



# regga

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# rega SOUNDS BETTER!

## INTRODUCING THE BEST LOOKING TURNTABLES YOU'VE EVER SET EARS ON!

Looking at a Rega turntable you will probably notice a distinct absence of the many gimmicks and gadgets which are currently being fitted to so many record decks. Concentrating much more on high quality, Rega has been able to keep the design simple and very effective.

At every design stage Rega has considered the effect on reproduced music and engineered the wow, flutter and rumble so that the ear is least annoyed. Thus they achieve far better music reproduction than a turntable designed only to perform well into test equipment.

For those with particular arm/cartridge interface problems both the Planar 2 and Planar 3 are available without tone arm.

The overall dimensions of the Rega turntables are 466 mm X 365 mm X 125 mm with the dust cover shut (17 1/2" W X 14 1/4" D X 4 3/4" H).

They are belt driven with two speeds, 33 rpm and 45 rpm, manual speed change and on/off switch.

## THE PLANAR 2

The combination of a glass platter and hybrid mat is an integral part of the Planar 2's musicality and isolation from mechanical and acoustic feedback.

The Planar 2 is fitted with the Rega tone arm, recognized as being one of the best and most versatile that is currently available. The arm is an excellent combination of low mass, high rigidity, lack of resonances and very low friction levels. Nearly all cartridges can be used including those with a very high compliance. Bias is achieved magnetically.

While maintaining very exacting standards of quality and sound reproduction the Planar 2 must surely be one of the most competitively priced turntables in the Hi-Fi Market.

## THE PLANAR 3

The Planar 3 has been developed to extract the ultimate in sound quality from the Planar design. The turntable is engineered from 12 mm plate glass and covered with 3 mm thick natural felt. This combination helps stop high frequency vibration feedback to the record and assists the rest of your equipment to produce a stable stereo image and clear, unmuddled sound.

Careful attention to every minor detail of assembly is important and the designer personally checks every turntable. This means that only limited quantities are available.

Adjudging the Planar 3 with arm to be the best buy in turntables, The Audiogram considers it "probably second only to the Linn Sondek LP12."

## DUST COVER

The thin and resonant nature of most lids supplied with turntables makes them quite effective receptors of air-borne energy. Rega uses acrylic rather than polystyrene or p.v.c. because of its superior rejection of acoustic feedback.

## HINGES

The dust cover hinges are Rega's own design and could more properly be termed acoustic decouplers since they are designed to effect maximum resonance isolation between lid and plinth.

## BASE

Thin sheet metal, plastic, aluminum, and/or wood box construction was rejected since the air so enclosed acted as a helmholtz resonator generating its own sound. Rega turntables use solid, one-inch-thick low resonance particle board stressed with a solid hard laminate. The result is a hard and light plinth with exceptional isolation from acoustic feedback.

## FEET

Conventional use of four feet means that unless the turntable is precisely stable the unit will rock minutely in response to feedback. Since it is impossible to rock a tripod, Rega uses three feet (this also allows ease of leveling) each consisting of three layers of rubber possessing different resonance frequencies for maximum isolation.

## THE MOTOR

The motor is a 24 pole synchronous type revolving on a mirror finished bearing shaft running in large self-lubricating bronze bearings and is controlled by a phasing capacitor specially selected for a low level of vibration. The motor is dynamically suspended on nitrile rubber mountings uniquely designed to give 3 different vibration isolating frequencies. Because of low turntable bearing friction the motor revolves at almost half power, further reducing its noise and vibration output.

## THE DRIVE SYSTEM

The drive system consists of an injection moulded plastic pulley and hub coupled by a round section rubber belt. The use of relatively inert materials in the coupling system effectively isolates the metal motor and turntable spindle and eliminates the transmission of metallic resonances from these parts to the stylus.

## THE BEARING AND SPINDLE

Conventional practice is to utilize a resilient thrust pad to decouple the platter shaft from the plinth in an attempt to isolate resonances. This can be quite effective although Rega Research found that it also decouples the stylus from the record groove and deteriorates bass reproduction. Rega therefore utilizes a unique steel ball thrust pad for a direct coupling and tighter bass reproduction.

On the thrust pad in a bath of thick high pressure oil is a 5/16 inch diameter spindle which is precision pressed in the hub and revolves in a diamond lapped bearing that retains a lubricating film between bearing and shaft giving an 'oil' bearing with no lateral metal contact.

## THE PLATTER MAT

The traditional practice of using metal platters necessitates the use of a thick "lossy" rubber mat usually containing ribbed circular rings to suspend the record and damp out the metallic resonances of the platter. For the same reason that it is undesirable to use a resilient main bearing thrust pad, this decoupling of the stylus from the record by the thick soft rubber pad results in loss of bass detail and tightness.

Rega Research has developed the technology for manufacturing plate glass platters which have very different and more easily controlled resonance characteristics than metal. An added benefit is that the precision inherent in float glass can only be achieved in metal through expensive precision machining. To damp out what resonance does exist, the Planar 2 uses a thin hybrid mat which preserves bass tightness and avoids the small resonant cavities formed when a record is played on a circular-ribbed mat. These cavities resonate in response to the resonances generated by the stylus as it traverses the record.

The Planar 3 utilizes a 3 mm thick felt pad which more ideally suits its slightly thicker (12mm, 4 1/2 lb.) platter and allows tag cueing. The combination of glass and felt helps stop high frequency vibration feedback to the record and allows for the production of a stable stereo image and clear, unmuddled sound.

Rega turntables do not have electronic speed control since this invariably degrades the audible performance. Rega uses a synchronous motor which locks on to the mains frequency and hence cannot be less accurate than electronic speed control that uses as its reference a neon light illuminated at a rate determined by the mains frequency. Speed control via a neon light can therefore be no more accurate than the tolerance of the supply voltage which is itself inaudible.

Furthermore, speed control usually exists primarily to correct drift which is itself the result of the electronic parts warming or aging. To overcome this irony manufacturers are introducing feedback systems based on references independent of the mains supply i.e. quartz crystals. The quartz crystal produces a reference which is compared to the revolving platter. An error signal is produced which indicates the amount of correction required.

This type of speed adjustment, however, is still capable only of correcting relatively slow speed drift and is wholly inadequate when dealing with the audibly offensive high frequency flutter caused by the momentary slowing of the platter as the stylus encounters a high frequency transient. Turntables utilizing feedback error for speed adjustment will inevitably further degrade the performance when encountering these

flutter-producing transients. This is because speed correction does not take place until after the transient information is traversed by the stylus and an error signal derived. Speed correction takes place after it is no longer required and therefore creates its own error which requires subsequent correction. This constant modifying of the signal exacerbates the annoying high frequency flutter which the system was supposed to correct. In addition, the sophisticated electronics required for this self-defeating exercise are less reliable and more subject to aging than the rest of the turntable. The circuit boards themselves are also the source of unwanted resonances in many electronic units.

## DIRECT DRIVE

It is not necessary to engage in the best drive vs. direct drive controversy in order to make a very bold statement: **Rega turntables are superior in their audible performance to any direct drive in, or remotely approaching, their price range.** This is not due to any inherent superiority in belt drive design but rather that the predominant research focus on direct drive and sophisticated speed correction has been at the expense of other more audibly important areas. Rega Research recognized this situation and designed a complete acoustic system based on its ability to reproduce music accurately in the manner most subjectively satisfying and fatigue-free to the listener. It is the achievement of this design goal which gives Rega turntables their sonic superiority.

## SPECIFICATIONS

Manufacturers provide quantitative measurements of turntable performance in the naive belief that this information will aid the consumer in making an intelligent, rational and audibly satisfying choice among a myriad of competing products. What turntable manufacturers neglect to state is that the wow, flutter and rumble specifications they provide bear little or no relationship to the 'sound' of a turntable. No one understands, in quantitative terms, the relationship between traditional parameters of turntable performance and the subjective enjoyment of music reproduced on a turntable. This is because the ear is capable of resolving subtle nuances in musical reproduction which defy measurement. The result is that many turntables on the market today are designed to produce impressive statistics but are incapable of reproducing music with a high degree of accuracy and a minimum of subjective annoyance. Rega turntables are the antithesis of this design approach and all engineering trade-offs are entirely related to their effect on perceived audible performance.

On Rega turntables wow, flutter and rumble are so low that there is presently no known method of accurately measuring them or of relating these measurements to sonic performance.

## LIMITATIONS OF SPECIFICATIONS

### WOW AND FLUTTER

Wow is slow speed variation usually of 10 Hz or less and flutter is higher speed variation usually measured at a single frequency around 3kHz with a sine wave record. Of the two, wow is easier to measure and, as touching the edge of a turntable or playing an off-center record will demonstrate, audible wow is very annoying. The point however is that wow is only annoying if it is very obvious—usually 0.2% to 0.3% (a figure up to 10 times that usually claimed for modern turntables). The ear is therefore relatively insensitive to moderate amounts of wow.

Flutter presents quite another problem because the ear is more sensitive to its presence, so sensitive in fact that it can discern flutter components which defy measurement. In addition, higher frequency flutter components are more annoying to the ear than are those of lower frequency. In an attempt to measure these minute quantities, increasingly sophisticated test equipment is introduced. The sensitivity of the test equipment required is such that it is susceptible to electrical mains interference, seismic vibration and surface noise on the test record. In attempting to separate the wow from the flutter component or the lower frequency flutter from higher frequency flutter, additional sensitive test equipment must be introduced which in turn compounds the overall inaccuracy of the measurement.

The paradox of course is that to obtain a figure with any pretense of accuracy, the wow and flutter components are lumped together thus rendering the specification all but meaningless. Because of the differing sensitivities of the ear to wow and flutter, a turntable with an impressive overall specification containing a high flutter component will sound worse than one with a poorer overall specification but which contains a lower flutter component. This is but one contributing factor to the specs well, sounds terrible syndrome so common in high fidelity today.

## RUMBLE

Rumble is unwanted low frequency noise generated by the main bearing and the motor and includes the hum field from the A.C. motor or the D.C. transformer. For the following reasons conventional rumble tests are completely useless for the purpose of comparative sonic assessment of turntables. Given the impossibility of producing a rumble-free record, rumble tests must be made with a test record which itself contains rumble. Furthermore, the rumble component of a turntable may be cyclic (33-1/3 r.p.m. and harmonic multiples thereof) or random in nature. The rumble component contributed by the hum field will also vary as the cartridge traverses the disc and moves in relation to the hum field source. A cartridge must be used which is itself non-linear and the rumble figure will fluctuate in response to turntable-arm-cartridge interface related variables.

If turntable rumble is exactly in phase with the rumble on the test record the final result will be exaggerated while if it is out of phase cancellation will occur and an impressive specification will result. Under test conditions there will likely be some degree of phase difference so that any number of frequency components will result. Under dynamic music conditions the result of these successive cancellations and additions will be that musical information will be removed, exaggerated or distorted.

The use of weighted rumble measurements also further obscures the relevance of this specification by ignoring subsonic rumble. Subsonic rumble may excite arm-cartridge resonances, cause mistracking, suck out the power amplifier power supply in an effort to reproduce this rumble, and result in large excursions of the speaker cone which cause considerable IM distortion.

## WHY REGA TURNTABLES SOUND BETTER!

Recognizing the limitations of conventional specifications was a liberating experience at Rega Research for it allowed them to concentrate on previously neglected or unknown parameters which do affect sound reproduction but do not lend themselves to quantifiable measurement.

Research revealed that the most important neglected parameter was the distortion caused by acoustic feedback at all gain levels and all frequencies. The taming of this feedback information is in turn intimately related to an understanding and control of resonances generated by the stylus and motor and excited in all parts of the turntable by feedback information.

In the development of Rega turntables conventional specifications were used only as a guide, and the choice of turntable design philosophy as well as the selection of individual components was made entirely on the basis of their contribution to audible performance. **The Rega turntable is therefore a synergism: the overall sonic achievement is greater than the sum of its parts.**

## THE **Rega** R100 CARTRIDGE

The Rega R100 cartridge was developed to afford the listener more emotional enjoyment than any cartridge in and beyond its price category. Rather than concentrating on one specific aspect (trackability, frequency response, stylus shape, etc.), all too often at the expense of the overall performance, Rega designed the R100 cartridge to retrieve musical information with a dynamic realism yet full-bodied smoothness typically found only among more expensive moving coils.

The R100 is exceedingly versatile and will perform admirably in inexpensive record changers as well. Often the R100 will prove the simplest and least costly method to upgrade a playback system.

To evaluate what the Rega will do for your system, have your dealer play your cartridge and then the Rega. Just ask yourself which cartridge sounds more emotionally satisfying. After all, the purpose of any hi-fi equipment should be to maximize the excitement and pleasure of reproduced music. We think you'll agree that the Rega R100 succeeds commendably in achieving this goal.

## SPECIFICATIONS

<b>Weight:</b>	6.2 grams
<b>Frequency Response:</b>	From 1Hz to 20kHz plus, limits dependent upon amplifier input stage and velocity, acceleration, and wave form of applied frequency
<b>Output Voltage:</b>	4.5mV at 5 cm/sec
<b>Stylus Shape:</b>	Super hypo catino ellipsoid
<b>Compliance:</b>	Static compliance circa 25 cu
<b>Vertical Tracking Force:</b>	1.5 g — 2.0g (optimal 1.75g)
<b>Recommended Capacitance:</b>	300—350 pF at phono input stage