An excerpt from **IAR**

The Oracle Speaks

International Audio Review
J. Peter Moncrieff

Hosanna! Hosanna in excelsis! Well, we promised that the first audio component to make Class 1 in IAR would be greeted with loud hosannas. And here it is.

Incidentally, those wary audio manufacturers who may have carped that IAR is too critical and our standards too high (why no Class 1 components?) can rest easy. If a product deserves a good rating, then that is what it gets, freely given. But only if. It's the prime responsibility of a competent reviewer to be truly discriminating, to give the audience an educated evaluative overview of the field that's rational, objective, and consistent in the long run.

If an audio critic doesn't understand the true measure of audio excellence, then he's likely to go overboard in reviews, seeking yellow journalist headlines by giving a sarcastic ax job to engineering compromises he can't fathom, or giving an undiscriminating rave to the latest favorite toy he's discovered, regardless of how good it objectively is in a larger, rationally measured sense. This emotionally fascinated overpraise of every latest favorite toy is of course what spawns the component-of-the-month syndrome, which is so costly to you the consumer and leaves you wondering just how absolute the sound can be that such reviewers use as a purported yardstick. Enough said. You get the point, that if a product elicits hosannas from us, it meaningfully deserves them.

All right, what kind of component is this Class 1 marvel? Obviously it can't be a transducer, seeing how imperfect they still are. Surely it must be some sort of amplifier, probably a preamp or head amp. Nope, not yet (though we have some exciting prototypes of products on the horizon in our lab). What, then? It's a turntable.

Turntable Sonics

If some of you perchance still think that all good turntables sound alike, please reread the pertinent sections of IAR 1/2. The standard good (and not-so-good) turntable is a cacaphonic symphony of mechanical parts vibrating, in addition to the music. Unwanted vibration (from whatever source) is sonically more devastating in a record player than in any other audio component (e.g. tape recorder, amplifier, or loudspeaker) because a record playing system has to be microphonic. Why? Microscopic vibration is the very source of the music you want to hear; that's how information is stored and retrieved in today's disc medium.

Ivor Tiefenbrun has earned the deserved high reputation for his Linn Sondek turntable by respecting and attempting to control minute unwanted vibrations. And the proof of the pudding is already in the listening. Ivor has staged numerous demonstrations in which the Linn Sondek is compared with other top of the line turntables. Most of the others don't even come close (a recent victim we heard succumb was the JBE slate plinth turntable, contrary to some British reports favoring the JBE).

The Linn's audible superiority to other high end turntables is most notable in greater dynamic transient range, and in dramatically less midrange garbage, with a consequent improvement in lucidity (inner musical detail) and intertransient silence (though to the naive listener, on a poor resolution system, the added brightness of the midrange garbage may seem to provide more 'clarity' from the inferior turntable).

Dramatic Superiority

Well, now there's a turntable that sonically clobbers the Linn Sondek by the same dramatically obvious margin that the Linn beats most others. This turntable is a new product by a new company. Its name is Oracle.

When we say dramatic, we mean just that. This is not the undramatic difference others have reported hearing between the Linn Sondek and other very fine designs such as the Win and Cotter (both of which also work hard at controlling certain sources of unwanted vibration). When we say obvious, we mean obvious. You don't have to have a finely tuned golden ear to hear it. Virtually everyone who has heard the Oracle A-B'd against the Linn Sondek instantly hears the obvious difference.

The sonic qualities in which the Oracle clobbers the Linn are the same at which the Linn excels over most others: better dynamic peaks, less blurring of musical detail in all frequency ranges (most audible in the midranges), cleaner, purer sound and better inter-transient silence (which also yields truer image focus and hall ambience).

Earning Class 1: Thorough Engineering

But the Oracle does not earn a Class 1 rating because it happens today to be so much better than any other turntable in our experience. If merely being best or our favorite were a sufficient criterion for an IAR Class 1 rating, the Linn would have gotten that long ago. So would the best or favorite audio components of each type. And off we'd be on that component-of-the-month merry-go-round, automatically top rating the hottest fashion toy we'd yet seen, only to downgrade it next issue for the next hot fad toy. No. That's not the way objective permanent yardsticks are used to gauge things in science.

The Oracle turntable earns a Class 1 rating because it is a totally and thoroughly engineered product. It represents, in our professional judgement, the best product that can be reasonably achieved, as measured against the objective, permanent yardstick of what is possible in turntable design with today's technology. Our evaluation of the Oracle's excellence (or any other product's) is based on its absolute quality, not merely its quality relative to its competition.

Absolute quality endures, relative favoritism or fashion does not.

It doesn't take an engineer's eye to appreciate the Oracle's design excellence and thoroughness. Its eye catching beauty alone is spellbinding (as is that of Sao Win's turntable). Everyone who sees the Oracle instantly covets it. But an engineer's eye is rewarded with whole other dimensions of appreciation and awe, especially as he begins to take the unit apart and understand its inner workings. The product is, in total concept and in engineering detail, simply a tour de force (in the exotic company of such as the Hill and Beveridge loudspeakers). We salute Marcel Riendeau and his design associates. They've thought of nearly everything there is to good turntable system design, and, more important, they've done nearly everything right. We'll run down some of these details below.

Groove Isolation from Record

First, though, you'll want to know what the key is to the Oracle's superior performance. Well, to begin with, it doesn't play the record. ***It doesn't play the record?*** Don't all turntable systems play the record? Others do; not the Oracle. But isn't it obviously the job of a record player to play the record?

Playing the Groove

No, it is not. It is the job of a record player to play ***only the groove***, in particular that part of the groove where the stylus is being driven by the musical signal at some instant. The entire remainder of the record is irrelevant to the transient musical information you are hearing at some instant. And it is worse than irrelevant. This remainder of the record is an ***enemy***.

It is a foreign physical object, like the rest of the turntable system, which can vibrate. These foreign body vibrations, like those originating from and transmitted through other physical parts of the turntable system, destroy your music. When these vibrations reach the sensitive vibration sensor that is your stylus and cartridge, they add spurious energy and delayed eigenmode reverberations, which have little or no resemblance to the music being read at that instant at that point in the groove where the stylus is at that instant, and which therefore constitute a form of time variant distortion.

Directly Coupled Enemy

Unfortunately, that part of the groove being read by the vibration sensing stylus at that instant is directly coupled to that foreign vibrating body which is the remainder of the record; they're both part of the same physical object, and can't be separated. Furthermore, that foreign remainder of the record is unfortunately directly coupled to an active source of vibration which we can't (and wouldn't want to) eliminate: the stylus vibrating against the driving groove as it's sensing the music you want at that instant.

Even in a hypothetical turntable system with zero rumble and perfect isolation (mechanical and acoustic) from its surroundings, this potent, directly coupled vibration source, the sensing stylus itself, remains. It generates the vibrations from the true musical signal in the groove at that instant. The vibrations go careening through the directly coupled foreign body that is the remainder of the record. The vibrations reverberate (a time smear and echo) and acquire the sonically colored character of the physical object's (record's) eigenmodes. And finally these colored, reverberating vibrations arrive back at the sensing stylus, by which time the true musical signal in the groove is different, bears little resemblance to the delayed arriving vibrations, and so is grossly contaminated by them. You want to ***play*** (and hear) only the ***groove*** where this instant's music is, but instead you're ***playing*** and hearing the ***record***, the whole record as a foreign physical object.

Attenuating and Damping Record Vibrations

Since the vibration source, foreign reverberating body, and sensor are all directly coupled to each other, what can be done to surmount this contamination of your music? Somehow, the ***groove*** (that point of the groove your stylus is playing at some instant) must be ***isolated*** from the rest of the record as a foreign body. We call this desideratum ***groove isolation***. Groove isolation is a form of distortion reduction.

Groove isolation can be approximately achieved by coupling the entire record very tightly to another physical object that (unlike the record) does not itself support (transmit) vibrations, and that is soft enough and massive enough to absorb (damp) the vibrations trying to travel through the (thankfully) thin record. This tightly coupled other object will attenuate the vibrations as they travel outward from the stylus reading your music, and will attenuate them further on the round trip as they later travel back (having bounced off an edge or gone around the circle) toward the sensing stylus.

Turntable Mats and Clamps

We are speaking of course about turntable mats, and some weight or clamp above the record to tightly couple it to the mat. IAR 1/2 contains a further discussion of the benefits of a good turntable mat tightly coupled to the record; in fact, we're told that some of the mat and clamp products you can now buy to help you in this problem area were a result of that article.

To attenuate (damp) the vibration signal path from every possible groove point where the stylus might be playing music (and so transmitting to and receiving from the record's vinyl body), the mat obviously must couple to the entire grooved surface of the record. That rules out small area record support points (a la Transcriptors), pads (a la Sony), or concentric rings (a la Thorens) as hopelessly inadequate. Ever since we saw his original prototype, we've been trying to persuade our friend Sao Win that his estimable turntable would sound a lot better without its concentric record support rings and with a good mat instead.

Music-Smearing 'Liveness'

If a mat is hard (as has become the fashion among some designers and listeners), much vibrational energy from the record's body arriving at the mat/record interface should be simply reflected back into the record's body, there to continue reverberating, instead of being absorbed and dissipated in the mat (see the test results below).

Audiophiles and mat/turntable designers who advocate hard surface mats, or small area supports like concentric rings, claim that they hear a liveliness to the sound of the music that goes away and becomes 'dead' with a good soft full contact mat. They are right. But we have established, by listening and measurement, that the 'liveness' they are hearing is simply the excess midrange/upper midrange reverberant vibration characteristic of a vinyl record's eigenmodes. On a low resolution playback system, and/or to a naive listener, every bit of added midrange/upper midrange energy can sound like more 'clarity', regardless of how distorted or time-smearingly reverberant this added energy is, and regardless of how much it obscures the subtle inner true musical details that can only be heard against a background of intertransient silence.

The Best Mats and Clamps

A sneak preview of our forthcoming mat and spindle weight/clamp reviews: the best mat we've yet found is the old Spectra from France (no longer available; the Dumpa and new 'Spectra' replacements are not the same). The old Spectra has a special surface film that under pressure clings to every bit of the record's surface like glue (helpful trick: wash the mat's surface once a week in dishwashing detergent). Oracle themselves will be making a mat (included of course with the turntable, or available separately) intended to be as good as the old Spectra, and conductive as well (for reduction of static charges). The Metrosound clamp is somewhat deader, with better disc clamping, than other separately available clamps, and is better than any weight (helpful trick from our friend Sieg Modes: add a 3/8 inch metal thin washer on top to prevent wear of the acrylic as you screw the collet nut under pressure).

But no separate clamping system you can buy works as well at groove isolation as the system on the Oracle turntable. It features a patented integral screw down clamp, which can couple the record more tightly to the mat than any of the push down clamps (which then grab the spindle via a collet), and much more tightly than any weight. And that's not all. The Oracle also utilizes an ingenious vacuum hold down system, with a raised center support around the spindle. A vacuum between the record and the mat (actually the atmospheric pressure above the record) firmly holds every portion of the record's surface tightly against the mat, not just the center record label area as with the usual clamps.

This unique clamping and vacuum hold down system in the Oracle contributes to the flattening of many large, low frequency warps (dish and saddle) in records, more than ordinary clamps. But no clamping system can cure horizontal warps or the higher frequency pinch warps, especially those at the record rim. In fact, severe pinch warps at the rim may interfere with the formation of a proper vacuum. You can tell if you have a proper vacuum; you should be forced to slowly 'peel' the record off the mat when you want to remove it. This slow peeling is a bit of an inconvenience, as is the use of any clamping device. But you should get used to it; the dividends in improved sound are well worth it.

Groove Isolation from Other Enemies

The concept of groove isolation implies more than isolating the portion of groove being played from merely the rest of the record. It should also be isolated from the rest of the turntable system and from the outside environment. This too the Oracle does better than any other turntable. In order to accomplish this, the entire rest of the turntable system should be acoustically (mechanically) dead, and some parts of the system should be rigidly attached to one another, while other parts should be isolated (in particular sources or paths for outside vibration, such as the motor, dust cover, and feet).

Dead Platter and Subchassis

To begin with, the platter of the Oracle is deader than any other we have come across. Most other platters ring like a bell, especially if they have the usual weighty rim that's advisable for maximum moment of inertia (see IAR 1/2 for the reasons why a high moment is required for pure music as well as low flutter warbling). The Oracle employs grooves cut into the weighty rim to break up the ringing modes, and a rubbery foam insert to damp them.

The Oracle's subchassis, which couples your pickup arm to the platter via the spindle bearing, is very rigid in geometry and construction. It is one of the many places in the Oracle where exotic alloys are used for maximum hardness and rigidity. But it is also dead. It is a laminate, with intermediate deadening layers; the Cotter turntable takes a similar approach to simultaneous deadening and rigidity (the Win does not). But the Oracle's subchassis also has minimal surface area to minimize travelling wave modes of vibration, and to minimize absorption of acoustic feedback energy from your loudspeaker (a feature the Win, Linn, and Cotter do not have.

Subchassis Suspension

The Oracle's subchassis is then suspended and isolated from room vibrations by a tripedal mounting. This mounting, like that on the Win turntable, utilizes stretched rather than the usual compressed springs, plus additional nylon and foam rubber damping (to quell transmission of higher frequencies through the springs themselves). The springs have a unique bell shape, which is said to cure both the eigenmode ringing of cylindrical springs and the nonlinearity of conical springs, as seen in other turntable suspensions. It offers superb isolation from external mechanical shocks arriving at the turntable base, whether from intentional hammer or shoe blows, or from the more usual ambient vibrations such as footsteps, dancing, outside traffic, or music's bass from your loudspeakers transmitted through the floor, walls, supporting shelf, etc.

Filtering External Shock

The subchassis suspension of the Oracle is tuned to 3.5 hz, which is lower in frequency than most other turntable systems. That's important because a turntable's success in isolating your music from the sullying effects of external mechanical vibration depends on this frequency being as low as possible, not on the mass of the suspended system being heavy (as has been misreported in a GESR publication). This suspension acts as a high frequency filter, refusing to transmit energy at frequencies higher than its tuned resonance. So the lower the frequency, the less mechanical energy is transmitted, and the cleaner your music is.

Note that mechanical (and acoustic) external vibrations reaching your stylus will first muddy the bass and blur the music, at levels far lower than those at which they become obviously manifest as separate audible breakthrough signals, feedback, or groove jumping. That's why very good isolation (mechanical and acoustical) from the environment is necessary for a high fidelity turntable setup. Poul Ladegaard, Martin Colloms, and James Moir have been testing turntable systems for this isolation in reviews in British and Danish publications.

But a reviewer should not place too much emphasis on it. If an otherwise excellent turntable had awful isolation, this is the one aspect you could easily remedy (you can't fix flutter or rumble yourself). We've been doing this to our turntables for years by hanging them, sans dust cover, from the ceiling with bungee cords or nylon monofilament fishing line; even a marble slab on a tenth-inflated MX bicycle inner tube (16 × 2⅛ in.) helps.

Of course, it's nice if the turntable already comes with good isolation, and a totally engineered product like the Oracle has it is spades. The Oracle suspension's low tuned frequency of 3.5 hz is even below the fundamental vibration frequency of the motor (5 hz, from the 300 rpm synchronous motor common to most quality belt drive turntables), so not even motor rumble gets from the motor (mounted on the base) through to the subchassis, platter, and your arm.

Rigidity

Any substantial external mechanical shock energy that does get through the Oracle's suspension will be below 3.5 hz, and at this very low frequency the subchassis has no trouble at all moving instantly as a single rigid unit (uniformly for both platter and arm), without flexing, internal eigenmodes, or delayed transmissons. To help ensure that your arm does indeed move as a single unit with the subchassis, the Oracle's arm mounting plate is actually enclosed by the subchassis itself (and so is at the same height as the subchassis), instead of being a separate large 'sounding' board that sticks out beyond and above the subchassis, where it can flap in the breeze and pick up external vibrations from the environment (a la Thorens and Linn Sondek). For the moment, the Oracle's subchassis mount will accept only conventional arcing arms; an adaptor plate is planned for exotic radial (SLT) arms (but if you want to use an exotic arcing arm now, look into the remarkable Wheaton Decoupled arm, which works very well with the Oracle).

Horizontal Stability

All commercial turntable suspensions, including the Oracle's, move primarily in the vertical direction. This offers the best isolation to the vertical component of external shock forces. But what about the horizontal component of these forces? With most turntable suspensions, the center of gravity of the suspended moving system is located significantly above (or below) the point at which the suspension springs are fixed to the base, and about which they can therefore pivot somewhat. If the center of gravity is above the fixing point, the moving assembly can rock back and forth like a cradle; if below, it can swing like a pendulum. In either case, the moving system tends to continue to sway horizontally after any external shock with a horizontal (or rotational) component is applied, which is bad since the horizontal isolation is not as effective as the vertical.

Not the Oracle. Its center of gravity is at the same height as the suspension fixing points. So its horizontal reaction to external shock is inherently stable and well damped. It's this kind of thorough detail attention to proper engineering design that we see over and over in the Oracle, that earns it a Class 1 rating.

The belt drive is also located at the same height as the center of gravity. So the tension of the belt (tied to the externally mounted motor) does not tend to 'topple' the suspended system, and you don't need to do any fussy counter-balancing or tuning of forces (as you do on the Linn with the springs and the tonearm leads).

Levelling and Tuning

The tuning of the Oracle's suspension can be adjusted for maximum travel and floppiness (hence best isolation). But this tuning is substantially independant of the platter/chassis levelling, so both can be separately optimized (unlike the Linn and many other turntable suspensions, which alter spring compression or expansion with the levelling adjustment). The Oracle also has independent levelling adjustments for the base, and there are separate levelling bubbles for the base and subchassis.

All tuning and levelling adjustments are easily accessible from above the turntable. So you can quickly adjust everything correctly in real time — as opposed to the Linn system (and others) in which you must raise the turntable, reach underneath to change the adjustment some blind amount, then put the turntable back down to guess how far off the adjustment still is, etc., etc.

Airborne Feedback

The Oracle's success in combatting external acoustic vibration (e.g. airborne feedback from your loudspeakers) comes from a number of design considerations. Each and every part of the suspended moving system is made as dead as possible, so it refuses to accept and support externally induced vibrations. Each part has as small a surface area as possible, so as not to act as a diaphragm, and is solid and heavy (mass does help in immunity to being moved by airborne acoustic waves).

The dust cover, which was found by the British reviews to be the primary culprit in most turntables for acoustic feedback (since it acts as a large area diaphragm to intercept airborne vibrations), is attached to the base in the Oracle, and so is decoupled from the floating subchassis above 3.5 hz, even if the dust cover is lowered in place while the record is playing. If you wish, you can easily remove the dust cover and its hinges from the Oracle system entirely. The vinyl record itself is a diaphragm that intercepts airborne vibration, but the Oracle's tight coupling of the entire record surface to the soft mat takes care of that.

Rumble, and Wow & Flutter

The Oracle minimizes rumble and wow and flutter with a soft rubber belt drive and superior design of materials and tolerances in critical rotating areas. The Linn Sondek has shown how important precise machining of the motor pulley is; even a slight eccentricity will cause both rumble and flutter at 5 hz and its harmonics.

The Oracle's spindle bearing employs special Oil-on bushings. These can have the simultaneous advantage of very low friction (which affects wow and flutter) and zero bearing tolerance to avoid spindle wobble (which is also a source of rumble). The Win turntable uses the same superb approach to spindle bushing design.

The Oracle's thrust bearing at the spindle bottom is made of extraordinarily hard and polished materials, for minimum rumble and wear. The tip of the spindle is carbide steel (about 90 Rockwell hardness), and it rests on a polished pad of a special black ceramic (about 95 Rockwell hardness). The manufacturer says that the same combination of materials is used for the bearings in aerospace gyroscopes.

As discussed in IAR 1/2, slight amounts of rumble and flutter, too small and/or too low in frequency to be directly heard as spurious signals added to (or warbling) the music, nevertheless can blur your music by adding AM and FM distortion sidebands to the music. That's why rumble and wow and flutter measurements are indeed very significant to the sound of a turntable (contrary to some reviewers' published opinions). But, to relevantly correlate to what you hear on music, these measurements must be wideband, baseband (to DC) spectral analyses, not some 'audibility weighted' single figure of merit. In a later article we'll discuss further the scandalous inadequacy of today's standard rumble and wow and flutter measurements (see also Poul Ladegaard's B & K paper on this); the standard 'audibility weighting' curves in particular are an inane, archaic crock of bull, which unfairly hide the problems of many direct drive turntables (come to think of it, so are the observation techniques and the test records).

We did a wideband, baseband, and zoom spectral analysis of the Oracle prototype, and it was as good as or slightly better than the superb performance of the Linn Sondek in rumble and wow and flutter. The manufacturer says that the Oracle's rotating bearings and tolerances have been even further improved since this prototype, but by press time we haven't yet had a chance to verify if the rumble and wow and flutter have improved yet further.

Belt Drive

The belt drive on the Oracle rotates the platter with a torque that's far greater than the Linn Sondek's, easily enough to keep the platter spinning at full speed while you clean the record. The motor pulley grooves are contoured to the belt's round profile, to increase contact area in this necessarily small circumference drive region, and so reduce the chance of belt slippage under load.

In their unremitting determination to keep the platter as dead as possible, the Oracle's designers elected not to use the two piece platter (a la AR, Linn, Thorens, etc.) which makes belt/pulley speed changes relatively easy from above. That decision puts the Oracle's belt underneath the platter, where it runs on an interior rim. You have to gingerly run your finger in back of and beneath the platter in order to move the belt to the other motor pulley groove to change speed (33⅓ and 45 rpm are provided). We (and no doubt others) have encouraged the Oracle people to provide a fork to change the belt position and speed from above; this is now scheduled for a later production version.

The Sum of Essential Parts

We've listed and discussed all these abundant and unique technical features of the Oracle's design in part because they're interesting, to you and to us. In part because they form a solid basis for the award of a Class 1 rating. But, most of all, every one of these technical design features is essential to the markedly superior performance of the Oracle, both sonic and measured. This statement is not idle speculation or hearsay. We know first-hand.

Evaluating Each Feature

We visited the manufacturer's lab, and took along our own test equipment that we trust. We asked him to let us test all the different early prototypes and interchangeable turntable system parts he had lying around. This was an ideal opportunity for us to have a population sample with individually controllable variables, in order to develop better IAR tests for turntables that correlated with their sonics. It was also a chance for the professor to do a prototype seminar showing audio manufacturers the remarkable machine analysis (for diagnosis and design work) that could be done with the Gen Rad FFT analyzer.

Well, we took the various early prototype Oracles apart, put them together in various configurations, and analyzed them, until we knew as much as (or perhaps more than) the manufacturer about why his design sounds so good. We tested and measured different clamping systems, platters, subchassis, suspensions, spindle bushings, thrust bearings, belts, motor pulleys, etc. — always changing just one variable at a time to make the experiments scientifically controlled.

With respect to our evaluation here of the Oracle as a product, the results of all this testing of ours can be succinctly stated. We repeat: every one of the Oracle's many technical design features is essential to its superior musical and measured performance. Not one is window dressing. Cut any corner, overlook any detail with the slightly less thorough engineering that's so prevalent elsewhere in audio (cf. our cartridge review comments), and things start sliding downhill.

Measuring What We Hear

We heard the sonic improvements on music when each of the Oracle's technical design features was done right. And, as mentioned, we've heard the dramatic superiority on music of the finished Oracle to the Linn Sondek turntable and others. Now, at IAR, we believe what we hear, when we truly hear it. But some others might not believe what we say we hear. And we as scientists and philosophers are always more comfortable if we can back up and correlate the report of one observation method, however veridical, with the report of another observation method. So what about backing up these listening evaluations with some relevant electrical test?

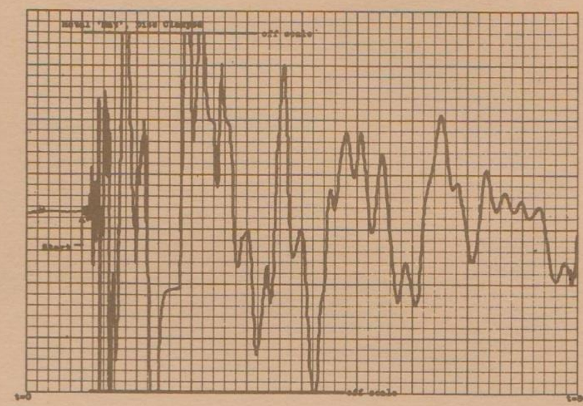
As noted, we applied our new, more sonically relevant rumble and wow and flutter tests to the Oracle. Flying colors. We checked suspension tuning and stability. Motor isolation. Spindle wobble and vibration. But a very few other turntables are pretty much as superb as the Oracle in these matters.

The Oracle's main claim to fame, in which it should be superior by technical design to the best of the other turntables, and probably the reason for the sonic superiority we heard on music, is its groove isolation, in particular its ability to isolate the playing point of the groove from the rest of the record and from a dead subchassis/platter. But how could we measure groove isolation in a way that would be relevant to what we heard on music? There is no good test for groove isolation, standard or otherwise. So we invented one.

Measuring Groove Isolation

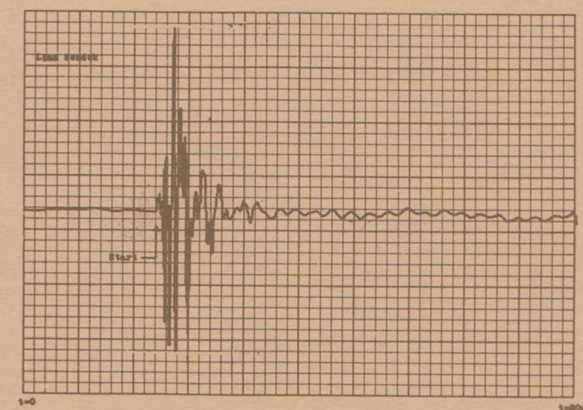
There are two factors to look for in evaluating groove isolation. One is the degree of amplitude attenuation of unwanted vibration signals travelling through the mechanical system. The other is the quickness with which they are damped (seen in the time domain) as they reverberate back and forth. The cute trick of listening to a Dust Bug playing an active groove (with the sensing cartridge in a silent groove) can only get close to evaluating the first factor, not the second. But the second factor might be the more important, for it chiefly determines how much your music is smeared in time by spurious vibrations that continue to reverberate long after a musical transient, thus filling in intertransient silence even if they are small in magnitude. An even more thorough system (including record, platter, etc.) is poor at attenuation and damping, the vibrations will continue to reverberate and be sensed long after their one way trip, similarly to how they continue to reverberate and be sensed long after a round trip.

A crucial advantage of this testing schema is that every bit of the vibration signal we sense at the stylus falls under the turntable's responsible jurisdiction (of trying to subdue). Therefore, the less signal we sense, both in amplitude and through time, the better the turntable system's groove isolation is. The ***amplitude*** and ***duration*** of the ***entire*** signal sensed become ***simple***, ***direct indicators*** of the ***merit*** of the device being evaluated.

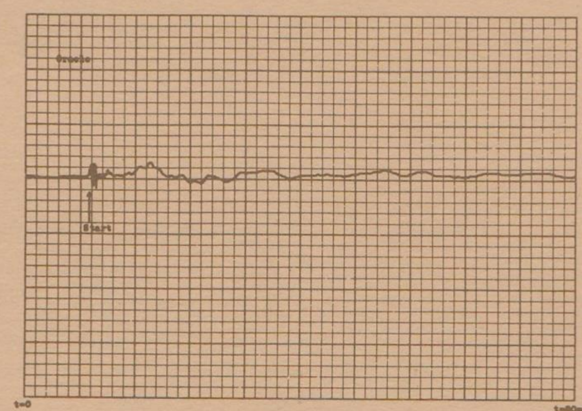


Meaningful Correlation

With the innovative engineering assistance of Michel St. Pierre, we rigged a device to deliver a repeatable mechanical impulse to the far edge of the record. This device and the same record could be placed on any turntable system to measure its groove isolation. The impulse was delivered at about 45 degrees, to supply both vertical and lateral energy.



The results of this test are dramatic. They show astounding differences between competing turntable systems (and mats, clamps, etc.). And specific aspects of the measured test results correlate very well with precise aspects of what we hear from the various turntable systems.



This is not a mere correlation (which could be accidental, a la Hume) between some test's arbitrary figure of merit and some vague, single figure of merit, subjective aural judgement about overall sonic preference or quality — a tenuous sort of correlation straw that too many desperate audio measurement searchers seem content to eagerly grasp at nowadays. Rather, this correlation is well grounded in a priori theory. And it correlates specific aspects of a measurement with specific aspects of what we hear on music. One would theoretically expect larger amplitude and longer lasting vibrations reverberating through the record and getting back to the stylus to sound more 'lively' (with unmusical timbral coloration), more smeared, with poorer intertransient silence — and that's just what we hear in a turntable system which measures that way (obviously the listening is done first to preclude subjective bias).

Test Results

The three time domain plots at left document what we hear and measure on three different turntable systems. They show the various turntable systems' groove isolation — their ability to attenuate and damp (and not spuriously react to) a standard mechanical impulse delivered to the body of the record, before the vibrations can reach the point at which your stylus is playing this instant's music in the groove.

The first plot shows the record clamped or weighted to a metal surface (with a non-ringing platter). This is typical of what we see with the hard mats popular in some quarters, or on a naked good platter. The results can be even worse if the record is not clamped or weighted (especially if it is warped, which our standard test record was not), or if the platter is live, ringing like a Rayleigh disc or like a bell (if it has a weighty rim). The amplitude of the vibrations that get through is gross; it actually goes way off the scale of our graph, to about 3 times the p-p magnitude you see here. And the vibrations continue to reverberate, virtually undiminished, on and on and on, even beyond the 80 ms time limit of our plot. Incidentally, if we had rescaled these three plots to accomodate the first one, you wouldn't be able to see any meaningful vibration measurement on the Oracle at all.

A turntable system setup like this sounds 'alive' all right — alive with garbage. The large vibrations continuing to reverberate through plastic and metal make the music brash and tinny, adding energy especially from the midrange on up. The coloration can sound as though the music were being played in a small, very live room with thin metal and plastic walls. And of course everything is hopelessly smeared in time.

The second plot is a stock Linn Sondek. Its attenuation is about 3 times as good in amplitude, which extends the full scale of the plot (32 small divisions, not 35). The Linn does allow these large amplitude vibrations to reverberate through the system (primarily the record, we think) for some time, 16 ms. That's large enough amounts of spurious vibrational energy, lasting long enough, to cause significant blurring of music's transients and inner detail, and to fill intertransient silence, thus obscuring image focus and ambience. Lucidity is degraded, and you can't effectively single out (or 'count') the individual voices in a massed chorus or string section. After the 16 ms, the Linn quells these reverberant vibrations. The smaller undulations remaining thereafter are probably from the subchassis, platter, or suspension; some mechanical part is ringing at about 500 hz.

The third plot is a stock Oracle. Look how well the amplitude of the vibration from the standard impulse is attenuated by the time it first reaches the stylus. It's about ***one fifteenth*** the magnitude of the Linn Sondek's! And look how quickly it's over. There's virtually no spurious record (and platter) vibration (the fast squiggles on the plot) after 1.2 ms, which is ***13*** times as fast as the Linn Sondek. The slow undulations afterward, probably from the subchassis, are much smoother than the Linn, and lower in frequency. In fact, the Oracle might even be successful at damping ***all*** record reverberation; the several small fast vibration squiggles you see at the beginning might ***all*** represent ***only first arrival*** transmission (via different path lengths through the record's body).

Needless to say, the Oracle sounds like what you see. Everything sounds much cleaner than the Linn Sondek. Transients sound faster and more dynamic, because they're over with quicker and not stretched over time. One hears more inner detail, better separation of individual voices, better focussing of image and ambience, etc.

Dramatic Measured Improvement

If we were forced to pick a single measurement number that would objectively quantify this difference we hear, it would be the total unwanted peak vibrational energy contaminating your music after it reaches the stylus and is sensed there. Technically, this total peak energy consists of peak power level multiplied by the time these unwanted vibrations continue to reverberate at each level. It can be roughly approximated for comparison purposes by drawing an envelope around the power peaks, and calculating the total area under this envelope (down to the zero axis) as time passes. Indeed, there's some evidence that the ear/brain acts as a peak envelope sensor in exactly the same way, which would make this envelope energy approximation the most relevant objective measurement of how severely you hear unwanted vibrations smearing your music. Note that this single number figure of merit, total unwanted energy, penalizes a lousy turntable system both for letting large vibration peaks through, and for letting them reverberate for a long time.

Well, how does the Linn Sondek compare with the Oracle? By this objective measurement criterion, the Oracle is ***634 times better*** than the Linn Sondek. No wonder everyone hears a dramatic difference between the two turntable systems! You'd think it a small miracle if some new amplifier had half the music smearing distortion of the best previous products. But ***one 634th***! That's why we consider the Oracle to be a milestone in reducing disc playback distortion.

Scientific Proof

These test results are scientific proof of the dramatic differences we claim to hear between the turntable systems. Indeed, the test results show the differences between the turntables to be measurably more astounding than we had expected even from our dramatic listening contrasts (a rare and happy exception in the field of audio, where the sensitive ear/brain can often reliably detect differences that are only minutely measurable, if at all, with today's instrumentation and techniques). Another victory for scientific method, instead of mysticism, working hand in hand with the ear. Appropriate indeed to the evaluation of a product such as the Oracle that is so thoroughly engineered along scientific principles.

Incidentally, Oracle (the manufacturer) has prepared a comprehensive brochure describing and illustrating the turntable's many technical features. You should read it; it is, for a change, neither hype nor snow job. The manufacturer asked our permission to use some of our test results and terminology in his literature, and we gladly gave it.

Epilogue

Oh, yes, we almost forgot the best news of all. How much money will the Oracle, this Class 1 marvel, cost you? With his first look at the product in the flesh, anyone can see that the Oracle is, in terms of parts, design, and construction quality (not to mention aesthetic beauty), in the same class as Sao Win's remarkable turntable. An engineer's eye can appreciate this even better. Well, then, will the Oracle set you back the $2000-2500 of a Cotter or Win? No, not quite.

The Oracle will (as of this writing) cost you — you are sitting down, aren't you — (...*). That's essentially the same as the Linn ($835 U.S.), whose performance the Oracle so dramatically surpasses (by a measured factor of 634 times)! In Canada (where the Oracle is made), it actually costs $240 less than the Linn Sondek. The Oracle is an amazing bargain for the performance superiority you get, and even more of a bargain for the construction quality and engineering design you get.

How can they do it for the price? No corners are cut in materials or assembly; indeed, the Oracle is singularly excellent here. The answer is probably efficient use of automated parts fabrication techniques, such as computer controlled lathes for large scale production. The manufacturer has connections with aerospace component manufacturers, and this gives him access to advanced materials and fabrication techniques for these materials. He has invested in many expensive dies and molds to make large production volumes efficient. Another example can put this into perspective. We personally visited the shop were Sao Win has most of the parts for his turntable made. Sao's parts are carefully machined by hand on lathes by individual craftsmen, to a mirror finish from raw metal stock; but this loving extravagance and the consequent small scale production costs dearly in the final product's price (note that the Win turntable at its price also gives you electronic drive of the synchronous motor, while the Oracle does not).

Speaking of which, we feel obliged to give the following consumer alert. It's no secret that the Linn Sondek is exhorbitantly priced in view of the cost of the parts inside and quality of construction. But

* See your Oracle dealer for current pricing informations

audiophiles have gladly paid whatever price has been asked for the Linn (this price has kept rising), and have bought all the factory can produce, because of the Linn's superior sonic performance to other turntables. The Linn Sondek's performance edge alone has supported an inflated price, and supported its used market resale value and hence its value as an investment. But, now that the Linn no longer has a performance edge, and is indeed dramatically inferior to at least one other turntable at a competing price, it must fall back on its true parts and construction value.

The Oracle, in contrast, offers enduring value in parts and construction as well as sonic performance. If you can possibly see your way to budgeting(...*)for the turntable in your system, you have yourself a steal. If the Oracle is in short supply at first, be patient. It's worth the wait. Your music will thank you.

Editor's Note: This article contrasts the Oracle's performance more with the Linn Sondek than with any other competing turntable. As we said above, this is a compliment to the Sondek, since it was a generally accepted world standard for many years, and we've been very impressed by its sonic performance. And Linn themselves started competitive turntable A-Bing. But some people with a heavy emotional investment in Linns might feel this article is biased.

Any reply we might make ourselves, however objective, could appear to be self serving. A more convincing reply has come unsolicited from an outside expert, who is not only independent, but if anything might even have cause to belittle IAR. A ***competitor*** to IAR (another audio publication reviewer) made a special point of saying that he'd just read a preprint of the above article, and he considered it the most well written audio review he had ever read anywhere. Why? He continued that the article not only stated an evaluative viewpoint on a product, but also went on to thoroughly discuss and objectively support its evaluation, with rational arguments and then scientific measurement. We are happy at such praise, and have nothing to add. But you should judge for yourself.

We must admit, however, to a very slight case of personal bias, which influenced IAR's editor to delete two potentially inflammatory sentences about the Linn from the original text of this article. Your editor knows Ivor Tiefenbrun and Gary Warzin (the U.S. Linn importer) personally, and they're both very nice people. He allowed his personal regard for these two gentlemen and sense of common decency to affect his editing of a product review. We are by nature open and frank, but IAR doesn't need to stoop to ax-jobs to boost circulation.

To answer the usual siege of requests we receive, here is the address of the Oracle Audio Corp: 505 Industrial Blvd., Sherbrooke, Quebec, Canada J1L 1X7. Tél. (819) 566-5566.