Pro-Ject

AUDIO SYSTEMS

INSTRUCTIONS FOR USE
Cartridge alignment tool
Pro-Ject Align it PRO

Pro-Ject
AUDIO SYSTEMS

12" 10" 9" 8,6"

6

4

5

7

BEAM

1

BASE

2

3
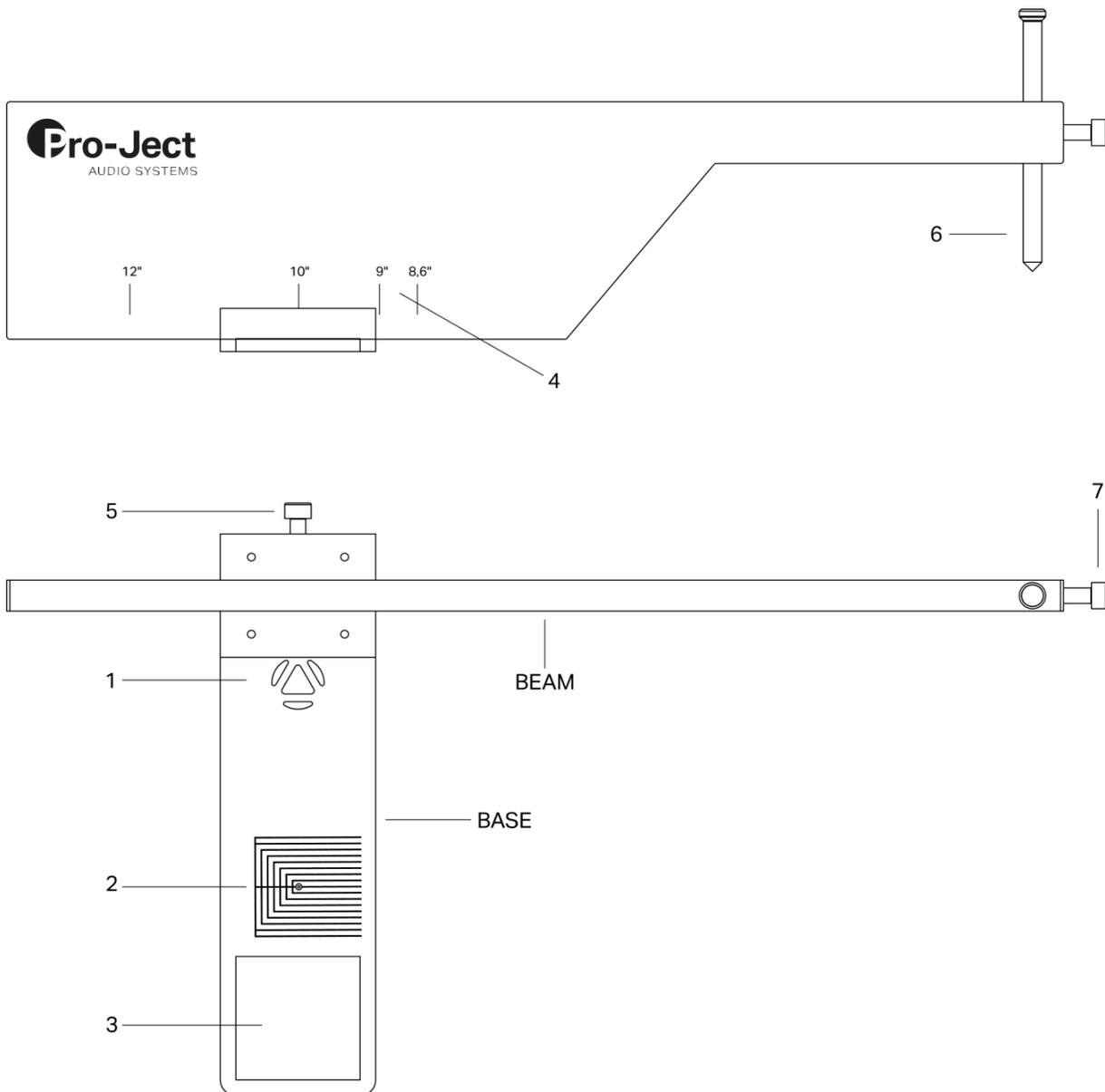
1- Spindle hole
2- Cartridge tangency adjustment
3- Mirror
4- Tonearm length marks
5- Length fixing screw
6- Rod
7- Rod fixing screw

Assembly

Slide the beam into the groove in the base and set it to the correct length according to your tonearm. Make sure that the beam length fixing screw is loosened far enough to allow the beam to insert easily, and then fix the screw in the selected length.

Using the tool

Loosen the rod's fixing screw and move the rod up. Place the tool on the record spindle. Turning the platter moves the end of the rod until it covers the tonearm's upper bearing. Make sure the rod sits exactly in the center of the tonearm bearing. Then move the rod down to fix the position of the tool. This ensures the position and angle of the protractor are 100% correct. Depending on the type of tonearm bearing you can use either the pointed or the circular end of the rod, sitting on the tonearm bearing. On some Pro-Ject tonearm bearings (CC or CC EVO tonearms, or X1, X2, X8,… and many more) there is a bearing adjustment screw on the top center of the bearing. This screw will fit exactly in the circular end of the rod. Make sure to set the length so the rod sits neatly on that screw. Make sure that the base is flat on the platter.

Adjusting azimuth

Lower the cartridge down on the mirror (3) and adjust the azimuth on your tonearm (Consult your turntable manual if necessary). If the bottom body of the cartridge and its reflection are completely parallel to each other, the azimuth, or horizontal alignment, is correct.
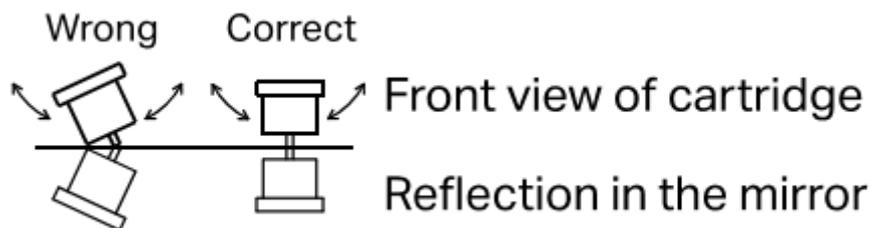
Cartridge alignment: Tangency and Overhang

An aligned cartridge is essential to ensure the most accurate reproduction of the recording, low noise, and the least amount of wear on the record and stylus. Lower the tonearm, so that the stylus tip sits in the center of the cartridge tangency adjustment (2). Slightly loosen the headshell screws and adjust the cartridge so that it sits on the center point and is parallel to all the guide lines around it.

With the Align it PRO you are able to set the overhang and tangency in one easy step, just using the inner null-point (2) as printed on the base.

☞ *Align it PRO uses the inner null-point of the Baerwald curve (16,21mm overhang).*

This is because the exact position of the base is defined by the beam. With traditional protractors where you have inner and outer null-point, it takes longer to set up the cartridge to the correct overhang, as you need to go back between outer and inner null-point until the positioning is correct at both. If you just use one null-point, but not the other, the result will be very, very inaccurate! The Align in PRO is designed to make this process much faster, with its fixed position!
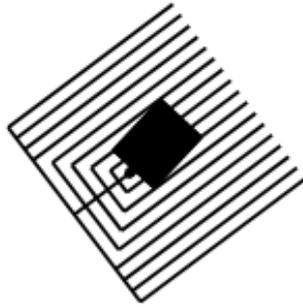
Wrong   Correct
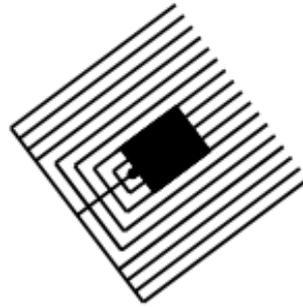
☞ *We recommend rechecking all the previous settings once done.*

This template is made for Pro-Ject tonearms or other tonearms which have the following pivot to spindle lengths:

200 mm (used on Pro-Ject 8,6" tonearms)
212 mm (used on Pro-Ject 9" tonearms)
238 mm (used on Pro-Ject 10" tonearms)
291,6 mm (used on Pro-Ject 12" tonearms)

Please consult the manual of your turntable or tonearm, should you use a different brand.

The overhang of this tool is defined by the Bearwald method. Bearwald has an overhang of 16,21 mm.

☞ *Your Pro-Ject turntable comes factory aligned with an overhang different to the Bearwald method! For example: Debut Carbon EVO and Debut PRO come aligned with 18,5mm overhang. X2 B with 18mm overhang. Check your turntable's manual for the factory adjusted overhang, and don't worry if your factory fresh turntable doesn't align by default with the Align it PRO and its Baerwald curve. That is because the factory alignment is not done using the Baerwald method!*

The effective length of your tonearm is the result of pivot to spindle distance PLUS overhang added together. For example: Pro-Ject turntables with 8,6" tonearms use a pivot to spindle distance of 200mm, add the overhang to that and you are at 216,21 mm effective length (=8.5").

☞ *Pro-Ject 8,6" tonearms use an overhang of 18,5 mm and the above-mentioned pivot to spindle distance of 200 mm. This results in an effective length of 218,5 mm (=8,6"). A cartridge alignment protractor for the Pro-Ject standard is included with all our turntables. The Align it PRO gives you access to the Baerwald alignment method, one, if not the most popular and versatile curves in use.*

Technical Deep Talk: Tonearm geometry, Baerwald and null-points

The optimum geometry of tonearms has been the subject of several articles over the past decades. However, the earliest complete mathematical study was that of H.G. Baerwald in his paper on optimum geometry in 1941, where an analytical survey of tracking error distortion showed that optimum geometry of a tonearm of given effective length would have a corresponding offset angle and overhang. This seems obvious today, but H.G. Baerwald was the first to show these facts.

Problems with playback in the inner grooves

The RIAA standard for 12" (long play records) says that the "Minimum Inside Diameter of Recording" is 4 3/4", which means a diameter of 120,65mm or a better radius of 60,325mm. Stopping groove (closed concentric circle) should be on the diameter of 4 3/16" ± 1/32". This means a diameter of 106,36mm or a radius of 53,18mm. Unfortunately, today most record publishers don't follow RIAA standards for records and cut the grooves very close to the stopping track. Very often nowadays, the end of the recording is found at a radius of 55mm. This allows the record to hold more music, but on the other side, it has very serious consequences.

1. A record player has constant angular speed, but as the radius of the grooves decreases, it also decreases the linear distance the cartridge travels in the groove in a given time. On the outer groove the linear velocity is 509mm/sec. On a groove with a radius of 60,325mm the linear velocity is 210mm/sec; on a radius of 55mm, it drops to only 190mm/sec. So, if the signal of 10kHz has a "length" of 0,05mm on the outer groove, on the inner groove with radius of 60mm, it will be only 0,02mm, and on 55mm, it will be 0,018mm. This is precisely the radius of the classical spherical stylus. But also, an elliptical stylus will have the problem of playing back such signal in case it is not perfectly aligned.

2. Tracking error versus radius of the groove versus distortion:
Bearing in mind that distortion = ABS((50 x tracking error)/groove radius), we can easily calculate that a tracking error of 2 degrees will generate outer groove distortion = ABS((50 x 2)/146) = 0,684%, but the same tracking error of 2 degrees on radius of 55mm will be already = ABS((50 x 2)/55) = 1,81%. So, the same tracking error generates three times higher distortion on the radius of 55mm than on radius of 146mm.

Bearwald (null points 66,0 and 120,9 mm)

Also known as Lofgren A, minimizes and equalizes distortion at the three weighted tracking error peaks resulting in a good compromise between inner and outer groove tracking. Baerwald displays moderate distortion at the beginning of the record, quite low distortion in the area between the null-points, but a steep increase in distortion from inner null-points up to the most inner groove. An excellent starting point and works universally well for many musical tastes. Widely used in the industry, null-points at 66,0 and 120,9 mm. Here is an example of the typical Baerwald geometry with correct null points. The blue curve shows the tracking error.
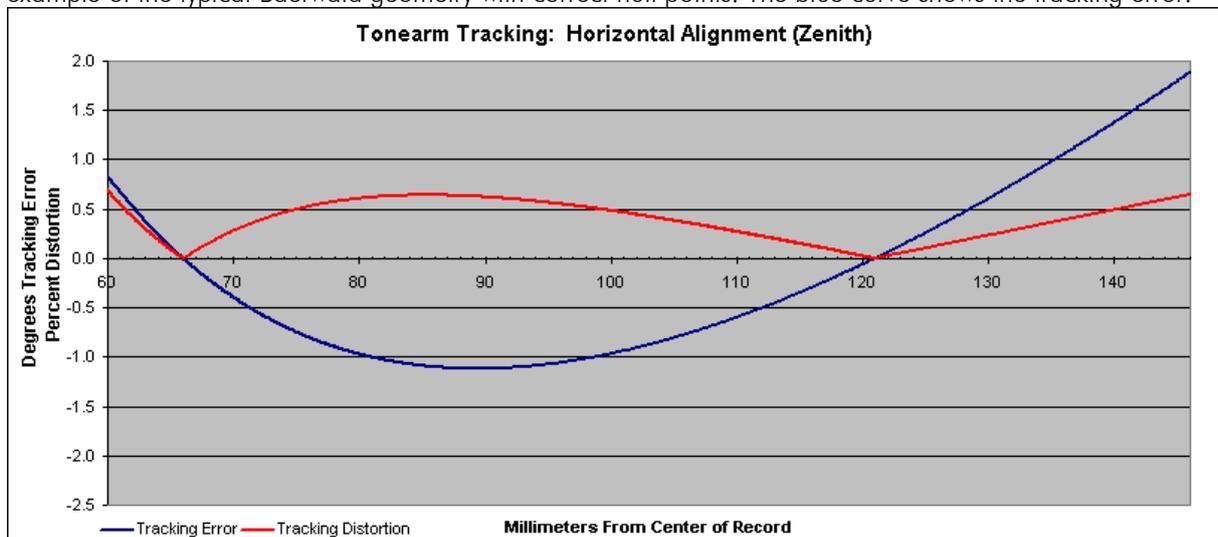
From the beginning, the tracking error has a positive value, but between null-points is negative and after the inner null-point positive. That is why our formula mentioned above counts with the absolute value of tracking error. The red curve represents distortion. The Baerwald geometry works universally and equally well for many musical tastes. An excellent allrounder, which is why it is so popular.

Null-points explanation

During playback, the stylus follows an arc on the record surface. And only at two points is the stylus tangential to the record grooves. The picture from vinylengine.com shows it exactly.
The arc path is purple in color. And on the arc lie two points where the green line (orthogonal to the axle of the cartridge) intersects precisely the center of the record. These points are called null-points. We have zero tracking error in these null points, resulting in zero distortion.
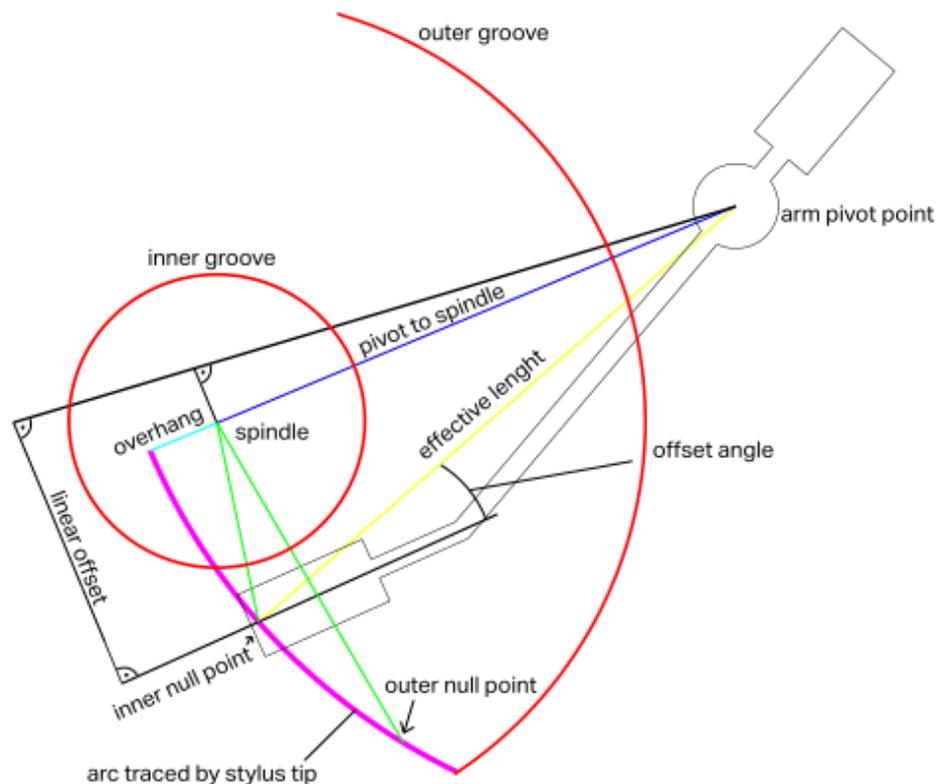
Other consequence of not correctly adjusted cartridge

If your cartridge is not aligned, there is a good chance that the cantilever will never be tangent to the groove and that the angle between the two will take exaggerated values. This can cause a lot of distortion and mechanical tension on the cantilever of your cartridge and the stylus itself and wear down the grooves of your records.

Service

Should you encounter a problem you cannot alleviate or identify despite the above information, don't hesitate to get in touch with your dealer for further advice. Only when the issue cannot be resolved there should the unit be sent to the responsible distributor in your country. Guarantee repairs will only be affected if the unit is returned correctly packaged. For this reason, we recommend keeping the original packaging.

Warranty

The manufacturer accepts no responsibility for damage caused by not adhering to these instructions for use and/or by transportation without the original packaging. Modification or change to any part of the product by unauthorized persons releases the manufacturer from any liability over and above the customer's lawful rights.