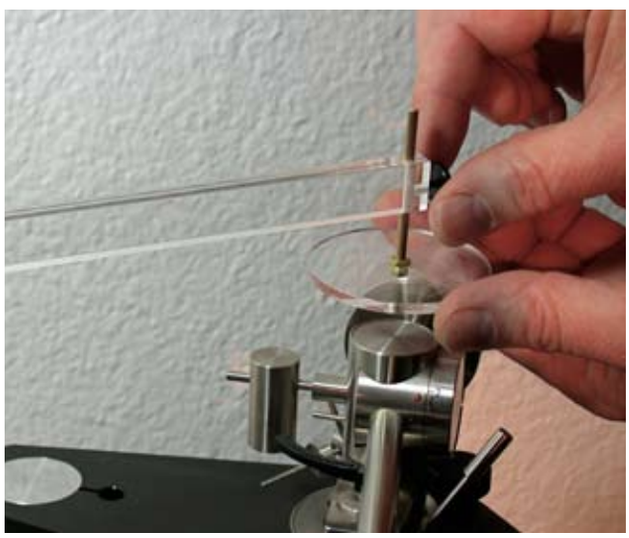


pin w/reticle

Step 10

Please insert the positioning arm into the linear drive. There is a matching notch in the top of the black POM block – the moving part of the linear drive. Do insert the positioning arm there.

Press it down gently so to make contact with the bottom of the notch.

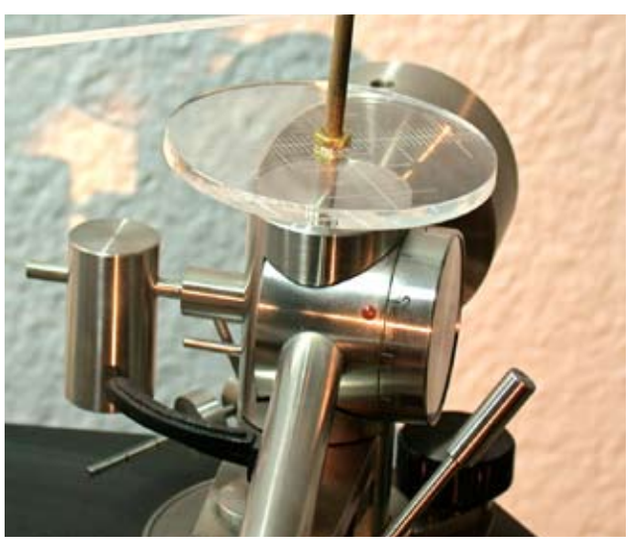


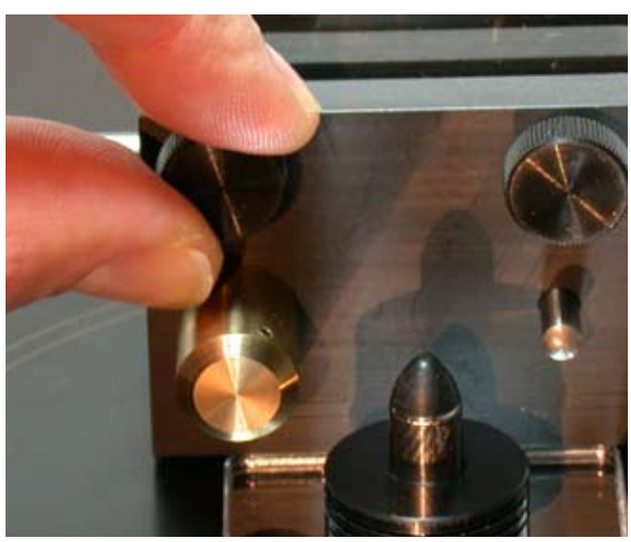
Step 11

Do locate the pivot center of your tonearm. Do position the center of the reticle or the tip of the pin there. Now do tighten the 2 screws to fix the positioning arm in place.

You have now completed positioning of your UNI-Protractor for the template in action.

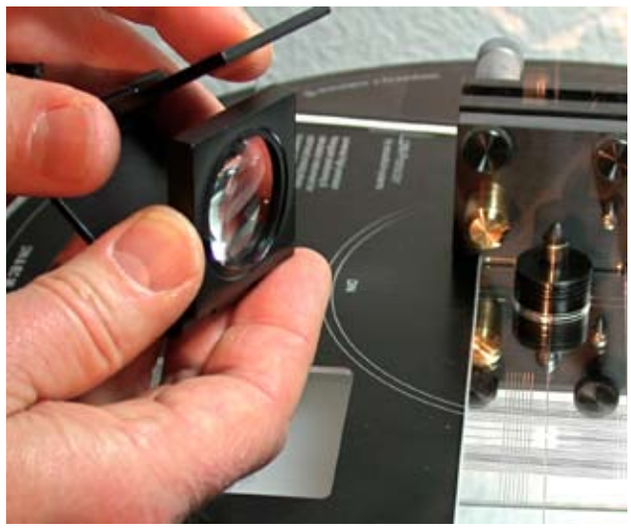
Please make sure the platter of your turntable does NOT move during the following steps.





Step 12

Now take the magnifier from it's etui and unfold the magnifier's parts like pictured.



Step 13

Place the magnifier as pictured into the almost square cut-out in the UNI-Protractor's main frame "south" of the template.

Do move the magnifier parallel to the template till the center "locks in" on the templates zero-point.

Step 14

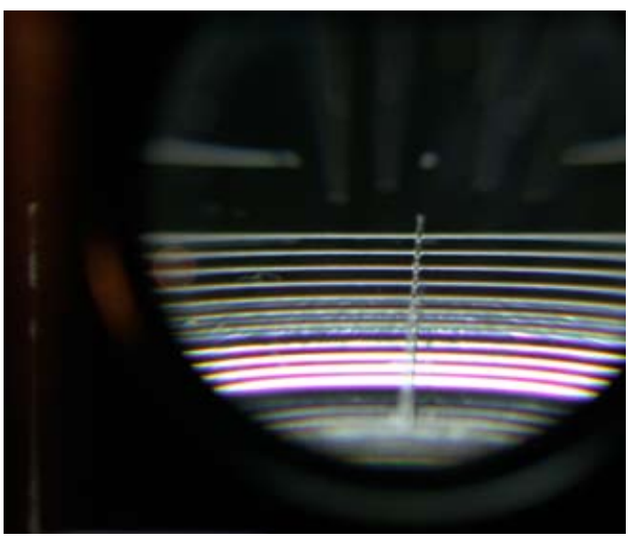
Release the tonearm from it's rest and swing it in position above the zero point on your template. Lower your tonearm till the stylus meets the template's surface.

Please note

you must have balanced your tonearm with the mounted cartridge and must have set recommended VTF - vertical tracking force - PRIOR TO THESE STEPS !!

Step 15

Have a first look through the magnifier to preliminary judge the actual position of your stylus (sorry – this couldn't really be captured with camera – here the human eye adapts much better to the variable focus then the digital cam).



You will see it very clearly and will see the tangential lines in full parallax.

Now we move to the real fine adjustment.

Setting up the UNI-Protractor is completed now.

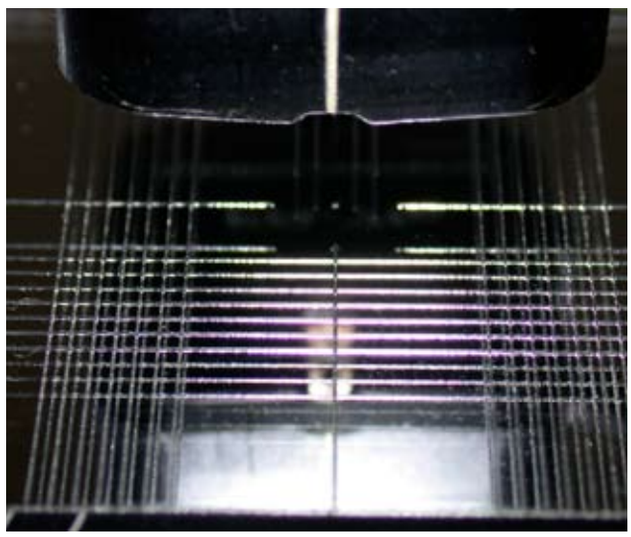
Step 16

Adjust the stylus and cantilever according to the instructions in the following chapter of this manual.

Adjusting the cantilever and stylus on the template

Please note

you must have balanced your tonearm with the mounted cartridge and must have set recommended VTF - vertical tracking force - PRIOR TO THESE STEPS !!



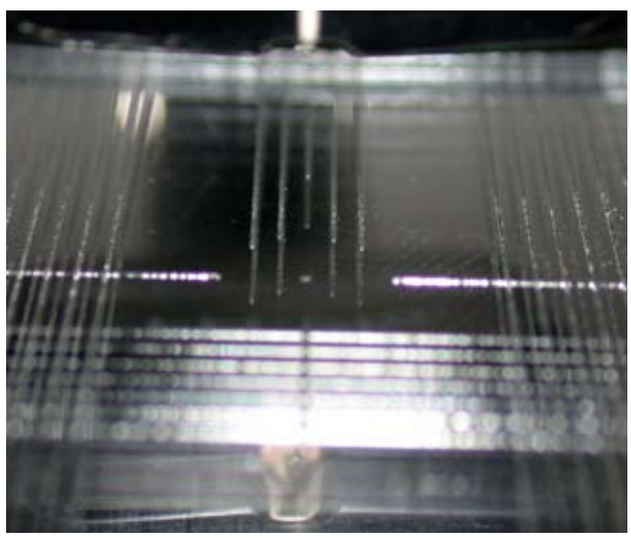
We tried to capture the view on the template with the camera, but these attempts weren't all that successfull in capturing the actual view on photo.

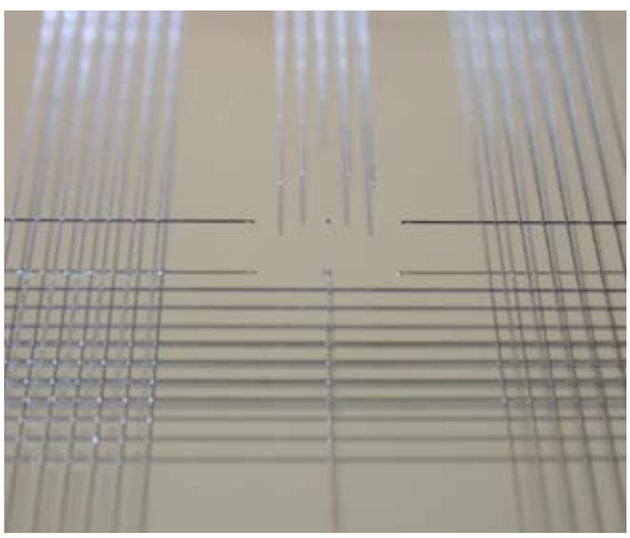
You'll note that your eye's view through the magnifier glass will provide much better view on the "sweet spot" and the aiding lines for adjusting the cantilever.

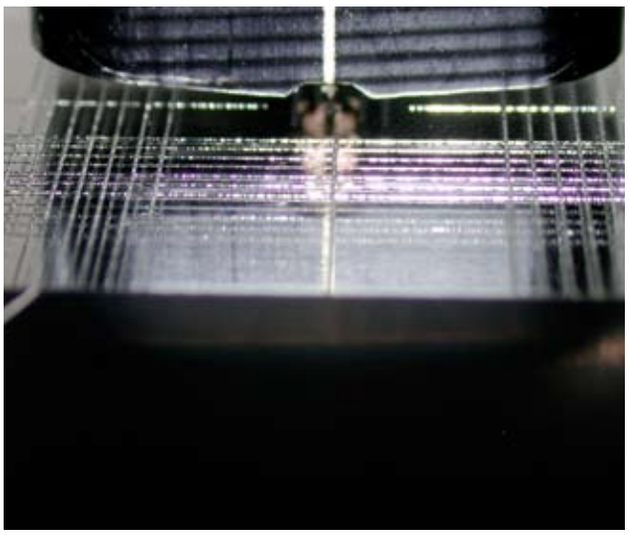
Each UNI-template has an individual sweet spot which is in fact the point where your stylus must rest to meet the alignment calculation curve.

The stylus must rest here and the cantilever should be parallel to the 5 lines "north" of the null point.

Make sure your turntables platter can NOT move during the adjustment.





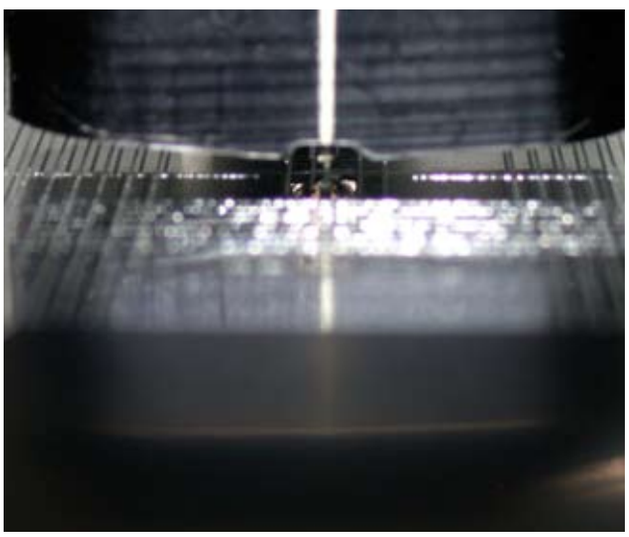


You can spot the 5 lines parallel to the cantilever. The cantilever MUST be in line with the middle line flanked by 2 lines on each side.

Move and ever so slightly rotate your cartridge in the headshell till your stylus rests on the spot AND your cantilever is right above the middle line north of the null point.

To perfectly check this, use the parallax-view offered by the 3mm deep mirror of your UNI-template.

All viewing should be made through the magnifier supplied with the UNI-Protractor or with the optional available UNI-Microscope.



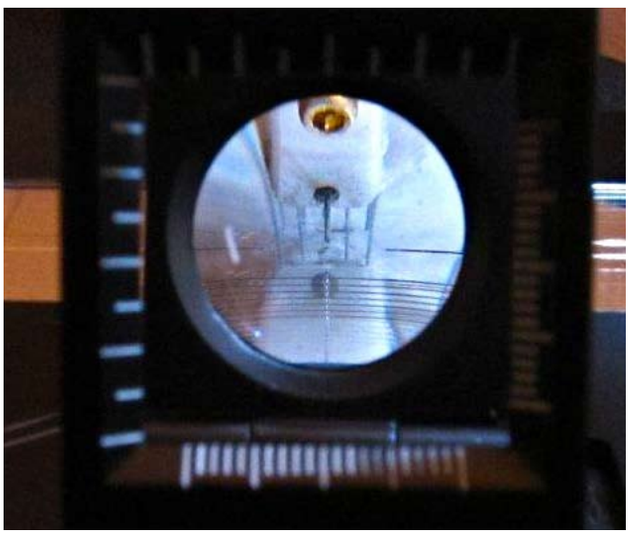
Please take your time when adjusting the stylus and cantilever.

Move the cartridge ever so slightly. Try to apply as little force as possible and you will get closer and closer to the “sweet spot”.

If you really want to get the best possible performance from your cartridge, tonearm and whole analog set-up, it is essential that you align the stylus on the null point and cantilever parallel to the center line north of the null point.

You need to adjust the tonearm/cartridge in this single one spot only. If your stylus and cantilever do meet the spot and line here, it does so on the whole arc following this calculation.

Time, care and patience spent here will pay off in optimized sonic performance of your analog set-up.



When the cantilever is parallel to the center line while the stylus rests on the null point, the adjustment is finished. The above picture gives a nice optical impression how it looks when the cantilever is perfect aligned with help of the parallax lines surrounding it.

P2S, Azimuth and Overhang

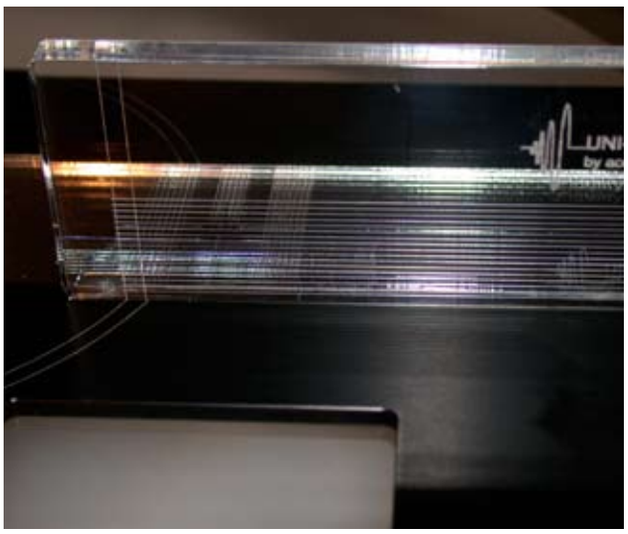
Use it to determine or check your mounting distance.

Put the “zero” at the center of your spindle and try to locate the pivot center of your tonearm. Do measure the distance from the center of your spindle to the pivot center.

Please note that the mounting distance of your given tonearm is a basic cornerstone of your tonearm’s geometry and you should meet the requested mounting distance - or P2S - as perfect as possible.

In your UNI-Protractor set you will find a metric stainless steel ruler with 0.5mm scale.

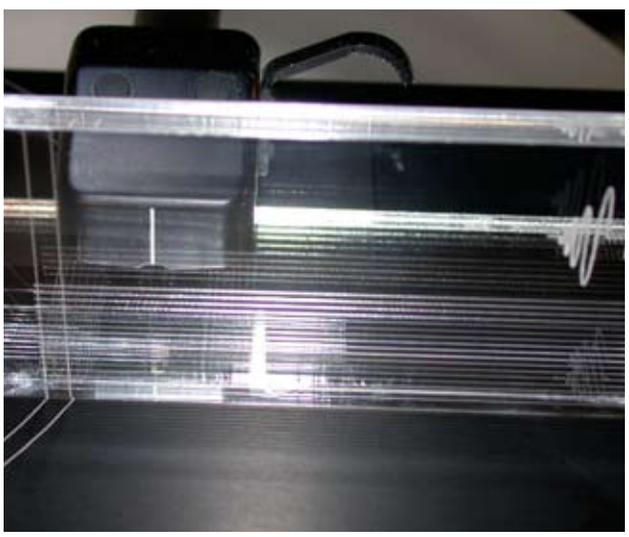
In your UNI-Protractor set you will find a 8mm acrylic azimuth template.



This template is a tool to evaluate horizontal level of your cartridge's body.

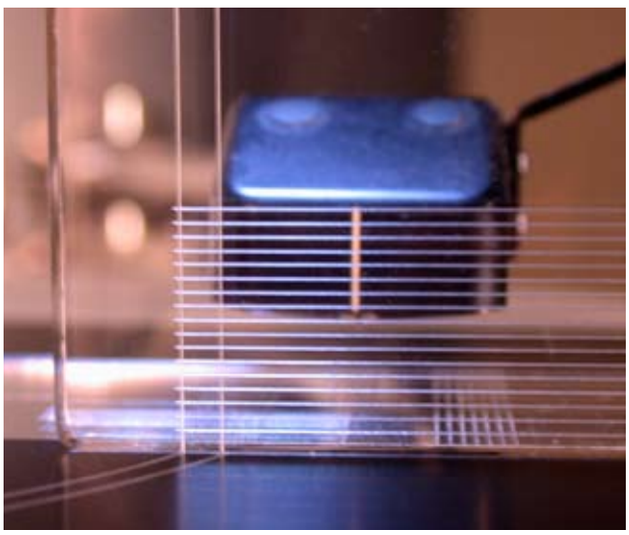
This is at least some help to pre-determine optical alignment azimuth of your stylus.

If you are lucky, your stylus is in line with the vertical lines of your cartridge's body. In that case this optical adjustment will ease the fine-tuning of your azimuth alignment.



However - it is intended to serve only as an optical "helper" and does in no way replace critical adjustment of your stylus' azimuth by means of a test record with cross-talk signals or similar test options which do deliver the results based on the position of the stylus towards the groove walls.

With better cartridges today we often find that the stylus is relatively in-line with outer lines of the cartridge's body.



Take the tt-spindle adapter suitable for your turntables spindle and put it over your spindle.

Place the overhang template over the spindle on top of your spindle adapter.

Turn it around the spindle till it's scale is in line with an imagined line pointing to the pivot of your tonearm.

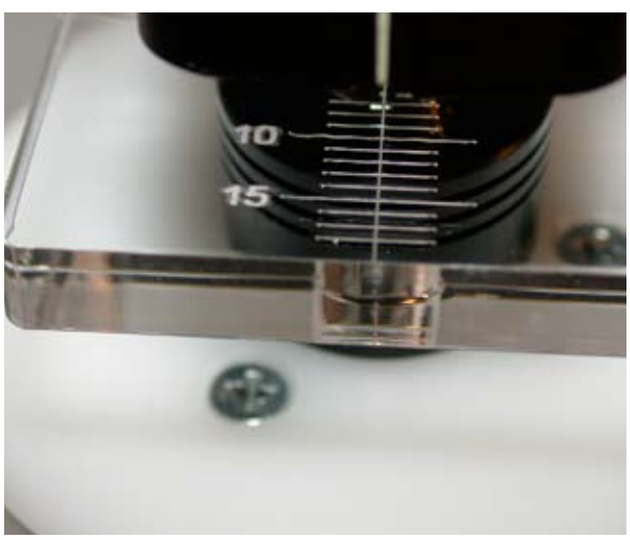
Every turntable's spindle has a different length and the one pictured here is very long. Most likely the overhang template will fit on your spindle with very little of the spindle (if any) will point out of the template.

The acrylic overhang template coming with your UNI-Protractor set enables you to measure direct overhang of your tonearm.

You can swing the tonearm direct over the spindle now.

Don't lower your turntable's cueing device !

By viewing from the side you may already spot the point on the scale direct under the stylus.



That is the overhang value for the current alignment of your tonearm.

If the overhang template does cover your spindle, you may lower your tonearm till the stylus rests on the scale. That reading will be more accurate.

Dismounting the UNI-Protractor

After you have aligned your tonearm, please do dismount your UNI-Protractor ONLY in the way pictured and described here.

First pull out the spindle adapter.

Next press your thunb onto the mirror parallax UNI-template.

Now grap your UNI-Protractor main frame on the left rim and lift it up while still pressing down the UNI-template.

You will need to apply some force as the UNI-template will display quite a tight fit.

This is intentional and correct. Don’t be afraid, you will not damage anything when you dismount the UNI-Protractor as shown and described.

Now put the UNI-Protractor’s main frame, the spindle adapter and the UNI-template back into the package.

Now you’re done.

Summary

The final sonic result of a tonearm alignment is 90% attention to detail and 10% patience.

Do take your time when aligning a tonearm/cartridge. You need a calm hand and a sharp eye (the magnifier will help you with the later ...) - and time.

Don’t stop till you have are sure that you have aligned the cartridge’s stylus and cantilever BEYOND ANY DOUBT on the spot and parallel to the help lines.

You won’t do this any day and what you miss here will show off any minute your stylus tracks the groove.

A perfect mechanical alignment is the mandatory base for the best possible sound your cartridge is capable to deliver.

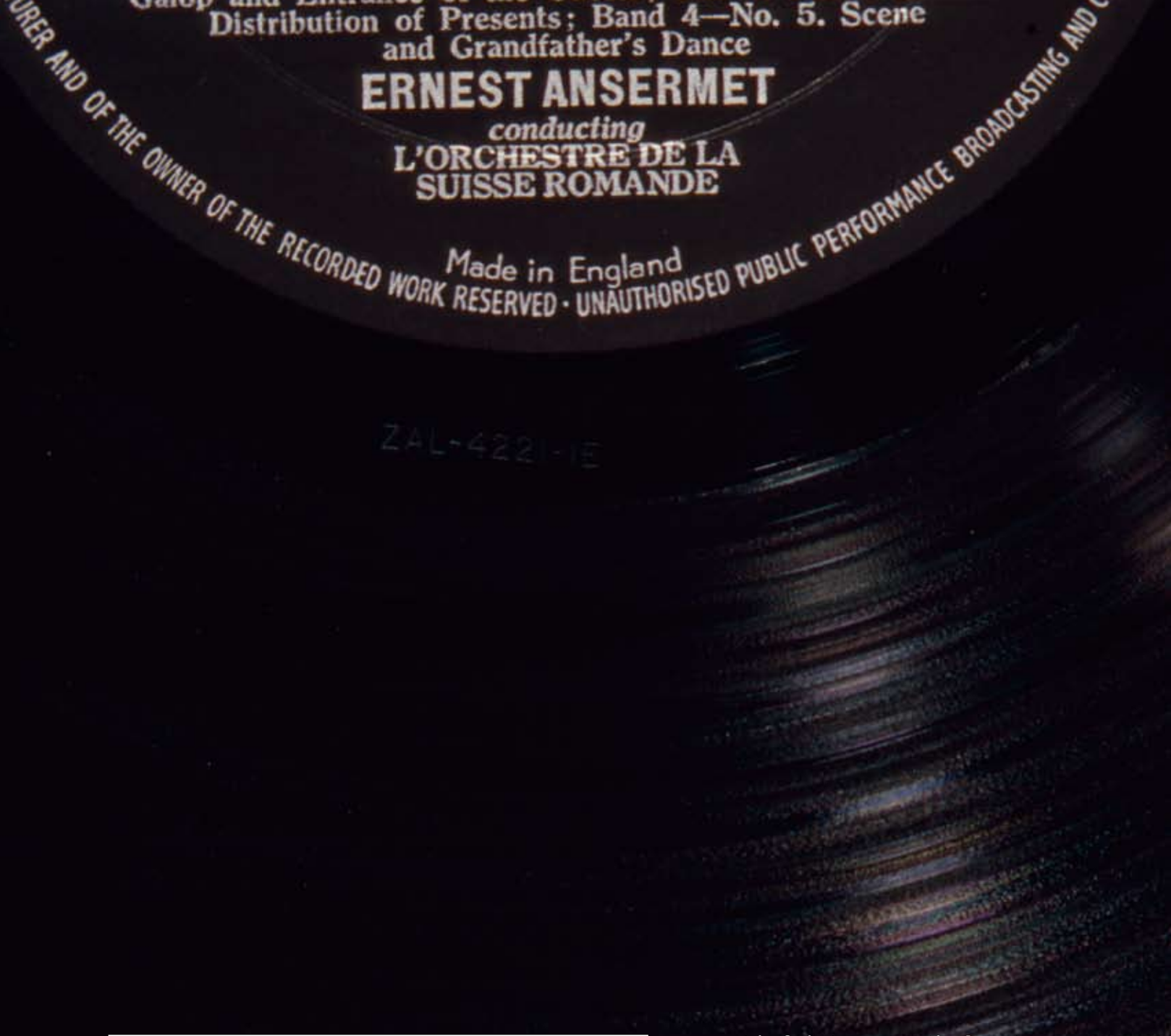
VTA, VTF, azimuth, SRA, antiskating (if any is needed - depending on your tonearm) - all these aspects come AFTER setting your tonearm’s geometry straight.

When you have performed the steps displayed in this manual you have laid the foundation of a perfect tonearm set-up.

What comes next is the fine-tuning of your specific cartridge’s performance by carefully adjusting vertical tracking force (VTF) according to your cartridge’s compliance, vertical tracking angle (VTA) groove-compliant to your records, azimuth according to the position of your stylus relatively to the groove walls and - maybe - antiskating or lateral balance.

All this comes after the UNI-Protractor has done it’s job on the specific tonearm you wish to use now.

Now enjoy your records!



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