

You'd be surprised how dramatic an improvement can be achieved by carefully optimising the adjustments on your record player cartridge. Allen Wright and Rowan McCombe of Sydney's Audiolab show how it's done.

## How to improve your hi-fi's sound



MARK LEVINSON Audio Systems claim that their electronically controlled straight line tracking arm will extract up to 30 dB more dynamic range from a disc than is normally achievable with conventional arms.

If this is so, it is primarily due to the accuracy with which the cartridge is held in the groove, and that the stylus assembly is used simply to extract information from the groove — and *only* that.

It thus follows that it should be possible to improve the dynamic range of conventional tone arms by using similar principles.

The authors of this article have spent many years designing and building audio equipment to provide the best possible standards of reproduction (remember the Wright AM tuner?) and have found that a very considerable increase in dynamic range can indeed be obtained by very careful attention to the cartridge/arm/disc combination.

First, some definitions of terms used and the theory behind these ideas.

**Definition:** The ability of a system to resolve fine detail in the signal.

**Depth:** The perception that the reproduced performers are placed at varying distances from the listener, sometimes in front of the speakers, but more commonly behind the speakers.

**Theory:** Assume the musicians have played one note and continue on to play more. In the recording environment, that note would decay in volume at a rate determined by the acoustics of the room or hall. A listener at the live performance would hear this note decay, and perceive a dynamic range from the original level of the note (say 110 dB) down to and below the ambient noise level of the room (say 30 dB). This would be a range of 80 dB.

The listener uses this reverberation data to compute the distance and direction of the individual performers, and to gain an impression of the size and shape of the space in which they are playing. To obtain a similar dimensional accuracy and realism in a disc playback system, the system must be able accurately to reproduce a similar dynamic range, as well as maintaining precise phase accuracy over the whole frequency range and *between channels*.

**Effective dynamic range:** A system of 100 watts output and a noise level 70 dB below full output, may in theory be considered to have a dynamic range of 70 dB, i.e., from noise level up to full output. With a sine wave input, under laboratory conditions, such a range may well be achieved — but it won't effectively reproduce *music* with this wide

As errors increase, the image may only be accurate in the region of one speaker, the other speaker putting out sound but this sound seeming to be divorced from the stereo image. Beyond this, no accurate stereo image is present, either the performer seems to be either "over there" to the left or "over there" to the right.

To obtain really three-dimensional imaging the ultimate in transducers and electronics is required, but any good system can be improved by following the procedure to be described. However, the better the equipment, the easier it is to hear and appreciate the improvements.

## Equipment

**Turntable:** Naturally the best possible unit will give the best possible results.

Mk VI's, but other cartridges that use a positive pivot point for the cantilever rather than a hysteretic rubber pivot should perform well and be worth the effort required to set up correctly.

## Set-up procedure

Your ears must be the only judge of how things are working. The final settings will be close to the "by the book" settings but as the only test is "how does it sound", any adherence to "the book" may inhibit you obtaining the best results.

Be warned that this set-up method can take a long time to optimise. At first you may not be able to hear changes in the sound from adjustments made. Persevere and your awareness of sound qualities will improve and you will come to be able to hear very small changes

# ....without depleting your wallet

range, for when this amplifier is called upon to amplify a complex music signal to full output, the distortions created (harmonic, intermodulation, transient intermodulation, and any others not yet isolated), cause a loss of low-level signals through masking by these distortions, and by modulating background noise.

These are the factors which cause the 'compressed sound' from some equipment, and poor performance under listening tests, in particular lack of depth.

In the above example of a listener at a recording session, 80 dB of dynamic range is acoustically available in the studio. But played back over a system with only 30 dB of Effective Dynamic Range (E.D.R.) 50 dB of dynamic range is lost. And there goes the realism of the live performance — and the "depth".

## The system

As the arm/cartridge/cartridge/disc system is the starting point in the replay chain, any losses of information in the signal at this point cannot be retrieved later in the chain, no matter how superb the electronics or speaker system.

We have proved beyond any doubt that, even with very high definition cartridges, electronics and speakers quite small errors in setting up cartridge tracking parameters caused stereo image shifts, loss of definition and serious loss of E.D.R.

As the errors increase from a perfect set up, the first property to go is depth. The three-dimensional stereo image reduces to a flat perspective, but with the left to right data maintained accurately.

We strongly favour the new range of belt-drive turntables that are being made in England, as giving noticeable sonic improvements over other top-line equipment.

**Arm:** Our set-up procedure involves critically adjusting the antiskating correction, arms that have a fixed amount of antiskating applied are not suitable, in our opinion, for a high-quality system. No high definition cartridge can give its best in terms of stereo imaging and E.D.R. without antiskating being correctly applied.

Some cartridges work only in damped arms, others are already well damped and need an undamped arm to avoid sounding "mushy". Experimentation is required to decide the best for your cartridge.

**Cartridge:** We use specially rebuilt Decca

with certainty.

This procedure is much easier to do if your preamplifier allows you to monitor either the left or right input over both speakers or good headphones. This allows instant comparisons between channels, which is the key to this procedure.

**STEP 1:** Refer Fig. 1. The stylus must be perfectly vertical in the groove as viewed from the front. Any slightly "off vertical" alignment must be corrected. A unipivot arm can pose problems in ensuring this adjustment is stable and accurate. If it is not, no other changes will optimise the system.

**STEP 2:** Refer Fig. 2. Set the vertical tracking angle of the cartridge by using the *mounting platform of the cartridge* as the guide, not the arm. This may be changed later but level the cartridge for the present. ▶

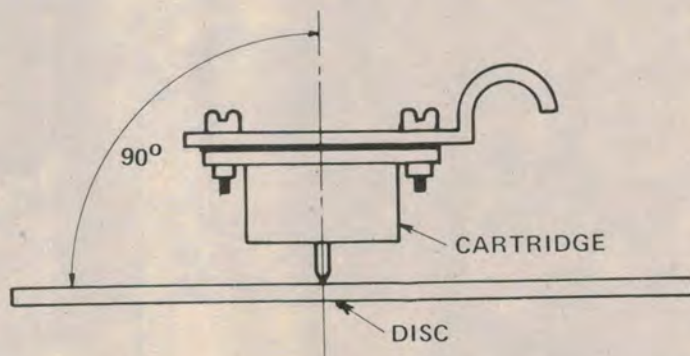


Fig. 1. The stylus must be perfectly vertical in the groove.

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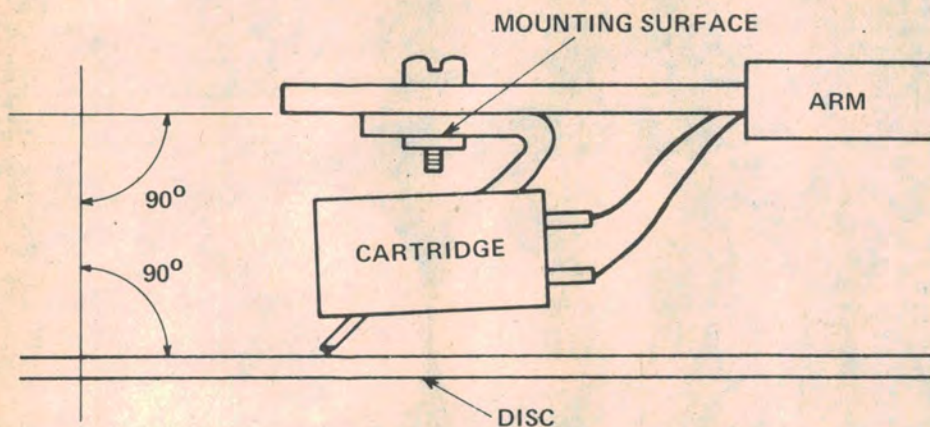


Fig. 2. The cartridge's vertical tracking angle is initially set as shown.

STEP 3: The stylus overhang at this point should be set per the alignment adjustments issued with the arm. Set it accurately!

STEP 4: The tracking weight should be set to the light end of the cartridge manufacturer's recommended value.

STEP 5: Buy a new (preferably import) copy of a record well known to you, of either a live recording with lots of natural reverberation, or a studio disc with good artificial reverberation.

STEP 6: Play an outside track and switch the preamp between the left and right channels. Adjust the balance controls to get the sound level accurately balanced (It is assumed that the speakers you use are in phase and hence give a definite centre image in mono mode). This step must be done after each adjustment to ensure the level is equal before doing other comparisons.

STEP 7: Switch to stereo, and sitting dead centre between the speakers as per Fig. 3 (if not using headphones), listen carefully to the test track.

STEP 8: One channel will almost certainly seem to have more life, more dynamics than the other, which will sound a little "flat" in comparison. Switch to each channel in turn to get a real impression of this. Do not blame the record for this unequal effect. Good records are very consistent between channels.

STEP 9: Reduce the antiskating adjustment to zero and increase it a little at a time. After each change, listen for a shift between channels of this "liveness". (Usually the right channel loses E.D.R. first for *small* changes of antiskating either side of optimum.)

STEP 10: Having found what you are certain is an optimum point for the antiskating, you can now move on.

What you are actually listening for is an increase in E.D.R. If you are not using phones, listening to the speaker from a distance of one foot or so will allow a better judgement of changes.

The final purpose is to optimise the "depth" in each channel and to equalise it between the channels, to obtain optimum definition and stereo image.

Using the same method of checking, i.e., an optimum balanced E.D.R. in each channel, slide the arm fore and aft in its mounting base to vary the cartridge overhang distance. Vary it by *very* small amounts, 0.25 mm or less at a time.

If the arm is fixed on the base, the cartridge may be moved in the headshell. This is, however, rather dangerous as it's easy to change the offset angle as well as the overhang, giving two variables at once which makes for an almost impossible situation to optimise. It's far better to cut a slot in the base to allow the arm to be moved rather than adjust at the headshell.

The same effects heard when changing the antiskating will occur. One channel will get better, then the other will also come in until an overall balanced increase is obtained.

STEP 11: With the overhang optimised, the antiskating is again varied to find a new optimum as per Step 9. It should only need a small change to again optimise it.

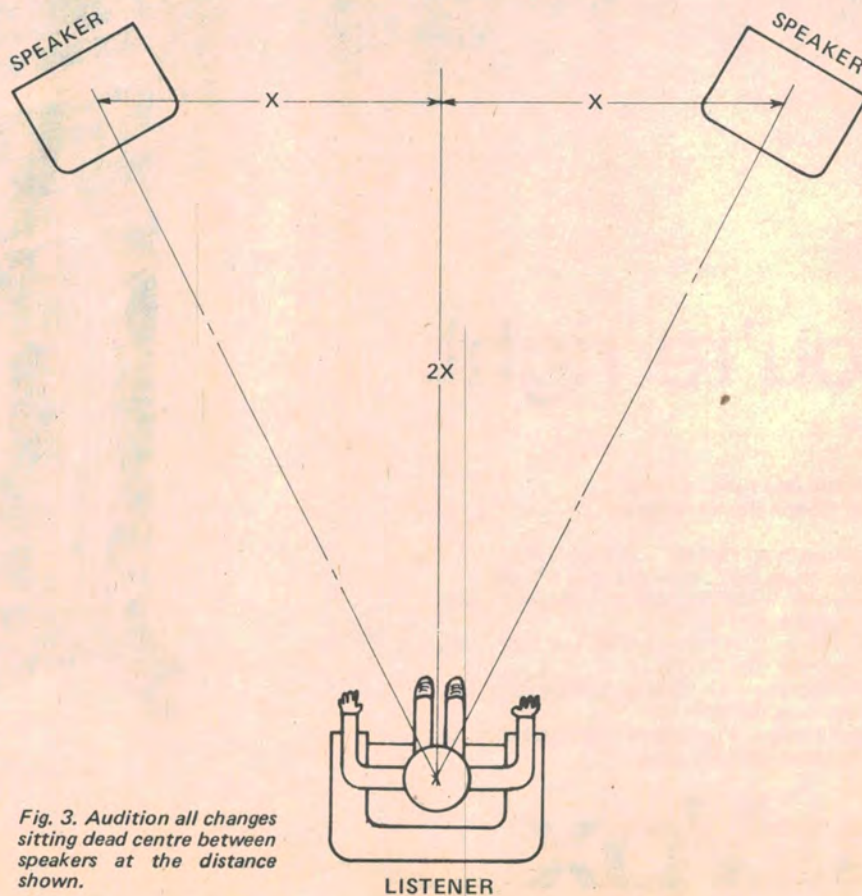


Fig. 3. Audition all changes sitting dead centre between speakers at the distance shown.

STEP 12: Now repeat Step 10 and Step 11 as a sequence, i.e., 10, 11, 10, 11, etc., until the absolute is obtained. Three times through should be enough.

STEP 13: Now the offset angle of the cartridge in the headshell can be varied small fractions of a degree to see if an improvement can be found. NB. Do not lose the overhang setting while changing the angle!

If a change does improve matters, Steps 10 and 11 will need to be repeated in the sequence 13, 10, 11, 13, 10, 11, etc.

STEP 14: At this point the vertical tracking angle can be varied by raising or lowering the arm in its mount. This may or may not show an improvement.

An article in the September 1977 issue of the UK magazine "Hi-Fi for Pleasure" claims that certain cartridges may show an actual tracking angle of  $25^{\circ}$  to  $30^{\circ}$ , rather than the design value of  $15^{\circ}$  to  $20^{\circ}$ , which can cause high distortions. Decca's, however, never

seem to need more than a degree or two to optimise.

STEP 15: By now, with the geometry near perfect, a benefit may be heard by reducing the tracking weight, thereby reducing stresses on the stylus assembly, and allowing it to work a little more effortlessly. As the tracking geometry is now optimised, the tracking should be improved, and the system not requiring so much weight to track accurately.

Any change in tracking weight will require an antiskating correction, but not normally the other variables.

## Problems

Even after all these adjustments, it may not be possible to get the channels equal. This indicates that either the cartridge or the preamp is not adequately channel matched. Correction of this is beyond the scope of this article but it is possible to find out which component is at fault.

Switch the preamp to the "good" channel only. Then reverse the leads from the cartridge at the amplifier input. If the E.D.R. remains, the cartridge is OK and the preamp at fault. If the E.D.R. drops down, the cartridge is faulty.

## Conclusion

By now the stereo and depth performance of your system should be noticeably improved.

There appears to be a lot more information on discs than has been considered in the past. It takes the absolute best in components and their set up to get this information to the preamp, but the results will be seen to be worthwhile. The concept of dynamic range and stereo image as the major value in a hi-fi system is new, but exposure to such a system is an experience not soon forgotten.

Real audiophile systems are getting away from the specifications race and into realism and using listening as the only valid test. We hope this article helps in furthering this move. ●