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TURNTABLES, ARMS & CARTRIDGES 1987

BY PAUL MESSENGER & MARTIN COLLOMS

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EDITOR: *Paul Messenger*
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ADVERTISEMENT MANAGER: *Dave Kay*
AD SALES EXECUTIVE: *Hilary Wells*
PRODUCTION ASSISTANT: *Claire Dudley*
PUBLISHER: *Marianne McNicholas*
PHOTOGRAPHY: *Derek Gouard*
COVER: *David Chambers*

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EDITORIAL

Record players still form the heart of the serious hi-fi system, so in many senses this is the most important issue in the *Hi-Fi Choice* series. The arrival of CD confused things last year: Summer '85 saw a combined *CD Player/ Turntable & Tonearm* issue (40), then Winter '85 combined Cartridges with Turntables and Tonearms, but with the emphasis on the cartridges as the players had been recently covered. Further components from the 'high end' were tackled for last Spring's special edition *'The Collection'*.

Now we have put all this together with as much more besides into what is surely *the* definitive guide to current record playing equipment — concentrating on turntables and arms but with a good selection of the latest cartridges besides. Even though many turntables apparently remain unchanged year in and out, most are undergoing continuous evolution so the reviews need continual updating at two- or three-year intervals. Cartridges also change, but much more slowly, and normally a new model gradually usurps its market slot predecessor without formal replacement.

Consequently this combined issue is a considerable 'shoehorn' job. Space dictates that only the new cartridges plus the majority of the recommended repeats can have full reviews, and even a number of the latter have been regretfully consigned to the *Summary* section.

There are some changes in the reviewing procedures too. Returning to the editorial patch of carpet, I can no longer carry out *Choice's* cartridge reviewing unaided, but am equally unwilling to dilute my involvement. Therefore, this issue is now a joint operation between Martin Colloms, his assistant Paul Crook, and myself. The work was carried out in Martin's lab and listening facility, but I was closely involved in the auditioning, and have done much of the collation and writing up. It is an arrangement which seems to be working rather well, and will hopefully be continued in future editions.

It does mean that the cartridge tests are less strictly comparable with the findings of earlier years, both in the measurement techniques and sound preferences. But they're pretty damn close! Martin and I may have different tastes, but we don't differ greatly in sorting the wheat from the chaff — and his lab work is certainly better than mine!

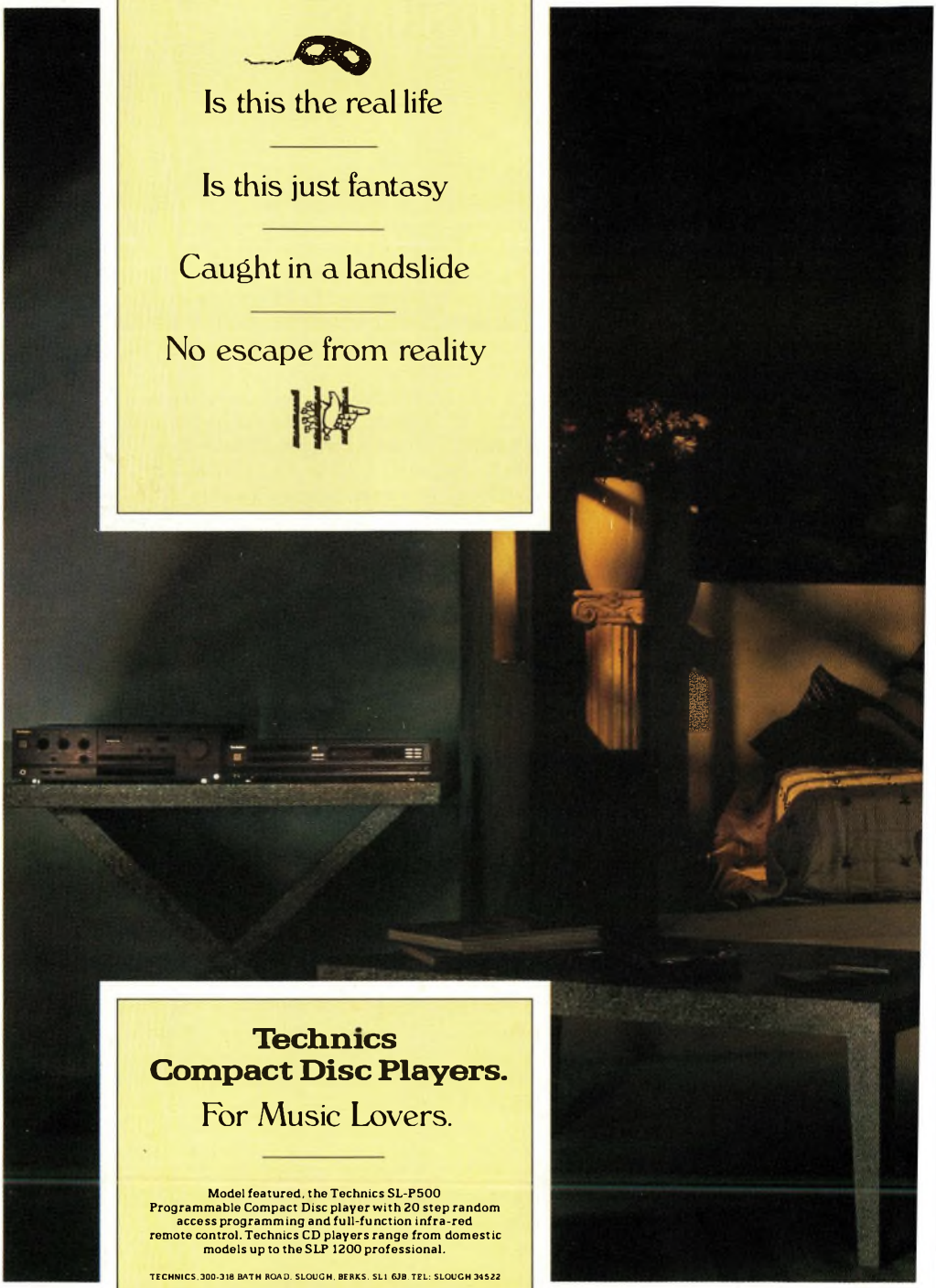
A five-year gap between my involvement in *Choice:* Turntables *etc* gives a longer view that is fascinating. No longer do we have to find space every year for a horde of freshly facelifted Japanese product. Barring a few honourable exceptions they are now so CD and System oriented that their turntables are very much an afterthought, and those that do win through do so as much on price as performance. Instead, a veritable marketplace of specialist UK product has moved in, providing most of the leading performers from £100 upwards. And the moving-coil now reigns supreme amongst cartridges costing over £50 or so.

Now that hi-fi has again become more of a passion than merely a branch of consumer electronics, much more attention is being paid to the really expensive products. It is not necessarily a trend we condone unreservedly, sitting as it does a little uneasily with our value-for-money philosophy. But it represents the mood of the marketplace, so the exotics are given their chance along with the more practical and mundane.

Most took the opportunity, risking our scepticism, while those who opted out should be considered guilty until proven innocent — under *caveat emptor* and all that. And we haven't even given them much extra space to breathe in this A5 edition — cramming the *Airtangent* and Oracle *Delphi* into 2½ pages is pushing it I admit. Still we'll put back the padding and give them a big pretty layout in our next 'high end' edition *The Collection*, due out February 1987.

Paul Messenger

Excerpt from "BOHEMIAN RHAPSODY" composed by Freddie Mercury



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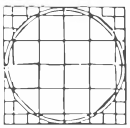
Source  Odyssey Engineering

THE QUEST FOR PERFECTION

As readers of this publication can see, analogue is thriving. By its nature, only analogue media and technology is capable of the innovation and improvement which is the essential purpose of high fidelity equipment and industry. CD will remain valid as a convenient and practical audio product, comparable to a midi-system in relation to separate hi-fi. In sonic quality CD is impressively clean and silent but no CD player can provide the low level harmonic content nor high frequencies, nor the dynamics all of which characterise true music as distinct from a clinical "bare" sound. Both the treble and bass content of good analogue equipment is authentic and exciting, and results in the emotional satisfaction which CD lacks. Feelings run high on both sides of the argument, and the issue is crucial to the future of hi-fi.

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CONSUMER INTRODUCTION

Despite the claims of more recent rivals, the LP disc has remained the prime source for music lovers for over 30 years, building a vast historical repertoire which will ensure it continues to have a future for present and future generations. The format has not been without its ups and downs (remember quadraphony), but the last ten years have seen continual and substantial improvements, not so much in the discs themselves, but in the quality obtainable on replay.

The current situation is ideal. LP discs are comparatively cheap to manufacture and purchase, while the quality obtainable by the user depends largely on the amount of money invested in the replay equipment. As an added bonus, upgrading the equipment produces improved sound quality from all the discs in the collection, while the buoyant secondhand LP market shows that repertoire will continue to be available whatever the future development of alternative media.

During the 'bad old days' of the 1970s, the LP came under strong attack as a result of indifferent manufacturing quality control. Lack of surface defects allowed the Musicassette to make a strong challenge, but with hindsight it may be seen that much of the problem with LPs came from poorly designed and matched replay equipment. This is not to say that a good quality record player can overcome all the inherent problems of the vinyl disc, or all the ravages of time and mistreatment. But it is true to say that a carefully chosen specialist player can emphasise the musical values and go some way towards avoiding the engineering limitations.

Such a claim may sound a little far-fetched, particularly to those who suffered the worst excesses of the direct drive period of turntable design. But the marketplace itself provides the justification: ten years ago the specialist UK turntable barely existed; now a dozen or more manufacturers are competing fiercely to provide a sound quality alternative to the superficially flashy but sonically inadequate products which are typical of much of Far Eastern production.

THE VINYL PROBLEM

One trouble with vinyl is that it is too effective a music storage system. The wide dynamic and frequency range of the signals which end up embedded in the plastic are a mechanical engineering nightmare to recover properly, because they are microscopically tiny — smaller, indeed, than the stylus which is trying to 'read' them. And to make matters worse, the turntable/disc is massively heavier than the stylus which is resting on it.

The cheap record player merely recovers the top few layers of information, the loud bits and the bass bits in particular. It can handle the quiet and trebly bits too, but if a loud bit comes along it is apt to 'swamp' the mechanics of the system, creating unwanted vibrations within the arm, cartridge or turntable which are much larger than the delicate subtleties of the record groove that the cartridge is trying to read. It is therefore hardly surprising that all record players are inadequate. It's just that some are much less inadequate than others.

THE TURNTABLE

While the rest of the world blithely assumed that if a turntable measured well on simple but artificial test, it must sound good on music too, it was left to a handful of bright Scotsmen to literally rediscover the wheel, and its importance in the hi-fi system. That is history, but the turntable is now taken very seriously.

Some of the reasons behind this remain obscure, but any hi-fi dealer worth patronage should be able to demonstrate the substantial difference that the turntable alone can make. And a very good case can be made for devoting a substantial part of the total budget to this one fundamental component. Spending more money on a turntable may mean spending less on arm, cartridge, amplifier and loudspeakers. Each component has its own influence on the final sound, but such qualitative differences are hard to quantify, and to some degree come down to personal taste.

As for the turntable itself, its basic function is to rotate at precisely the right speed and

provide appropriate support for the arm and cartridge. This sounds simple enough, but what is easily stated as an objective turns out to be devilishly difficult to achieve in practice, for all manner of reasons. A turntable is a most effective seismograph, capable of detecting any vibrations in the record surface besides the information actually in the groove. So some care needs to be taken to provide isolation, both from the vibrations in the turntable motor and from any external environmental influences, and the quality of main bearing is clearly vital.

The drive function itself is far from simple, because the groove drag created between the disc and the stylus is variable, according to the loudness and frequencies of the actual music. A loud bit comes along and tries to slow the turntable down, but by the time it has had a chance to respond its speed has already fluctuated and the loud bit has finished — with a good chance of speed overshoot in the quiet bit that follows. And if more power is taken from the motor during the response, this will pump more and/or variable mechanical vibration into the system. The designer has to choose just the right combination of motor drive, pulley and belt construction, in conjunction with the flywheel inertia of the platter itself and appropriate isolation of the motor itself, all within the cost constraints of the marketplace.

Equally tricky is the support for the arm, and its relationship to the platter itself and the plinth system employed. The arm gets a good shaking from the cartridge when playing a record, and most good arms transmit much of this vibration on into the turntable top plate or subchassis structure. To some extent the arm and turntable should be considered together, in order to allow the energy to be dissipated so that it does least harm, but there are various different possible solutions, some of which may work better with one arm than another, or even with one cartridge rather than another.

There is no single right approach to building a turntable, because the end result comes from the skillful balancing of different compromises. Belt drive and suspended subchassis designs tend to sound good, sometimes at the expense of ease of operation and the need for careful setting up. Yet some 'solid' designs have been appearing recently which can give them a run for their money, and only go to emphasise the fact that the rules, such as they are, are poorly understood and very easily broken.

The Tonearm

Whether you call it a pickup arm or a tonearm, there is absolutely no doubt that this item, whether part of an integrated player or as a separate item, plays a major part in determining the character of sound. The performance of the tonearms is also laid bare by the unique *Choice* accelerometer impulse test, though again listening tests provide the final arbiter, and turntable termination plays a crucial role.

If it were possible to create an arm that provided a vibration-free, rigid support for the cartridge, while at the same time being light enough to allow the cartridge to follow the groove spiral, there would be no problem. Unhappily this is not possible: all lightweight pivoted beams, 7 or 9 inches long, show some vibrational modes across the exceptionally wide (three decade) span of the audio frequency range, and this is one of the factors responsible for differences in tonearm sound quality. The designer has various options in terms of bearings, tubes and termination construction, in damped or undamped operation, and in single pivot or parallel tracking. Add in the cost constraints and cook until fully baked.

Each approach has its validation in some theory or another, and sometimes even produces a result which reflects the principles employed and choices made. For example, straight line arm tubes are usually shorter and therefore more rigid for the same effective mass; free from the uncertainties of offset bias and its compensation, they give exceptional stereo imagery. But against these advantages must be set the cost and complexity, not to mention the difficulty of ensuring rigidity in a sliding bearing, and the variations resulting from the changing bearing centre. And one can construct similar arguments for and against other tonearm modus operandi.

More straightforward is the matching of arm and cartridge, based on a simple mathematical formula so that the combination has its main mechanical resonance in the range of frequencies where it will do least harm.

This resonance is a major cause of record player ills, and cannot be avoided. Damping may be present in arm and/or cartridge, but this is no cure-all. More important is to place the

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Dynamic compliance: 9.0 × 10⁻⁶ cm/dyne
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resonance low enough to avoid upsetting the bass sound quality, but high enough to avoid excitation from disc warps. The generally accepted ideal range is 8-12Hz, but carefully chosen systems can operate satisfactorily a little beyond. Lowering the resonance can improve the bass reproduction, but usually at the expense of general stability at higher frequencies, and *vice versa*.

The Cartridge

No less complicated than turntables and tonearms, the cartridge is the 'business end' of the system, but is also a slave to the bigger mechanical components. There are two common kinds of cartridge, moving magnet and moving-coil: the former tend to be cheaper but the latter better. All amplifiers cope with moving magnets, but some of the cheaper amps don't handle moving-coils — and some that try don't succeed very well.

One reason moving-coils are generally more expensive is that they are rather more difficult to manufacture. Because the mechanical engineering needed to make them work at all has to be more precise, the mechanical integrity of the generator assembly and its mounting tends to be inherently better too. Most m-c types have fixed styli whereas most m-ms have user-replaceable stylus assemblies, but the inconvenience of the fixed approach is merely another price paid for superior mechanical behaviour.

The mechanics of the generator within the body is only one element; the mechanics of the fit between body and headshell can also play a part. If the cartridge is not fixed really securely, it will of course move or vibrate at some frequency or other, and take the 'fine edge' off the sound. To have a reasonable chance of working well, the body should be designed with strong fixing lugs and a flat headshell contact surface, so that the moving stylus/generator works against the whole cartridge/arm mass/stiffness (even the turntable itself), not just a poorly secured lightweight cartridge.

Most of the cost of a cartridge goes into the stylus and cantilever, so a range may share the same body while spanning a price difference of 5X, with differing standards of cantilever, stylus and quality control. These additional degrees of refinement have little if any effect at low and mid frequencies, which have much more to do with the mechanics and engineering of the whole moving element. Improved styli can enhance high frequency performance, but only if the turntable and arm is good enough not to scramble the potential improvement. However, one additional reason for choosing a good quality cartridge is to give your precious record collection a better chance of retaining much of its original quality without deterioration. A further reason for spending a little more than rock bottom price for a cartridge is to make sure that the stylus is delicate and shaped accurately enough to preserve the record collection in the best possible condition through repeated plays.

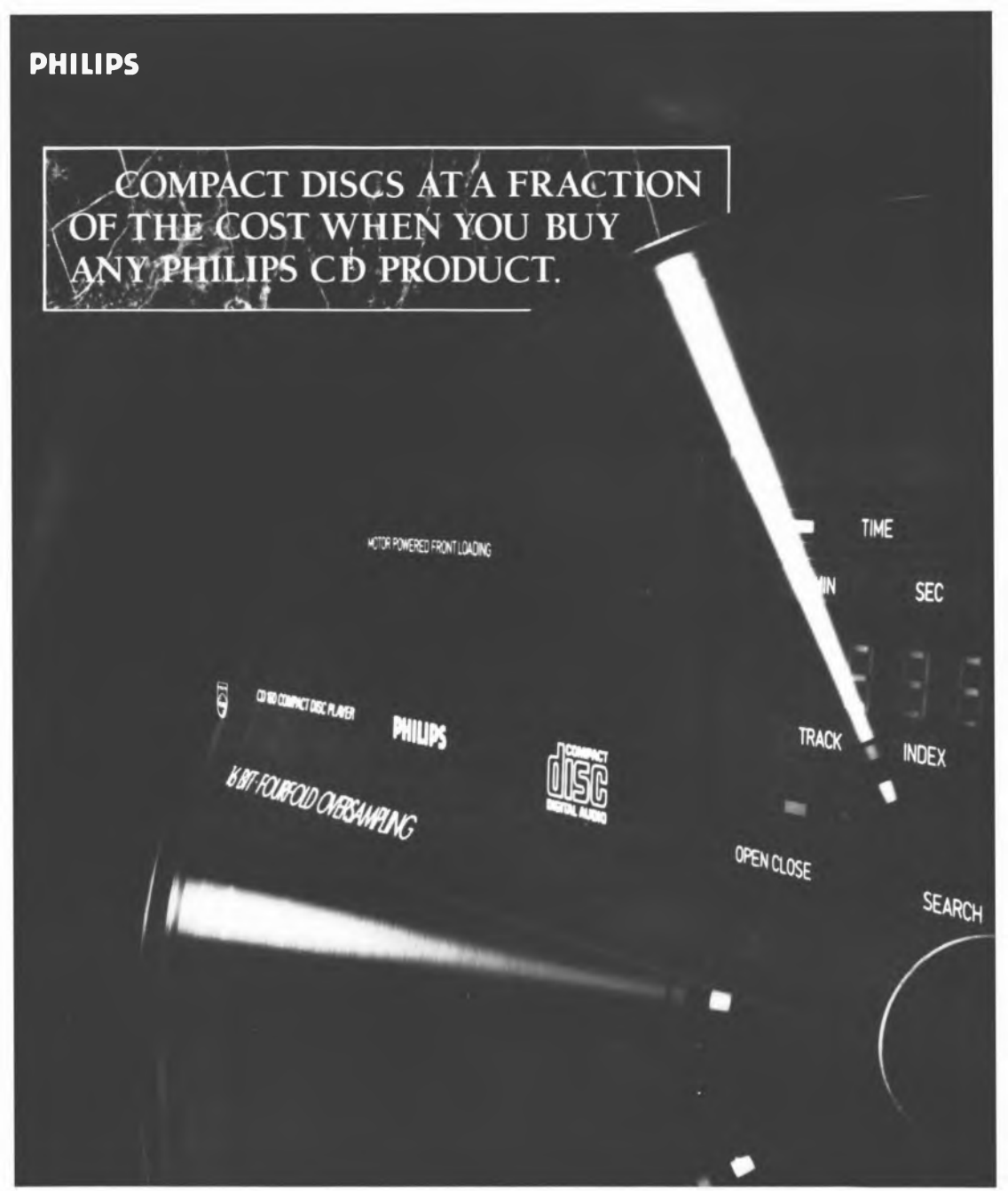
A cartridge is a transducer, changing the mechanical stylus/groove energy into electrical energy. It therefore has a specific tonal balance, which is largely determined by the frequency response and in this respect cartridge selection can be a useful technique for 'fine-tuning' the overall balance of a system. Moving magnet cartridges often have a response which is modified by interaction with the characteristics of the amplifier; this is probably undesirable *per se*, but can be similarly useful nonetheless. Frequency response can also give an indication of the inherent mechanical integrity of a cartridge, but another key measurement, the stereo separation response, reveals any shortcomings much more clearly.

Ensemble

The extensive measurements carried out in the *Choice* review programme help weed out the 'wallies', and suggest the combinations which are most likely to perform well together. Measurement also often provides backup evidence for listening findings, but auditioning remains the final arbiter.

However, individual tests cannot cover all the bases. They cannot cope with every combination, nor can they take account of the quality of the setting up. Finding a competent and conscientious dealer, committed enough to get a good sound yet sensitive to an individual's own preference, can be the most important task facing the prospective purchaser.

Paul Messenger



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TURNTABLE ARM AND CARTRIDGE TECHNICAL INTRODUCTION

The test procedures are necessarily complex, detailed, and flexible enough to allow for the individual characteristics of specific products. Although the philosophies have remained basically consistent, the techniques have inevitably evolved and become refined over the years, both in discrimination and presentation. To avoid confusion and unnecessary length, this abbreviated Technical Introduction outlines the 1986 test programme and its rationale.

TURNTABLE TESTS

Traditional measurement techniques 'proved' that most turntables were near enough perfect over a decade ago. However, subsequent listening tests have firmly discredited such measurements, and it has become clear that a simplistic technical figure of merit approach yields little information of relevance to the listening experience.

The *Choice* test programme is therefore devised to search out technical weaknesses which are known to have an influence upon sound quality, and is accompanied by careful comparative listening which frequently reveals the cause and effect of a particular engineering technique.

Simple observation by an experienced eye is often sufficient to identify certain characteristics and spot potential problems. The mechanical stability of a suspended subchassis system, and the ratio between subchassis/armboard mass and stiffness are both important factors. So is the quality of the main bearing itself, as a platter support which should be free of 'rocking' modes.

The various turntable subchassis/suspension modes are analysed using the spectrum analyser and vibrator. It is considered important that these modes should be placed outside the typical arm/cartridge fundamental resonance range (9-12Hz) to avoid any mutual interaction which will influence stability.

The platter mass, construction, self damping, and the choice and bonding of the mat all influence the sound, both in terms of coloration and subjective 'speed'. A disc impulse test (after Moncrieff), whereby a repeatable mechanical shock excites the edge of the disc and is analysed on the other side of the disc is most revealing of the quality of the platter support and the behaviour of the mat or platter surface as disc termination.

The thresholds for air-borne (acoustic) and shelf-borne (vibration) breakthrough are measured using 0-500Hz spectral analysis of the output from an equalised cartridge resting on a disc, first when the turntable support is excited by a mechanical impulse, and secondly when the turntable is 'bombarded' by a high level acoustic impulse. A split display allows the two to be compared and summed, and it is worth noting that a smooth, even characteristic is more beneficial than one which is good at some frequencies but poorer at others. Both graphs have a 60dB range with −90dB baselines, and the frequency axis is linear rather than the more usual logarithmic display.

The main sources of unwanted vibration and noise in a turntable are the motor and the main bearing, while hum fields are a form of electrical noise that may have similar influence upon the magnetically sensitive cartridge. A precision 'rumble coupler', developed by Thorens, allows resolution down to −80dB, well below the −65dB of the best conventional disc and −73dB of studio master lacquers. Spectral analysis is again employed, giving a far more meaningful and useful result than a single 'figure of merit'. Twin graphs are shown, the upper showing total mechanical and electrical rumble towards the centre of a disc, the latter electrical (hum) only, largely the contribution of the test set-up.

Speed accuracy is assessed using a Matsushita master ascetate and an advanced B&O

(Instruments) WM1 wow and flutter meter. Additional assessments are made of wow and flutter separately, along with absolute speed accuracy and the reaction to a transient load increase (on application and upon removal, to check for servo overshoot).

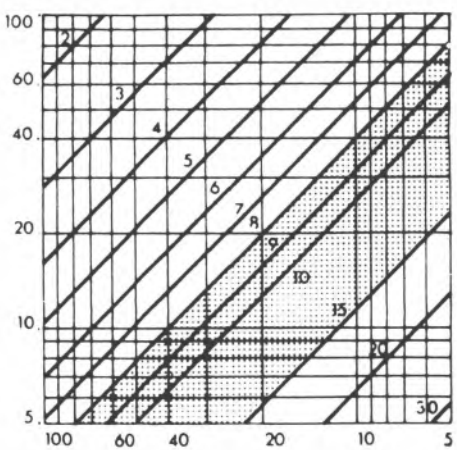
Tonearm Tests

Informed inspection again reveals a great deal about the potential of a tonearm. The self-damping or otherwise of the materials used, the quality of mechanical junctions between headshell and arm tube, between arm tube and bearings, and between overhang and counterweight, plus the quality of the bearings themselves all help build up the picture.

Geometric accuracy can be established when the arm is fitted correctly to a turntable. Some provision for adjustment may be helpful in optimising the performance of the cartridge (though the need to use it is a reflection on poor cartridge assembly), and there is always a difficulty in combining maximum rigidity as well as a range of adjustment. (An American audiophile obsession with raising and lowering the rear pillar in order to attempt to adjust vertical tracking angle has compromised more than one potentially good tonearm.)

Effective mass or inertia of a tonearm is a vital parameter that plays a part in determining the frequency of the fundamental arm/cartridge resonance, calculated by adding in the cartridge mass and compliance. Typically, high compliance (c30+cu) need low effective mass tonearms (5-9g), while lower compliance cartridges (12-25cu) work best with medium mass arms (8-15g). Most arm and cartridge reviews carry reference to matching, and individual combinations can be calculated from the accompanying graph (Fig X).

The structural rigidity of the complete tonearm is the major key to the character of the sound it can produce, provided it is used on a suitable turntable. A standard cartridge of good mechanical integrity and average (18cu) compliance was fitted in each tonearm with an accelerometer attached to the headshell. The



Arm and cartridge resonance matching: the low-frequency resonance of an arm/cartridge combination can be calculated from the arm effective mass, cartridge mass and cartridge compliance. Add together the arm and cartidge masses, and draw in the corresponding vertical line. Then draw in a horizontal line corresponding to cartridge compliance. Where the two lines intersect, the resonant frequency can be read from the diagonal scale. The shaded area is the optimum area within which the lines should intersect.

output of the accelerometer was then fed to a spectrum analyser while the arm is subjected to a mechanical impulse, the resultant analysis showing the various breakup and resonance modes within the arm structure.

Other important considerations include the calibration accuracy of downforce and bias compensation mechanisms, and bearing friction. Most recent conventional arms use heavily pre-loaded ballrace bearings to improve rigidity, but the pre-loading needs to be adjusted very precisely to avoid increasing friction to an undesirable level.

Cartridge Testing

Once again simple observation provides many clues to the likely performance of a cartridge, in certain areas at least. The rigidity of the mechanical structure and the ability to bolt a large flat area tight against the headshell are important elements in the performance of a high quality system, as is the fit of a stylus assembly in detachable stylus models. Further inspection is extended to the stylus itself, its set and polish, and the internals of moving-coil cartridges, using a long focal length microscope.

Many of the fundamental performance characteristics of a cartridge can be measured using the Ortofon *TC3000* cartridge test computer, with its associated test records. This provides simple spot frequency data on relative output, channel balance, tracking ability, stereo separation, and high frequency response. Examination of the results and comparison of left and right channels provides important data on the sample's micro-engineering precision.

Further tests ascertain the highest point of the arm/cartridge fundamental resonance and the magnitude of the resonance rise, expressed separately for vertical and lateral planes. From the known effective mass of the test arm, and the mass of the cartridge, the dynamic compliance at resonance can be calculated, and information gleaned about the level of damping and mechanical symmetry of the generator

TWO FOR THE FUTURE

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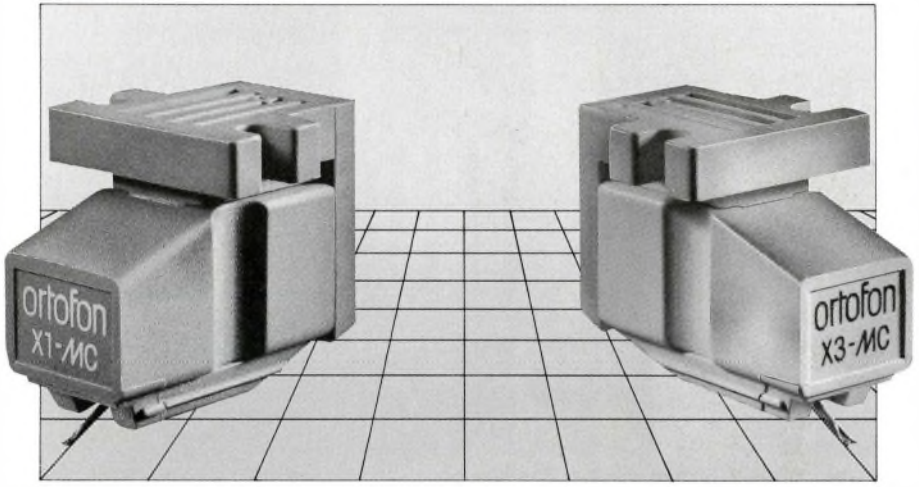

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mechanism.

Additional full range frequency response and stereo separation measurements are taken, using the JVC *TRS-1007 II* test disc with pen chart recorder and spectrum analyser. Note that earlier reprinted reviews were measured using the middle of side bands, while new reviews were tested using the outside bands of the disc, giving a systematic difference in output very high frequency of c3dB. The chart recorder is run at low and high pen writing speeds, the latter helping to identify any undesireable mechanical defects in the cartridges. High impedance moving magnet designs are also checked for the effects of changes in amplifier loading upon their responses. The separation spectrum provides valuable information on generator symmetry, mechanical integrity, and the unwanted generation of ultrasonic spuriae.

Listening Tests

Though various listening combinations were used during the course of the tests, the core system components on this occasion were as follows: Audio Research *SP11* pre-amplifier, Audio Research *M100* monoblock power amplifiers, special bi-wired loudspeakers (based on Celestion 600), Foundation *Reference* stands. System wiring included Siltech and van den Hul, and most components were auditioned on a Target wall-mounted spiked turntable support with Sicomin shelf panel. 'Reference' turntables included a slightly modified Linn *Sondek LP12*, Pink Triangle *PT TOO* and Roksan *Xerxes*, each fitted with SME *Series V* tonearms, while the favoured reference cartridge was the van den Hul MC *One*.

Amongst a variety of music discs reflecting a similar variety of tastes, favourites included: Vivaldi's Four Seasons (Mariner/ZRG 654) Argo, Clannad: Magical Ring (RCA PL7000), Ricky Lee Jones (Warner K56628) Mendelssohn's Hebrides Overture (Maag/LSO/Decca SFA503), Grandmaster Flash etc: The Message (PPT SHLP1007).

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ACOUSTIC RESEARCH EB101

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Following the successful relaunch of the classic AR deck (now the *Legend*), Acoustic Research UK developed this further *EB-101* model, with vinyl 'black ash' finish and a steel girder subchassis substituting for the aluminium original. A new arm commissioned from Japan is factory fitted to provide a complete integrated player. For the review, a modest cartridge was also included, the whole selling for around £190, a considerable saving over the original model, equivalent to throwing in the arm and cartridge free.

This deck has rather a dark appearance, and comes with a low resonance tinted PVC cover on sprung hinges. The two-piece alloy platter has been retained while tolerances have been improved on the bearing, as well as in other areas. The robust arm has a firmly clamped headshell using a locking sleeve; its bearings proved free from play, an important aspect. Fully suspended, the chassis moved very freely and promised good acoustic and vibration isolation.

LAB REPORT

The total platter mass was close to 2kg, healthy for the price category, with the two part construction offering good mutual damping. Tested for disc impulse, the initial transient was quick with a fast decay and no low frequency hangover.

Speed change is manual, on lifting the outer platter. At 33⅓ the deck ran nearly 0.5% fast, which was satisfactory, while slowing under load was held to a fine 0.25%. Long term drift was negligible with the synchronous motor employed. DIN peak weighted, the overall wow and flutter was a fine 0.09%, with similarly low individual contributions from the wow and flutter components. Start up was a fairly rapid 3.5 seconds, and the player clearly had healthy torque. DIN B rumble measured very well, at −77dB. Little breakthrough was evident since the electrical and mechanical spectra matched well; just a hint of motor vibration was evident at 200Hz. The high quality suspension was demonstrated by the excellent breakthrough responses for both acoustic and vibration excitation; here the unit was clearly up with the best modern examples.

Turning to the arm, the robust headshell was nominally detachable but did not come with a plug and socket. Rotational adjustment is allowed, as well as overhang and lateral tracking angle. Effective mass was in the medium to high range at 13.5g including hardware, and consequently suited to fairly low compliance cartridges.

Charted for arm resonances with a Shure moving magnet cartridge, the first break appeared around 700Hz, with the overall behaviour looking quite tidy, particularly at higher frequencies. Bearing friction was quite low, 40mg lateral and 20mg vertical, while sensible bias levels were also established. Downforce calibration was accurate while the arm cue device operated well.

SOUND QUALITY

There was no doubt concerning the high subjective merit of this player. The sound was notably well-focused, with good stereo stage width and depth. Transients were reproduced with good speed and attack, while the overall

effect was lively, with well differentiated dynamics. The bass was quite good, articulate as well as extended, with considerable detail apparent. Overall the tonal balance seemed well proportioned while the supplied cartridge was quite tidy itself and did not let the deck down.

Conclusions

This belt-driven turntable offers a remarkable package. A genuine high fidelity product, it had no significant subjective or lab-tested weaknesses. Its rigid arm, good platter and drive, with a fine, effective subchassis, are complemented by a workable cartridge, which will happily benefit from upgrading at some future date if so desired. Pricing is also very competitive, and a Best Buy rating the logical outcome.

Test Results

Motor section	Integrated player
Type	belt-drive, subchassis
Platter mass/damping	2.0kg/good
Finish and engineering	very good, very good
Type of mains connecting leads	3 core/phonos plus earth
Speed options	manual change, 33/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.09%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.1%/0.07%
Absolute speed error	+0.45%
Speed drift, 1 hour/load variation	negligible/−0.25%
Start-up time to audible stabilisation	3.5 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−77dB
Arm section	
Approximate effective mass, inc screws, excl cartridge	13.5g
Type/mass of headshell	special/9.8g
Geometric accuracy	very good
Adjustments provided	tilt/overhang/offset
Finish and engineering	very good/very good
Ease of assembly/set-up/use	very good/very good/very good
Friction, typical lateral vertical	40mg/20mg
Bias compensation method	internal spring
Bias force, rim/centre (set to 1.5g elliptical)	225mg/275mg
Downforce calibration error, 1g/2g	−0.05g/−0.1g
Cue drift, 5mm ascent/descent	negligible, 1.0 secs/2.5 secs
Arm resonances	fairly good
Subjective sound quality	see system result
Arm damping	decoupled counterweight
System as a whole	
Size (w×d×h)/clearance for lid rear	44×38.5×16cm/7cm
Ease of use	good
Typical acoustic breakthrough and resonances	very good
Subjective sound quality of complete system	very good
Hum level/acoustic feedback	low/very good
Vibration sensitivity/shock resistance	excellent/fairly good
Estimated typical purchase price	£199 inc cartridge

For graph references see issue No. 43

RECOMMENDED

AIRTANGENT/ORACLE DELPHI

ABSOLUTE SOUNDS, 42 PARKSIDE, LONDON SW19.
TEL: 01-947 5047

The excuse for combining these products is that they are handled by the same importer (Absolute Sounds), and were supplied as a system (with Koetsu *Red*). The *Delphi* was covered in great detail last Spring in *The Collection*. *The Airtangent* is an exciting and interesting brand new product — not to mention the most expensive tonearm we have yet encountered (£1350!). Accordingly we will concentrate on the latter, while giving brief coverage to the Oracle besides.

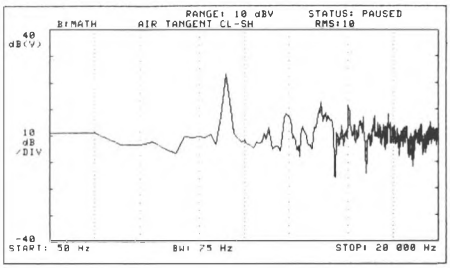
Possibly Sweden's first real contribution to high end hi-fi the *Airtangent* is a linear tracking air-bearing tonearm, very elegantly engineered and presented. A 'normal' arm mounting supports the substantial air bearing rod and damping trough set at a tangent to the platter. The arm itself is a rigid, lightweight tapered beam, symmetrical in plan with a choice of counterweights. Wired with silver van den Hul leads, these may be unplugged and the arm slipped off for cartridge removal — or replacement by a second arm fitted with an alternative cartridge.

Linear tracking arms have certain characteristics that distinguish them from conventional pivoted designs. No bias force is generated, so the arm happily stays precisely in the centre of the groove. Simplicity dictates a 'passive' design where the arm is dragged across the record during play, so a very low friction horizontal sliding bearing is needed — hence the air-bearing. But to work properly this must always be horizontal, even though the whole arm mass shifts during play. Clearly, low mass subchassis turntables are not a good match.

Another inherent problem is the difference between the vertical and horizontal effective masses, the former the usual pivoted value, but the latter the whole arm mass. The low horizontal arm/cartridge resonance is why linear air bearing arms have horizontal fluid damping troughs. And there is one other significant practical problem — where to put the air pump, a noisy device that normally blows bubbles into a fish tank. The best answer is the next room. Given the will to grapple with the set-up procedures, the *Airtangent* shows solid precision engineering and is very nice indeed to use.

Lab Report

Given the fine tolerances it was impossible to detect play in the air-bearing, and friction was completely unmeasurable. The vertical effective mass worked out at a low/medium 7.5g, suitable for almost any cartridge. The arm resonance graphs under 'standard' conditions showed an impressively smooth, even energy trend, with a single major break at around 800Hz. Another two spectrograms (not shown) compared the accelerometer on the arm bearing sleeve with it placed nearby on the actual airbearing shaft. Results were near identical, so a likely implication is that the bearing is very efficient indeed.

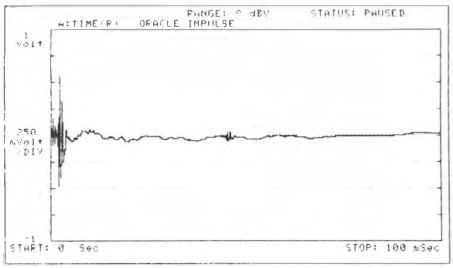


Tonearm structural resonances.

Sound Quality

In the context of the reference system and room, and taking account of the influence of the different turntables, the *Airtangent* scored the highest marks yet, by a small but comfortable margin. Midrange depth, focus and resolution were quite remarkable, coloration was very low indeed, and

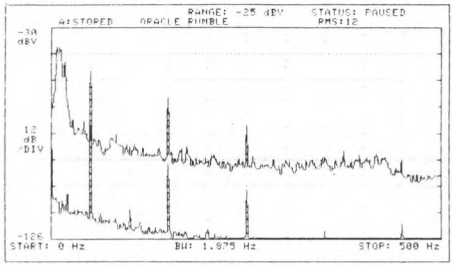
Continued over page



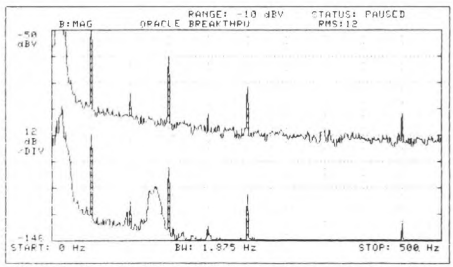
Disc edge mechanical shock.

Test Results

Motor section	Oracle Delphi
Type	electronic, belt, subchassis
Platter mass/damping	2.8kg/excellent
Finish/engineering	excellent
Mains/connecting leads	2-core, phono sockets + earth
Speed options	33⅓, 45rpm
Wow & flutter (DIN pk wtd)	0.04%
Wow & flutter (lin pk wtd)	0.01%/0.06%
Absolute speed error	+0.1%
Speed drift/load variation	<0.5%/−0.1%
Start up to stability	7.5 secs
Rumble L/R (DIN B wtd)	−81dB/−76db
Tonearm	Airtangent
Effective mass (approx)	7.5g (V), 60g (l)
Type/mass headshell	fixed
Geometric accuracy	excellent
Adjustments provided	height, lateral
Finish and engineering	excellent
Ease of set-up/use	quite difficult
Friction (typical lat/vert)	unmeasurable (excess lead torque)
Bias method	n/a
Bias force, (rim/centre set to 1.5gE)	n/a
Downforce error, 1g/2g	n/a
Cue drift, 8mm up/down	negl, 1 secs/4 secs
Arm resonances	excellent
Sound quality	excellent
Arm damping	silicon though, cwt decoupling
Whole system	
Size (w×d×h)/lid at rear	48×36×16cm/8cm
Ease of use	average
Acoustic breakthrough, resonances	excellent
Sound quality	good/excellent (see text)
Hum/acoustic feedback	excellent
Vibration, shock sensitivity	V good
Typical price	£1350, £1400



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

Airtangent/Oracle Delphi Continued from previous page

the sound open, clear, sweet and 'airy', with a slight 'sheen'. The bass was considered a little lightweight, however, possibly a function of the effective mass and damping.

ORACLE DELPHI

Oracle pioneered a number of new ideas when they appeared a few years ago, and the current *Delphi* has sorted out the odd weakness of the earlier versions. It is an expensive but beautifully finished skeletal design, founded on an acrylic baseplate/cover, and with properly developed peripheral tower springing system supporting the full subchassis. A 'sticky' mat and stressed disc clamp ensures tight vinyl damping. All the simple and advanced lab tests were passed with flying colours, earlier problems like slowing under load having been eliminated.

Reassessed for sound quality with the *Airtangent*, the *Delphi* was rated as highly as before, though it still comfortably made the 'good' category, particularly when placed on the Sicomin support shelf. Still rated highly on focus and control, there was criticism of a mild lack of 'life' and a slightly 'rubbery' bass quality which somehow affected overall dynamics adversely.

CONCLUSIONS

Given caveats of a set up nature, the *Airtangent* delivers the goods, so may be recommended regardless of its extravagant price. The *Delphi* is less cut and dried. Good it is; £1400 worth it is not — but then take the finish and build into account and it looks pretty good again after all.

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Better known for cassette decks and complete systems, Akai's *AP-A201* is regrettably all too typical of the Japanese 'system' turntables which seem designed to present as attractive an appearance as possible, whatever the compromises made under the skin. Front panel controls give cue and speed change, while the bendy plastic P-mount pivoted tonearm, complete with *PC35* cartridge, has auto return, plus fixed downforce and bias (as permitted by the P-mount option).

Black finished (of course) with extensive use of flimsy plastics mouldings, the moulded plinth is very lightweight and fitted with a coupled resonant styrene lid, which at least is designed without rear overhang. The base is a thin hardboard panel, and soft rubber feet make a (vain) gesture towards providing some vibration isolation. The platter is a lightweight aluminium casting, fitted with a lightweight rubber mat, sits on a fine quality main bearing, but with obvious signs of platter-weave.

Lab Report

Following inspection, it was not surprising to find significant lab weaknesses. Arm friction was difficult to assess given the fixed bias compensation, however estimates suggest it was quite good, though the bearing did show some play. The resonance graph showed multiple discontinuities throughout the midband, plus excessive damping at high frequencies.

The motor provided fine measurements for rumble, wow and flutter, even the rumble spectrogram being respectable enough. However the disc impulse revealed a major rocking resonance, and the breakthrough tests for acoustic and vibration energy represents a new low in our experience. This turntable is clearly only designed to be used as far away from vibration as possible — not on top of a stack of equipment between a pair of loudspeakers, where it will combine the roles of microphone and seismograph with some enthusiasm.

Sound Quality

The *201* predictably lived down to our expectations. It sounded 'dead' and 'smeared', had overwide stereo with little depth, poor bass weight and definition, a coloured 'hollow' mid-

range and a peaky 'spitchy' treble. On the positive side, it was quite lively but there was no real dynamic range and surface noise was emphasised. The level of microphony and lack of shock resistance made for user unease, and feedback was never far away.

Conclusions

Not the stuff of which recommendation can be made, the Akai did at least provide the useful service of enabling us to 'scale' the 'serious' specialist turntables in the context of deteriorating performance standards in the mainstream 'systems' market. (In the recent *Choice: CD Midi System* book, only one such record player merited a second look, and that Sony alas did not arrive back in time for testing in this book.)

Test Results

Motor section

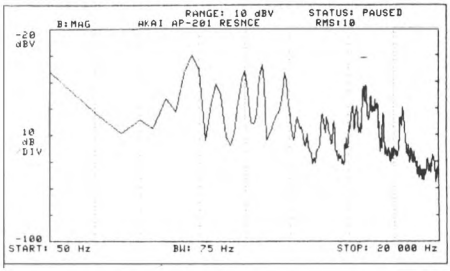
Type	auto return, direct drive, solid
Platter mass/damping	n.a./below average
Finish and engineering	good
Type of mains connecting leads	2 core/phonos and earth
Speed options	33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.07%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.09%/0.08%
Absolute speed error	−0.04%
Speed drift, 1 hour/load variation	+0.04%/−0.20%
Start-up time to audible stabilisation	3 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−76/−78dB

Arm section

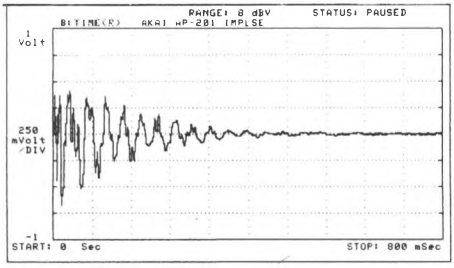
Approximate effective mass, inc screws, excl cartridge	5g
Type/mass of headshell	P-mount
Geometric accuracy	average
Adjustments provided	none
Finish and engineering	good
Ease of assembly/set-up/use	excellent/very good
Friction, typical lateral vertical	see text/30mg
Bias compensation method	spring
Bias force, rim/centre (set to 1.5g elliptical)	150mg/200mg
Downforce	set to 1.4g
Cue drift, 8mm ascent/descent	negligible, 0.5 secs/3 secs
Arm resonances	poor
Subjective sound quality	poor
Arm damping	some c/wt decoupling

System as a whole

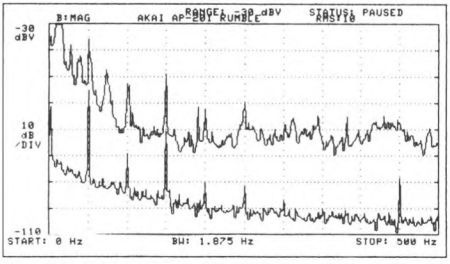
Size (w×d×h)/clearance for lid rear	44×34.5×10cm/0cm
Ease of use	very good
Typical acoustic breakthrough and resonances	very poor
Subjective sound quality of complete system	poor
Hum level/acoustic feedback	very good/poor
Vibration sensitivity/shock resistance	very poor/good
Estimated typical purchase price	£80



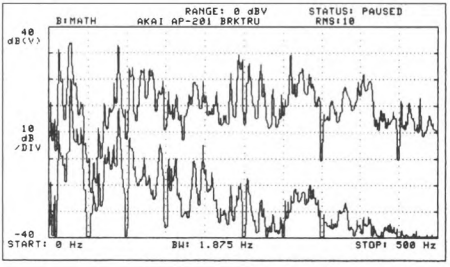
Tonearm structural resonances.



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

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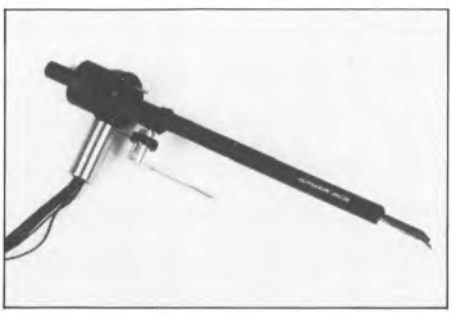
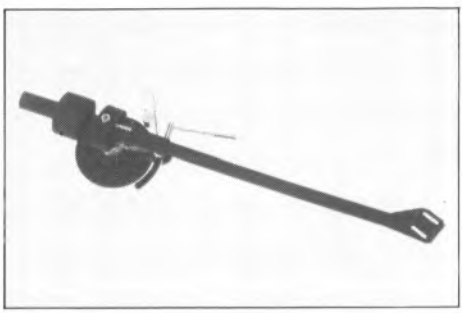




Another year, another tonearm . . . Last year *Choice* actually reviewed two new Alphasons, the £100 *Opal* and £200 Xenon. Now the *Delta* has arrived to split the gap at around £150. Leaving their top of the line *HR100S* with a page on its own (overleaf), we have decided to combine the three cheaper models together, the new model with a new full review, and its either side stablemates reprinted.

ALPHASON DELTA

More businesslike than elegant in appearance, this matt black £150 tonearm follows the Alphason tradition for high quality properly adjusted gimbal bearings, which operate through the armtube centre. As does the headshell in this instance, this flat cartridge mounting plate being grafted into the end of the generous main beam tube. Mounting is straightforward enough, and the arm is compatible with Linn bases. The counterweight is nylon lined, but effectively rigid.

Effective mass is quite high, restricting the choice of cartridges to those with fairly low compliance, notably the costly moving-coil models. Despite tight bearings, friction was better than our measurement limit in both planes. Bias was a little high, and cue descent a trifle slow, but in other respects all was fine. The resonance spectrogram shows a number of well distributed discontinuities, generally reasonably controlled, and a gently falling energy trend towards high frequencies.

Sound quality rated good, despite the fairly modest price. It was characterised by good balance and neutrality, decent bass power and timing, good focus, depth, detail and precision, albeit with a slight blurring and fizz in the treble.

Overall this is yet another highly competent design from Alphason. It doesn't perhaps stand out as clearly from its price pack as their other models, but it fits snugly in their hierarchy and fully justifies recommendation.

ALPHASON XENON

The *Xenon* owes much to the well established *HR100S*, using the same good-sounding one-piece arm/shell unit, a large diameter 'S'-shaped titanium tube, filled with a damping material. Some savings have been made in the cue mechanism, and the bias compensator as well as the exterior finish of the bearing assembly. The concentric bearing gimbal design is retained and was well aligned, offering negligible play plus very low levels of friction and stiction.

Slightly on the high side of the medium mass range, effective mass with fixing hardware approached 13g. Cartridges in the range 8-20cu are most appropriate.

Bias correction erred on the high side, resonances were few and moderate.

At first it proved hard to separate this model from the well-rated *HR100S*. The *Xenon* showed sonically solid overall control with a firm sense of image focus over a wide frequency range. The

treble was clear and finely detailed; the mid undoubtedly low in coloration with minimal 'clang' or hardness; bass was free from boom or emphasis, and stereo depth was respectably portrayed.

With Alphason's high standard of engineering, a basically good finish and a fine lab and sonic performance, the *Xenon* comes strongly recommended.

Alphason Opal

Comfortably under £100, the *Opal* nonetheless manages to maintain Alphason's high standards for solid engineering and low friction, with bearings free from play or looseness. It may be fitted *via* a single hole in an arm board, but compatibility with the popular Linn mounting is also provided.

This fixed head arm has a strong main beam fitted with a properly clamped counterweight supported on a concentric gimbal bearing. Appropriate calibrations are given for bias and downforce, and the arm falls into the medium-mass category; an effective mass of 10g was recorded.

Performing well on lab tests, this was a well aligned and set up arm. The various facilities worked well, while the bearing friction was held to excellently low levels. Rated above average for arm resonances, several audible range modes were distinguishable; for example, the counterweight at 250Hz and first beam modes at 675 and 950Hz.

The *Opal* gave a good account of itself on audition, happily meeting other rated £90 tonearms in their own territory. In tonal balance it appeared lightweight and 'airy' with some 'zinginess' in the high treble. The bass was dry and firm, while mid focus and stereo depth were both pretty good. A particular attribute was the smooth uncoloured midrange, an Alphason hallmark.

With its individual interpretation of good sound, the *Opal* proved to be a well designed and constructed British tonearm. There are no problems in recommending this one — so let's give it a Best Buy!

Test Results

Delta tonearm

Approximate effective mass, inc screws, excl cartridge	16g
Type/mass of headshell	fixed
Geometric accuracy	very good
Adjustments provided	height/overhang/lateral
Finish and engineering	very good
Ease of assembly/set-up/use	very good/good
Friction, typical lateral vertical	<20mg/<20mg
Bias compensation method	thread and weight
Bias force, rim/centre (set to 1.5g elliptical)	220mg/220mg
Downforce calibration error, 1g/2g	+0.15g/+0.3g
Cue drift, 8mm ascent/descent	negligible, 1.0 secs/3.5 secs
Arm resonances	good
Subjective sound quality	good
Arm damping	none
Estimated typical purchase price	£154

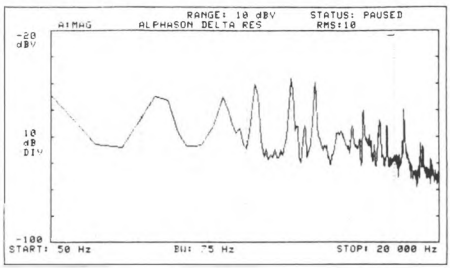
Xenon tonearm

Approximate effective mass, inc screws, excl cartridge	12.75g
Type/mass of headshell	fixed
Geometric accuracy	very good
Adjustments provided	height/overhang/lateral
Finish and engineering	excellent/excellent
Ease of assembly/set-up/use	very good/good/good
Friction, typical lateral vertical	<20mg/<20mg
Bias compensation method	thread and weight
Bias force, rim/centre (set to 1.5g elliptical)	275mg/200mg
Downforce calibration error, 1g/2g	+0.25g/+0.25g
Cue drift, 8mm ascent/descent	negligible, 2.0 secs/5.0 secs
Arm resonances	very good
Subjective sound quality	very good
Arm damping	none
Estimated typical purchase price	£196

Opal tonearm

Approximate effective mass, inc screws, excl cartridge	10.0g
Type/mass of headshell	fixed
Geometric accuracy	very good
Adjustments provided	height/overhang/lateral
Finish and engineering	very good/very good
Ease of assembly/set-up/use	very good/good/good
Friction, typical lateral vertical	<20mg/<20mg
Bias compensation method	thread and weight
Bias force, rim/centre (set to 1.5g elliptical)	240mg/220mg
Downforce calibration error, 1g/2g	+0.15g/+0.30g
Cue drift, 8mm ascent/descent	negligible, 2.0 secs/4.5 secs
Arm resonances	good+
Subjective sound quality	good
Arm damping	none
Estimated typical purchase price	£95

For Opal and Xenon graph references see issue No. 43

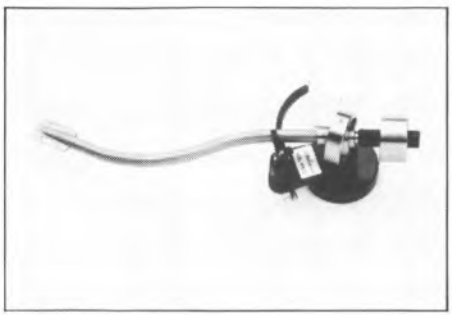


Delta tonearm structural resonances.

RECOMMENDED

ALPHASON HR100S

ALPHASON, 190-192 WIGAN ROAD, EUXTON, NEAR CHORLEY, LANCS PR7 6JW.
TEL: (02572) 76626



Now available optionally with van den Hul 'monocrystal' wiring throughout, as the *HR100S MCS*, this medium mass arm has high rigidity and uses a substantial titanium beam tube with classic 'S' shape geometry. This allows a straight join to the headshell, which is ingeniously formed from the front end of the tube, a transition that gives good interfacing of cartridge and arm.

The concentric gimbal bearings are built of hardened tool steel for maximum strength, and the pivots have bearing surfaces using ultra-hard carbon inserts, offering high rigidity with low friction levels.

Appearance and finish are very good, and the arm is supplied with a Linn *Ittok/Basik*-compatible mounting.

The Alphason's fixed arm leads are reasonably compliant, aiding subchassis cable dressing, and are fitted with gold-plated plugs of good quality. Cable capacitance was a low 95pF. The counterweight slides on a hard nylon insert with a locking socket-head screw, while the weight carrier is stiffly engaged on a threaded section allowing fine adjustment of downforce — 0.4g per revolution for the heavier of the two weights supplied.

LAB REPORT

Effective mass was in the low-to-medium range at 10g inclusive of steel fixing bolts, and the structure was notably 'dead' as well as rigid, with zero bearing play and excellent geometry. With the larger bias weight on the centre notch the compensation was sensible for a 2g downforce with the right operating ratio, while friction was very low. The cue worked well though the arm lock was rather stiff — I would prefer a separate pillar rest. Resonant behaviour was very good, indicating a low-coloration design.

SOUND QUALITY

The *HR100S* impressed us strongly by its neutral and tonally balanced performance. Treble was detailed and precisely located yet low in 'edge' or 'grain'. The midrange gave a fine rendition of vocal lines while bass was firm, extended and detailed. Stereo was very good with precise positioning and fine depth and ambience. Despite an apparent 'smoothness', transients were nevertheless reproduced with fine 'attack'.

CONCLUSIONS

Since our first review some time ago, the *HR100S* has been updated in respect of finish and tube damping. Re-auditioned for 1985-6, the standard arm showed improvements in high frequency control, while the MCS version gave worthwhile gains in clarity and definition throughout the range. Both versions can be recommended.

TEST RESULTS

Approximate effective mass, inc screws, excl cartridge	10g
Type/mass of headshell	non-detachable
Geometric accuracy	excellent
Adjustments provided	overhang/offset/height
Finish and engineering	good/excellent
Ease of assembly/setting-up/use	very good/good/good
Friction, typical lateral/vertical	10mg/20mg
Bias compensation method	thread, pulley and weight
Bias force, rim/centre (set to 1.5g elliptical)	180mg/150mg
Downforce calibration error, 1g/2g	−0.1g/−0.1g
Cue drift, 8mm ascent/descent	negligible, 0.5 sec/1.0 sec
Arm resonances	very good
Subjective sound quality	very good
Lead capacitance/damping method	95pF/none
Estimated typical purchase price	£335

For graph references see issue No. 40

The Best System

RA820BX2

RT830L

RL850

RP830

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It is made up of components that are very highly regarded in their own right as hi-fi separates – in fact, the Rotel RA-820BX amplifier won the Award in its own category in last year's What Hi-fi? Awards. Suffice it to say that this amplifier now in Mk II form, is still one of the best on the market in this price range.

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What Hi Fi. Nov. 86.

WINNER 87

WHAT HI FI? AWARDS·87

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BEST BUY

ARISTON RD60

ARISTON ACOUSTICS LTD, FREEPORT, SCOTLAND, PRESTWICK AIRPORT, PRESTWICK, SCOTLAND KA9 2RB. TEL: (0292) 76933

This new Ariston subchassis turntable is available as a £200 player with the *Enigma* arm fitted. Neat, compact and attractive in appearance, in many senses it is a 'slimmed down' economy version of the *RD90*, and again the detail design left something to be desired.

The plinth is textured Q-board, whereas the subchassis is MDF, while the moulded base is fitted with sprung feet. The slim plinth and substantial composite work leave restricted space for the inverted top-adjustable springs, which consequently lack excursion. The single piece aluminium platter is driven by a decent square-section belt, with manual speed change via the grooved stepped pulley. The lid, hinged with countersprings, is lightweight styrene, the arm mounting plate overlapped the subchassis by some 40%, and the armlead terminal board had been cracked when fitting.

LAB REPORT

Rumble was above average, but the spectrogram showed a substantial −33dB 100Hz component, and perturbations between 50 and 100Hz. Absolute speed was a high +0.75% and drift was on the high side too. 0.18% wow and flutter represents marginal high fidelity, and reflects the weak subchassis dynamics. The disc impulse damping was satisfactory enough, while both acoustic and vibration breakthrough gave eminently satisfactory results.

SOUND QUALITY

Despite the technical criticisms, the *RD60* squeezed a 'good' rating, falling only slightly short of the more expensive '90. The sound was lively, with good frontal detail and a 'tidy' top end. The bass lacked some weight and scale, and the midrange also lacked the transparency and focus of top designs, yet it remained balanced and communicative.

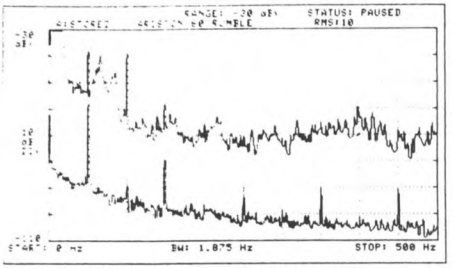
CONCLUSIONS

Despite giving the impression that a potentially better turntable is trying to get out of the *RD60*, the overall performance for the price is still good, rating Best Buy with the decent quality *Enigma* arm.

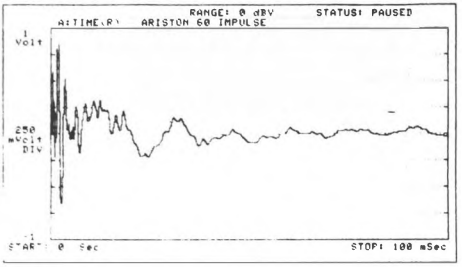
Test Results

Motor section

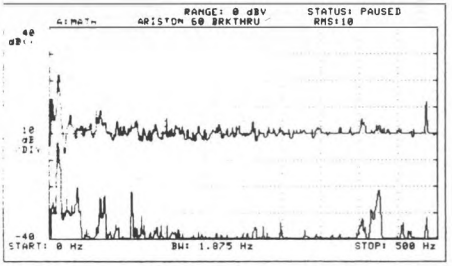
Type	manual, belt-drive, subchassis
Platter mass/damping	1.73kg/very good
Finish and engineering	good
Type of mains connecting leads	2 core
Speed options	33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.18%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.21%/0.08%
Absolute speed error	+0.75%
Speed drift, 1 hour/load variation	+0.42%/−0.1%
Start-up time to audible stabilisation	3.5 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−72/−74dB
Size (w×d×h)/clearance for lid rear	41×34.5×13cm/5cm
Ease of use	good
Typical acoustic breakthrough and resonances	good
Subjective sound quality of complete system	good
Hum level/acoustic feedback	good/very good
Vibration sensitivity/shock resistance	very good/fairly good
Estimated typical purchase price	£200



Rumble, mechanical above electrical hum.



Disc edge mechanical shock.



Breakthrough, acoustic above vibration.

ARISTON RD40Q/ENIGMA

ARISTON ACOUSTICS LTD, FREEPORT SCOTLAND, PRESTWICK AIRPORT, PRESTWICK, SCOTLAND
KA9 2RB. TEL: (0292) 76933

This complex, even mildly confusing range of turntables is based on the original skeletal *RD40*, a circular metal subchassis motor unit with outrigger tower springs and arm. Originally the cheapest in the range, the latest 'Q' incarnation is moving steadily upmarket, with improved finish and damping materials, and a string of upgrade options. The 'basic' synchronous AC motor now costs £190, the electronic DC £250. £40 buys a 'luxe' finish in various colours, £50 a heavy Mazak platter, £8 a disc clamp, £35 mass rings to counterbalance heavy tonearms, and £40 the pop-on cover. For £624, you can have the whole shooting match in brass and bronze, known as the *Superior*.

Our previous experience has been that the cheapest AC version was the best balanced model, the DC suffering from lack of motor torque, while the optional heavy platter seemed to add little real benefit. For the 1986/87 edition Ariston supplied the *Electronic* and a new £105 *Enigma* arm, which is also incorporated within this review but applicable to any Ariston or other motor units. It is a conventional high quality fixed head arm of moderate effective mass, well suited to almost any cartridge.

LAB REPORT

Encountering the arm for the first time, it is a decent quality item, typical of its class, with good apparent rigidity and well chosen effective mass. Bearings were tight and friction levels low, the only minor complaint being the out of kilter bias compensation, which should increase towards the middle of the disc. The resonance graph was a bit scrappy through the midband, and the treble energy level was suppressed. The high quality *Belden* signal leads were susceptible to hum pickup, and needed careful siting.

The DC motor unit showed the same problem as before, namely poor speed stability, with the actual speed 0.46% fast and slowing under load sufficiently severe to give audible pitch instability. Rumble, in contrast, was very good, the disc impulse fairly good, and acoustic breakthrough good. Vibration breakthrough is compromised by the foam suspension damping, chosen to improve handling stability. Previous tests have shown that the speed problem does

not affect the cheaper AC version.

Sound Quality

Pitch uncertainty continues to leave the DC *RD40* at just a lowly 'average' rating. Notwithstanding damping and a decent enough arm, it is hard pushed to keep up with the much cheaper *RD60*. The general sound character is clear and open, with quite good stereo and depth, and firm bass. The *Enigma* tonearm gave good account of itself, but its not the best in its class, the midband sounding a little uneven, and the treble is trifle 'brash'.

Conclusions

The synchronous AC *RD40Q* remains worth considering for its stylish appearance and decent performance, though the '60 undermines it in sheer value for money terms. The DC variants remain unacceptably flawed.

Test Results

Motor section

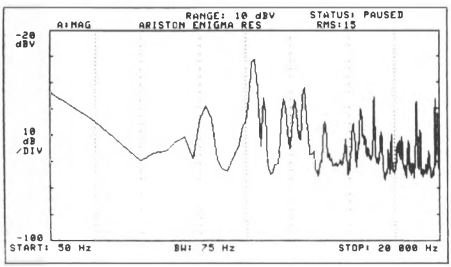
Type	(manual)/electronic, belt, subchassis
Platter mass/damping	optional kg/good
Finish and engineering	good
Type of mains connecting leads	remote PS/phonos + earth
Speed options	33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.07%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.25%/0.05%
Absolute speed error	+0.46%
Speed drift, 1 hour/load variation	+0.38%/−0.75%
Start-up time to audible stabilisation	7 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−77/−81dB

Tonearm section

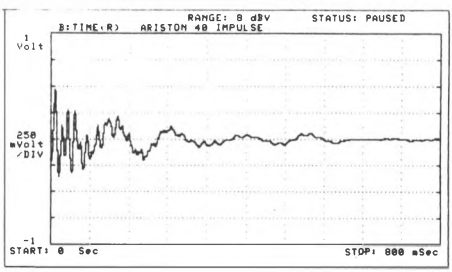
Approximate effective mass	11.5g
Type/mass of headshell	fixed
Geometric accuracy	v good/good
Adjustments provided	height, overhang, lateral
Finish and engineering	v good
Ease of assembly/set-up/use	v good/good
Friction, typical lateral vertical	20mg/20mg
Bias compensation method	dial spring
Bias force, rim/centre (set to 1.5g elliptical)	250mg/150mg
Downforce calibration error, 1g/2g	−0.5%/−0.2%
Cue drift, 8mm ascent/descent	slight, 1 secs/2.5 secs
Arm resonances	average+
Subjective sound quality	average+
Arm damping	c/wt decoupling

System as a whole

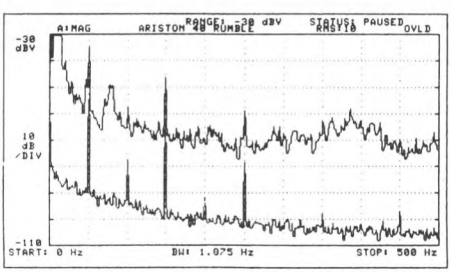
Size (w×d×h)/lid at rear	41×35×13cm/cm
Ease of use	good
Typical acoustic breakthrough and resonances	v good
Sound quality	(above average) average
Hum level/acoustic feedback	see text/excellent
Vibration sensitivity/shock resistance	f good/fair
Estimated typical purchase price	(£295) £355 (cover £40)



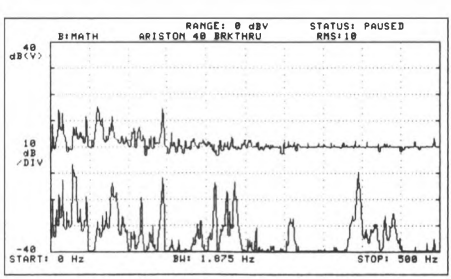
Tonearm structural resonances.



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

ARISTON RD90

ARISTON ACOUSTICS LTD, FREEPORT, SCOTLAND, PRESTWICK AIRPORT, PRESTWICK,
SCOTLAND KA9 2RB. TEL: (0292) 76933

Ariston have a long history, with occasional ups and downs, and Autumn 1986 sees new impetus with several revised models. Top of the line is the *RD90*, which has something of a 'back to the roots' feel, reminiscent of the *RD80*. Available as a £300 motor unit, or for £405 with the *Enigma* arm, it is a substantial, nicely finished subchassis design, with wooden plinth and non-resonant lid but a somewhat resonant pressed-steel bottom. Clearly alternative arms could be used.

The platter is a massive single piece casting, with a substantial 10mm bearing running in a rather scratched* brass sleeve. The synchronous motor is mounted on three points.

The complex subchassis system is a two-dimensional steel plate and has multi-turn springs plus a small additional horizontal spring to counter belt tension, while the armboard is aluminium with a cork interlayer.

LAB REPORT

Rumble figures were very good, and this was confirmed in the spectrogram. Wow and flutter were generally good, with linear wow a little on the high side. Absolute speed was fine (+0.25%), and slowing under load a marginal −0.3%, with start-up a slow 6 seconds. The disc impulse gave unexceptional results, with some continued ringing, and vibration breakthrough showed mild suspension resonance.

SOUND QUALITY

Rated 'good' with the quite modest *Enigma* arm, depth and focus were fairly good, and the sound was described as quite interesting, with some general 'softening' but good midrange clarity.

CONCLUSIONS

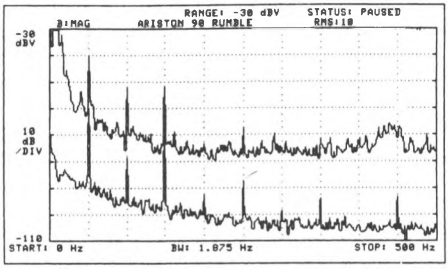
In a number of ways the *RD90* does not appear to adopt ideal solutions to the problems and compromises of turntable design, but it is solidly engineered, well balanced in performance and sound, and gives a respectably competitive result for the price.

Test Results

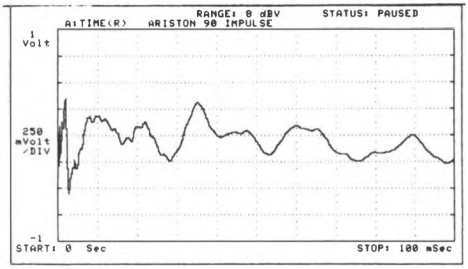
Motor section

Type	manual, belt-drive, subchassis
Platter mass/damping	3kg/average
Finish and engineering	very good
Type of mains connecting leads	2 core
Speed options	33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.06%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.2%/0.04%
Absolute speed error	+0.25%
Speed drift, 1 hour/load variation	−0.13%/−0.3%
Start-up time to audible stabilisation	6 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−78/−82dB
Size (w×d×h)/clearance for lid rear	44.5×36.5×18cm/6cm
Ease of use	average
Typical acoustic breakthrough and resonances	good
Subjective sound quality of complete system	above average/good
Hum level/acoustic feedback	very good/good+
Vibration sensitivity/shock resistance	good/good−
Estimated typical purchase price	£300 exc. arm

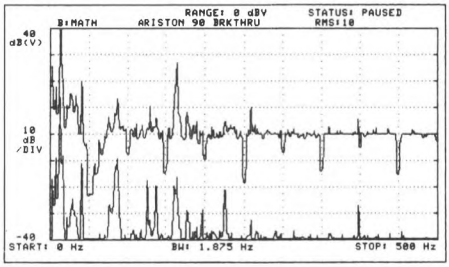
** to aid lubrication?*



Rumble, mechanical above electrical hum.



Disc edge mechanical shock.

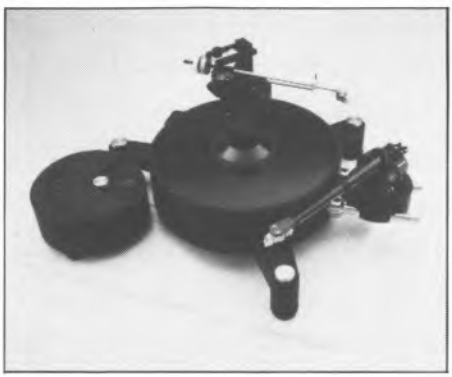


Breakthrough, acoustic above vibration.

RECOMMENDED

AUDIO LABOR KONSTANT

AUTOMATION SCIENCES CO, 20 LITTLE GADDESDEN, BERKHAMSTED, HERTS HP4 1PA.
TEL: (044284) 2786



Designed and manufactured in West Germany, the Audio Labor turntable costs a basic £2,560, and only the Goldmund designs are more expensive. How can one justify the money? Obviously not on a direct value basis, but a wealthy enthusiast may have sufficient reason for acquiring one. In any case, a very good sound quality is mandatory, and fortunately, when properly installed, this is just what the *Konstant* delivers. Moreover its design allows it to do so without the need for undue alignment, and the results are consistent over very long periods.

Thoroughly engineered, this turntable is founded on a massive tripod frame built in solid alloy, to which massive horizontal beams are attached *via* highly secure clamps. Substantial arm mounting blocks fitted to these stainless steel beams allow for fine adjustment of stylus overhang before tightening.

As a result of the symmetric construction and separately positioned motor unit, up to four tonearms can be installed. SME V and a *Well Tempered Arm*, being used in this review. The motor is built in a separated cylindrical housing which is placed on a shelf adjacent to the turntable. Special isolating feet are fitted to the housing, while the DC brushless motor is itself supported on damped anti-vibration mounts and operates very silently. For optimum performance the whole assembly is best run on a marble slab, the latter resting on a rigid wall-mounted shelf.

Special power supplies are fitted to the motor to smooth and isolate supply line fluctuations. Smooth acting logic type buttons select 33⅓ rpm, 45rpm and off; a red LED changes to green when the correct speed has been attained. Coupling between the motor and the platter is effected by a resilient synthetic rubber cord.

The heavy 7kg platter is milled out of a large alloy billet of excellent tolerances, and is mounted on a massive 16mm main bearing of superb engineering quality. The platter is highly inert by virtue of its engineered form, and a polished glass mat is used to support the record. Good contact with the disc is assured by means of a weighted centre clamp; it goes almost without saying that records must be kept scrupulously clean to avoid damage to disc undersides.

The use of a damped spring suspension to isolate the deck from higher frequency shock and vibration, proved to be most effective, aided by the high suspended mass and its non-resonant properties.

No standard plinth cover is available, due to the skeletal design, but custom cases can be made to order in clear or tinted acrylic. Size and weight both mean that it needs a substantial shelf!

LAB REPORT

Absolute speed was highly accurate while DIN peak weighted wow and flutter was a superb 0.035%, virtually at the test limit. Individual contributions of wow and flutter were both very low, and nicely balanced. Drift was also very low but the 0.35% slowing under load was a little higher than I should have liked, a mild weakness in a product at this price. However, the adverse effects were mitigated by the very high platter mass, together with the zero rotational overshoot defined by the internal fluid damping paddles. Ultimately pitch stability was high, while start-up was a fairly rapid 4 seconds in view of the

high 7kg platter mass. Rumble levels were very low though some mild motor-related periodicity was evident.

The high overall mass and fine platter damping ensured very good results for acoustic breakthrough despite high suspension spring damping. Vibration isolation was also good, though not as impressive as 'free' chassis types. The standard *Choice* impulse disc test gave an excellent result, free from any frequency-dependent emphasis.

Sound Quality

A particular Audio Labor hallmark turned out to be its quality of absolute stability, as if it were founded on a rock, which must be due in part to the wall-mounted marble slab. The bass was singularly 'open' and extended, free from emphasis, and near to mastertape. No trace of boom or lumpiness was evident. The feeling of neutrality extends throughout the midrange which lacked the usual vinyl thickening or 'rounded' type of coloration and allowed, for example, voices to soar with finely controlled proportion and perspective.

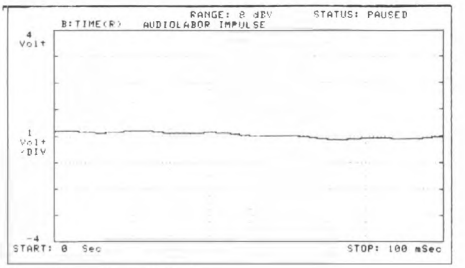
It was notably clean in the treble and again both depth and perspective were preserved in the large scale stereo image. Dynamics were reproduced with authority, aided by the strong pitch stability inherent in the massive platter and powerful drive. Taken overall it sounded confident, neutral and relaxed.

Conclusions

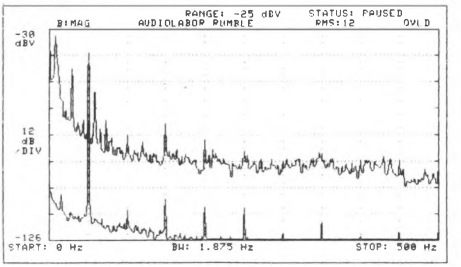
If you have the money, the shelf facilities, and require a very neutral state-of-the-art turntable with superb engineering and facilities for up to four tonearms, *Konstant* deserves serious consideration. The *Well Tempered Arm* was found to work very well with this deck.

Test Results

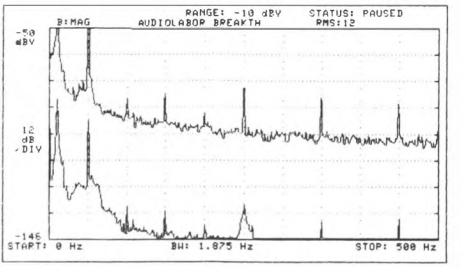
	Motor unit
Type	belt-drive, subchassis
Platter mass/damping	7kg/average+
Finish and engineering	excellent/excellent
Type of mains connecting leads	3 core
Speed options	33/45rpm variable
Wow and flutter (DIN peak wtd sigma 2)	.035%
Wow and flutter (LIN peak wtd 0.2-6Hz/6-300Hz)	0.055%/0.045%
Absolute speed error	0.07%
Speed drift, 1 hour/load variation	<0.05%/−0.35%
Rumble, DIN B wtd, L/R average	−79/−81dB
Size (w×d×h)/clearance for lid rear	58×43×16cm/none
Ease of use	good
Typical acoustic breakthrough and resonances	excellent
Subjective sound quality of complete system	very good
Hum level/acoustic feedback	very good/very good
Vibration sensitivity/shock resistance	very good/very good
Estimated typical purchase price	£2560



Disc edge mechanical shock.



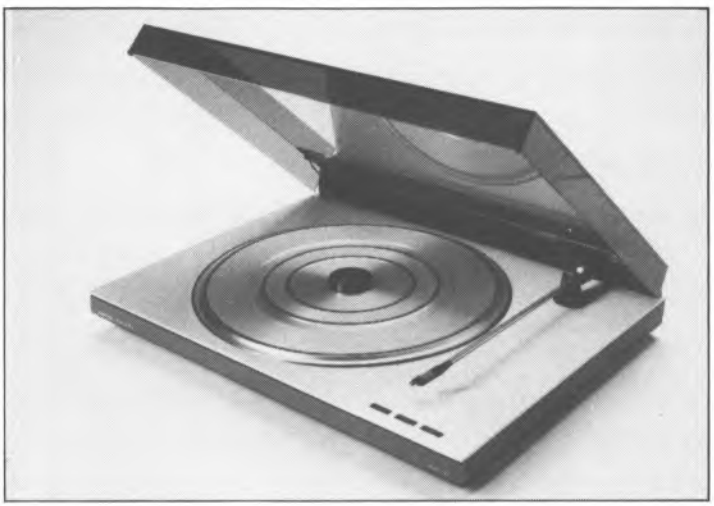
Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

BANG & OLUFSEN BEOGRAM RX-2

BANG & OLUFSEN UK LTD, EASTBROOK ROAD, GLOUCESTER GL4 7DE.
TEL: (0452) 21591



Initially supplied for review as a *Beogram 1800*, this deck has been re-introduced as an *RX-2* with phono-plug signal wiring and some cosmetic changes. Retaining B&O's extremely effective suspended sub-chassis with cantilevered leaf springs, and demonstrating modern, unfussy styling, the *RX-2* is excellently finished and offers fully automatic operation. An ultra-low-mass tonearm accommodates a matching B&O cartridge.

The construction is rather lightweight in two areas, namely the thin aluminium platter and the tonearm bearing/pillar assembly; the latter clearly does not follow the current fashion for rigidity with bearings free from slackness.

LAB REPORT

Under test, the motor section performed well. DIN peak-weighted wow and flutter was fine at 0.09%, with good figures also for the separate flutter and wow component. Absolute speed error was low while good torque was shown by the mild 0.22% slowing under load. Some mild speed overshoot was detected on recovery after load removal. Start-up was satisfactory, and the deck's automatic cycles were free from the frustrating dithering and delays so often experienced with other 'auto' players.

Rumble was excellently low for the price, the spectrum analysis revealing nothing of significance, with both motor and hum vibration very well suppressed. Acoustic breakthrough was particularly well-handled, and vibration isolation was also good considering the low sub-chassis mass. The suspension was also well behaved, placing all modes clearly in the 3-5Hz region, well clear of the arm/cartridge resonance frequency.

The arm performed fairly well on measurement, though tests were complicated by the unique cartridge and fixing, and the automatic facilities. A lack of rigidity was indicated by modes at 300Hz and 600Hz, but this is satisfactory in this price context, and arm friction was low. Bias levels were on the high side by about 30%, but this again is not serious. The platter did not appear to offer very good record termination.

Sound Quality

Performing well in its category, the *RX-2* was an eminently civilized and well mannered product. In terms of frequency balance it was fairly neutral, with a sweet, restrained treble register, but overall lacked some 'bite' and 'attack'. The bass could also have been firmer, and while the stereo effect was pretty good, more transparency would not have gone amiss. Nonetheless, the overall impression was fair, and both shock and acoustic feedback were well handled.

Conclusions

The present version of this deck will set you back around £135, with optional cartridge. The overall performance is satisfactory but has remained static, while other comparable decks have continued to improve over the same period. These factors have served to relegate this B&O deck from the Recommended to the Worth Considering category.

Test Results

Motor section	
Type	automatic belt-drive, subchassis
Platter mass/damping	0.6kg/fairly good
Finish and engineering	very good/good
Type of mains connecting leads	2 core/phono
Speed options	auto, 33/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.09%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.11%/0.14%
Absolute speed error	−0.15%
Speed drift, 1 hour/load variation	+0.08%/−0.22%
Start-up time to audible stabilisation	approx 3 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−80dB
Arm section	
Approximate effective mass, inc screws, excl cartridge	6g
Type/mass of headshell	integrated optional cartridge
Geometric accuracy	very good
Adjustments provided	downforce
Finish and engineering	very good/good
Ease of assembly/set-up/use	very good/very good/excellent
Friction, typical lateral vertical	35mg/20mg
Bias compensation method	internal fixed spring
Bias force, rim/centre (set to 1.5g elliptical)	400mg/420mg
Downforce calibration error, 1g/2g	±0.06g/±0.06g
Cue drift, 8mm ascent/descent	low, 1.2 secs/0.8 secs
Arm resonances	see graph
Subjective sound quality	–
Arm damping	none
System as a whole	
Size (w×d×h)/clearance for lid rear	44×33×9.5cm/none
Ease of use	excellent
Typical acoustic breakthrough and resonances	very good
Subjective sound quality of complete system	average
Hum level/acoustic feedback	very good/very good
Vibration sensitivity/shock resistance	very good/very good
Estimated typical purchase price	£135

For graph references see issue No. 40

RECOMMENDED

DUAL CS505-2 and CS505-2 DELUXE

HAYDEN LABORATORIES LTD, HAYDEN HOUSE, CHILTERN HILL, CHALFONT ST PETER, BUCKS.
TEL: (0753) 888447

In production now for a number of years, the 505 design has undergone a continuing series of minor improvements which have helped maintain its competitive position, while the price has also been kept in check. The player is based on an old-style steel deck plate, supported on four foam-damped coil springs, the current models featuring a higher spring rate than the samples reviewed here. This deck plate is heavily flanged to increase rigidity, and the modest platter is equipped with a fairly heavy rubber mat.

Belt driven by a 16-pole synchronous motor, the 505 is fitted with a unique variable pitch control, achieved by the use of a multi-lobed variable diameter motor pulley. Correct speed setting is achieved *via* stroboscope markings on the platter rim, though these were found none too easy to use.

The tonearm has been revised for the latest *505-2* version and is now fitted with a special detachable headshell with quite firm fixing. The *Deluxe* has better looks and a lower resonance construction, with a substantial wooden plinth finished in 'black ash' vinyl. Both versions come complete with a compatible Ortofon cartridge.

LAB REPORT

A notable feature of the latest *505* is the significant reduction in rumble, which has improved from 67dB to 73dB. Spectrum analysis showed the usual contribution of motor vibration components, but these were not considered very serious. Speed characteristics were much as before with good wow and flutter, while good torque was also demonstrated, the mild 0.2% slowing under load being up with some of the best, helping to offset the low inertia of the platter. Vibration and acoustic isolation factors remain unchanged, and well above average for the price.

The arm now has a moderate effective mass, 10g including mounting hardware, the headshell itself weighing a modest 4g. The arm was well aligned and the pivots were reasonable, proving moderate in friction but subject to a rather small pre-load; more than a gentle twist to the arm resulted in audible bearing 'clicking'. Biasing was accurate and downforce calibration acceptable. Arm structural resonances were charted with the

cartridge supplied; the first weakness appeared at 90Hz, while the main problems occurred at 220 and 400Hz, not a great improvement on the previous design. Above 600Hz, however, the resonances were pretty well behaved.

Sound Quality

The 505's sound was tuneful, lively, punchy and somewhat 'forward' in presentation. Pitch and timing were good, the bass fairly good, and the stereo image had quite respectable depth and above-average focus. The sound could become a little muddled in the mid and treble but not seriously so, and the cartridge suited it well — we would not change it. The 'S' version showed a small improvement in clarity and definition, attributable to the improved plinth.

Conclusions

The *505* is still managing to maintain a reasonably competitive position despite price rises, and provides a competent hi-fi sound. It may therefore continue to be recommended as a complete package with the *OM10* cartridge.

For graph references see issue No 43

Test Results

Type	semi auto, belt-drive, subchassis
Platter mass/damping	0.85kg/good
Finish and engineering	very good/good
Type of mains connecting leads	2 core/phonos and earth
Speed options	variable, 33/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.075%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.95%/0.08%
Absolute speed error	−0.1%
Speed drift, 1 hour/load variation	+0.065%/−0.2%
Start-up time to audible stabilisation	2.4 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−72/−74dB
Arm section	
Approximate effective mass, inc screws, excl cartridge	10g
Type/mass of headshell	special detachable/40g
Geometric accuracy	good
Adjustments provided	overhang/offset
Finish and engineering	very good/good
Ease of assembly/set-up/use	very good/very good/very good
Friction, typical lateral vertical	40mg/20mg
Bias compensation method	spring
Bias force, rim/centre (set to 1.5g elliptical)	225mg/225mg
Downforce calibration error, 1g/2g	−0.12g/−0.2g
Cue drift, 8mm ascent/descent	very slight, 3.5 secs/3.0 secs
Arm resonances	average+
Subjective sound quality	average+
Arm damping	decoupled counterweight
System as a whole	
Size (w×d×h)/clearance for lid rear	43.5×37×14cm/7cm
Ease of use	good
Typical acoustic breakthrough and resonances	average+
Subjective sound quality of complete system	average
Hum level/acoustic feedback	good/good
Vibration sensitivity/shock resistance	good/good
Estimated typical purchase price	£120 (*Deluxe*, £140)

DUAL CS5000

HAYDEN LABORATORIES, HAYDEN HOUSE, CHILTERN HILL, CHALFONT ST PETER, BUCKS.
TEL: (0753) 888447

The player capable of accommodating 78rpm discs is a rare bird these days, and no one who loves music should lightly dismiss the marvels locked in those ancient shellac grooves (remembering you need a special stylus), so Dual deserve credit on those grounds alone. (The only other we know of is a special 78-only version of the Rega.) The 5000 is a large integrated player with a real wood plinth in a real wood colour, the top edges heavily radiused to give an attractive 'styled' appearance. The manually operated arm has good bearings but a deliberately highly decoupled counterweight, and the main vertical arm pillar was disturbingly flexible. It has a lightweight plastic detachable headshell which is reasonably rigid, but ironically has extra mass loading added. Springs provide dialled-in downforce and bias compensation.

Some isolation from outside influence is provided by a large ribbed plastic subchassis, the foam-damped springing effective enough vertically but rather stiff in rotation. Moreover, the substantial brushless servo DC motor is mounted on the subchassis alongside the platter and arm. The cast alloy platter is unbelievably elaborate, with extra rim mass added and a heavy mat. A substantial low resonance lid is fitted.

LAB REPORT

The medium mass arm offers good compatibility, and good bearing friction with firm bearings besides. Bias force was set a little high, but downforce calibration was good. The early break in the resonance sweep showed yet again the inherent rigidity compromise of a detachable headshell, while the treble range is reasonable, if down a little in level.

Rumble gave reasonable results, but the spectrogram showed numerous harmonics generated from the subchassis-mounted DC quartz motor. Start-up was pretty slow, but the other speed characteristics were all pretty good. Acoustic breakthrough was likewise respectable, but the stiff damped springs did allow some vibration through below 150Hz. The disc mechanical impulse showed quite good damping from the heavy mat, though there was some ringing in the trace nonetheless.

Sound Quality

Overall, the sound was a little disappointing perhaps, rating only average and perhaps reflecting rapidly improving standards elsewhere. The sound was fairly open with some depth and fair focus, but the bass was 'softened' and 'bumpy' without much resolution, and the treble was a little untidy. Balance was fairly good, the sound seeming to suit classical material rather better than rock.

Conclusions

Full marks for the 78 facility, but a bit ordinary for the price elsewhere, the prospective purchaser must make his own choice, depending on musical taste. The *5000* doesn't merit full recommendation on price *vs* performance, but is pretty decent for all that.

Test Results

Motor section

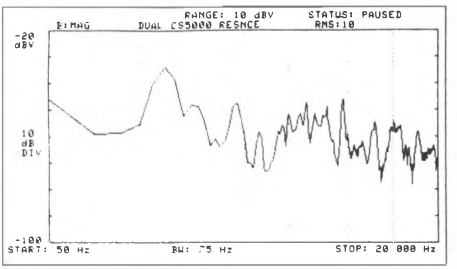
Type	electronics belt, subchassis
Platter mass/damping	1.4kg/v good
Finish/engineering	v good/good
Mains/connecting leads	2 core socket/phonos & earth
Speed options	33⅓, 45,78rpm
Wow & flutter (DIN pk wtd)	0.08%
Wow/flutter (lin pk wtd)	0.14%/0.1%
Absolute speed error	0%
Speed drift/load variation	+0.1%/−0.15%
Start-up to stability	8 secs
Rumble, L/R (DIN B wtd)	−69dB/−77dB

Tonearm

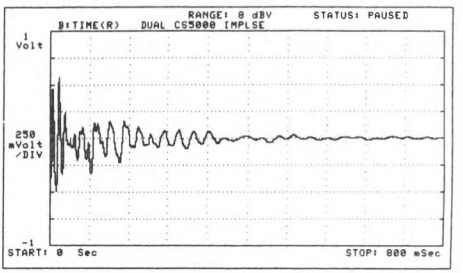
Effective mass (approx)	10g
Type/mass headshell	special detachable
Geometric accuracy	v good
Adjustments provided	overhang/lateral
Finish/engineering	good
Ease of set-up/use	good/v good
Friction, (typical lat/vert)	20mg/<20mg
Bias method	spring slider
Bias force (rim/centre 1.5gE)	200mg/200mg
Downforce error 1g/2g	−0.05g/−0.05g
Cue drift, 8mm up/down	negl, 1 secs/1 secs
Arm resonances	see text
Sound quality	average
Arm damping	cwt decoupling

Whole System

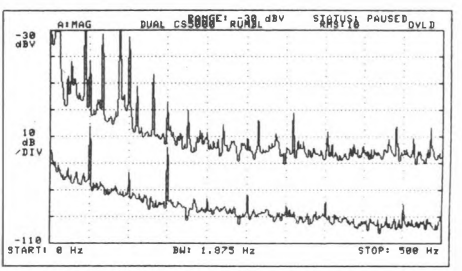
Size (w×d×h)/lid at rear	44×40×12.5cm/5cm
Ease of use	v good
Acoustic breakthrough, resonances	v good
Sound quality	average
Hum/acoustic feedback	good/v good
Vibration, shock sensitivity	f good/good
Typical price	black £200, real oak £210



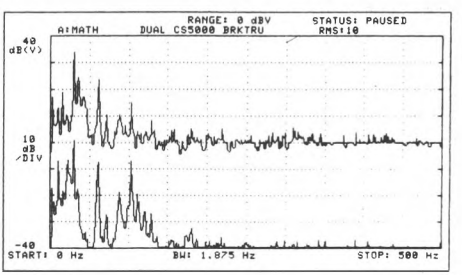
Tonearm structural resonances.



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

ELITE ROCK

ELITE TOWNSHEND LTD, UNIT 2, NORTH WEYLANDS INDUSTRIAL ESTATE, MOLESEY ROAD, HERSHAM WALTON-ON-THAMES, SURREY. TEL: (0932) 246850

This totally unorthodox player has been steadily refined over a number of years, particularly in terms of finish quality. The *Rock* itself is a basic motor unit fitted with a unique arm damping trough and costing a reasonable £299. This sits inside a separate £89 plinth/cover unit, which has a good lid and a gilt coachwork stripe to break up the black monotony. Add the optional £125 *Merlin* electronic power supply and £299 *Excalibur* arm and the package has hit a substantial £800+.

The damping trough is a substantial silicone-filled casting on the front edge of the plinth, and must be swung back in order to change discs. A headshell outrigger sits inside, damping arm movement and purportedly absorbing cartridge vibration, turning the arm into something of a 'bridge'. Though one gets used to using the trough, silicone is messy stuff, accurate cueing is difficult and stylus cleaning awkward. The damping method certainly confers fine shock stability, but needs care if disc warps are not to be a potential linearity problem. The *Excalibur* arm incorporates a damping paddle and large rigid tube. The bearings are deliberately slack, so the whole behaves a little like a damped gravity unipivot. The arm is uncalibrated and the lever-weight bias compensation is damped — an unusual technique which will surely reduce its effectiveness.

Sitting on Sorbothane spheres to provide some vibration resistance, most of the *Rock* is made from Gypsum. Both plinth and 2kg platter are cast from this heavy and inert mineral, the latter having a bonded acrylic surface with a disc clamping system. The motor has a stepped pulley to give speed change without the need for *Merlin*, driving the platter via an O-ring cord. The main bearing is inverted, stainless steel running in a brass sleeve.

LAB REPORT

Arm geometric accuracy is fine, yet friction is not particularly good despite the loose bearings. The resonance impulse test gave a generally good result, though the break at 1.2kHz is quite severe, and the treble range seemed over-suppressed. Effective mass measured a quite high 14.8g — probably well suited to Decca cartridges which are likely partners.

Motor rumble is well suppressed and speed

accuracy good too, though slowing under load could have been better; start up is slow but wow and flutter quite respectable. Acoustic breakthrough is very well controlled, though vibration shows some problems around 60-70Hz. The mechanical disc impulse showed outstanding disc damping, with total control, but this was accompanied by 75kHz platter rocking, fortunately decaying fairly quickly.

Sound Quality

The *Rock* has a quite distinctive sound that was rated good overall, and is worth trying for this reason alone. Stable with 'rock solid' bass and low overall levels of coloration, rhythmic dynamics were also praised, but image depth seemed noticeably flattened. A slightly 'spitty', 'grainy' top end focused our suspicions on the arm bearings. While it followed the flow of the music very well, the overall dynamic 'window' seemed somehow constricted, with a loss of transparency.

Conclusions

The *Rock* itself is clearly worth considering: ingenious in many ways, it has its own unique strengths, shows evidence of decent engineering in the lab performance, and has good sound quality. However, the *Excalibur* looks rather expensive.

Test Results

Motor section

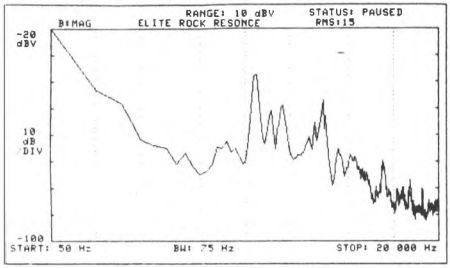
Type ____ electronic, belt-drive, solid
Platter mass/damping ____ 2kg/very good
Finish and engineering ____ very good
Type of mains connecting leads ____ 3 core remote/phonos and earth
Speed options ____ 33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2) ____ 0.07%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz) ____ 0.23%/0.07%
Absolute speed error ____ 0%
Speed drift, 1 hour/load variation ____ 0.13%/−0.30%
Start-up time to audible stabilisation ____ 5 secs
Rumble, DIN B wtd, L/R average (see spectrum) ____ −77/−82dB

Arm section

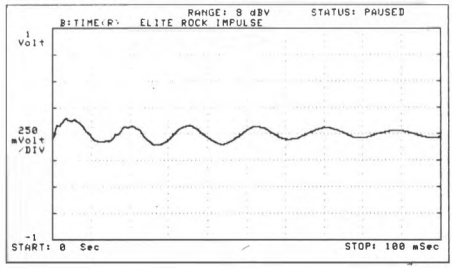
Approximate effective mass, inc screws, excl cartridge ____ 14.8g
Type/mass of headshell ____ fixed, with damping paddle
Geometric accuracy ____ very good
Adjustments provided ____ height
Finish and engineering ____ very good/good bearings
Ease of assembly/set-up/use ____ average
Friction, typical lateral vertical ____ 45mg/40mg
Bias compensation method ____ thread and lever
Bias force, rim/centre (set to 1.5g elliptical) ____ 170mg/130mg
Downforce calibration error, 1g/2g ____ n.a.
Cue drift, 8mm ascent/descent ____ none, 0.5 secs/2 secs
Arm resonances ____ good
Subjective sound quality ____ above average
Arm damping ____ strong, headshell trough

System as a whole

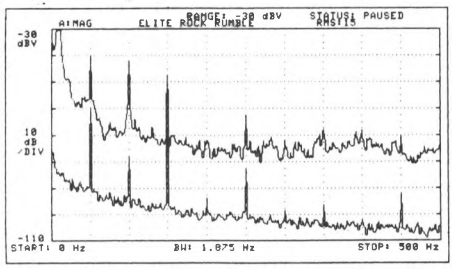
Size (w×d×h)/clearance for lid rear ____ 44×37×14cm/7cm
Ease of use ____ average
Typical acoustic breakthrough and resonances ____ very good
Subjective sound quality of complete system ____ good
Hum level/acoustic feedback ____ good+/very good
Vibration sensitivity/shock resistance ____ good/excellent
Estimated typical purchase price ____ £299-£822 (see text)



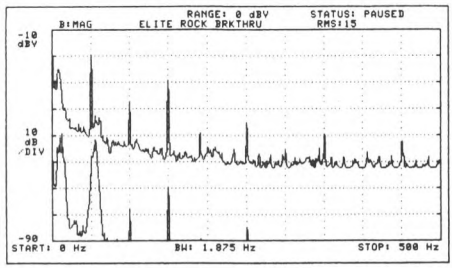
Tonearm structural resonances.



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

RECOMMENDED

EMINENT TECHNOLOGY

AUTOMATION SCIENCES, CO 20 LITTLE GADDESDEN, BERKHAMSTED, HERTS, HP4 1PA.
·———TEL: (04284) 2786———·

One of only two air-bearing linear-tracking tonearms available in the UK (the breed thrives in California), such arms are fundamentally different from lever/pivot arms in several ways. Avoiding bias forces, they need no compensation, but suffer different lateral and vertical inertias while their centre of mass moves slightly during play. (For more details, see *Airtangent* review).

The *Eminent Technology* is curiously shaped, and finished in a rather dull, matt grey. Based largely on precision plastics mouldings, the main pillar section grasps the arm tube proper in a fist-like grip, air-lubricated of course. The arm itself is a dog-leg through the bearing, with the arm tube one side and counterweight the other: consequently the stylus drag acts asymmetrically through the air-bearing. The metal tube was rather scruffy in appearance, with limited mounting rigidity, but had a decent diameter tube, while the counterweight was heavily decoupled laterally.

Effective mass is a sensible 9g vertically, but the high lateral value suggests low compliance types are best. The cue worked satisfactorily, but some means of siting a noisy airpump out of earshot needs to be found, and set-up is inevitably tricky and time consuming.

LAB REPORT

Banishing lateral friction is vital for a passive linear arm to work properly, and the air-bearing seems to be the effective solution, giving effectively zero friction and play, but not without some difficulties minimising leadout wire torque. With main modes clustered around 750Hz, and good HF behaviour, the resonance performance was very good.

SOUND QUALITY

Clearly one of the best sounding tonearms available, stereo imaging was most impressive — wide, open and transparent, with fine focus. Bass was even and lively, if lacking a little 'slam', the midband was very uncoloured, and the treble lucid and a little lively.

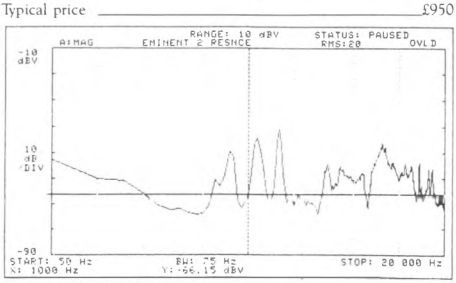
CONCLUSIONS

Despite practical reservations over set-up and use difficulties, the *Eminent* clearly delivers ample sound quality to justify recommendation at its admittedly high price.

TEST RESULTS

Tonearm

Effective mass (approx)	9 (vert/30g (lat)
Type/mass headshell	fixed
Geometric accuracy	excellent
Adjustments provided	height, overhang, tilt
Finish/engineering	good
Ease of set-up/use	difficult/average
Friction (typical lat vert)	approx 50mg lead-torque
Bias method	n/r
Bias force (rim/centre, 1.5gE)	n/r
Downforce error 1g/2g	uncalibrated
Cue drift, 8mm up/down	negl, adjustable
Arm resonances	v good
Sound quality	v good
Arm damping	seismic counterweight
Typical price	£950



Tonearm structural resonances

Alphason

Arms and now turntables

— for lovers of music

The turntable used by Alphason Designs Ltd for development of the HR-100S Reference pick-up arm is now available in a highly developed form, known as the Alphason Sonata.

The forerunner to the Sonata was first constructed in 1979 as the Alphason test bed for use in development work.

Since then the turntable has been refined as new materials and techniques have been made available culminating in a very high performance turntable which when combined with the HR-100S Reference pick-up arm will provide endless hours of enjoyable listening to true music in the home.

For further details contact:

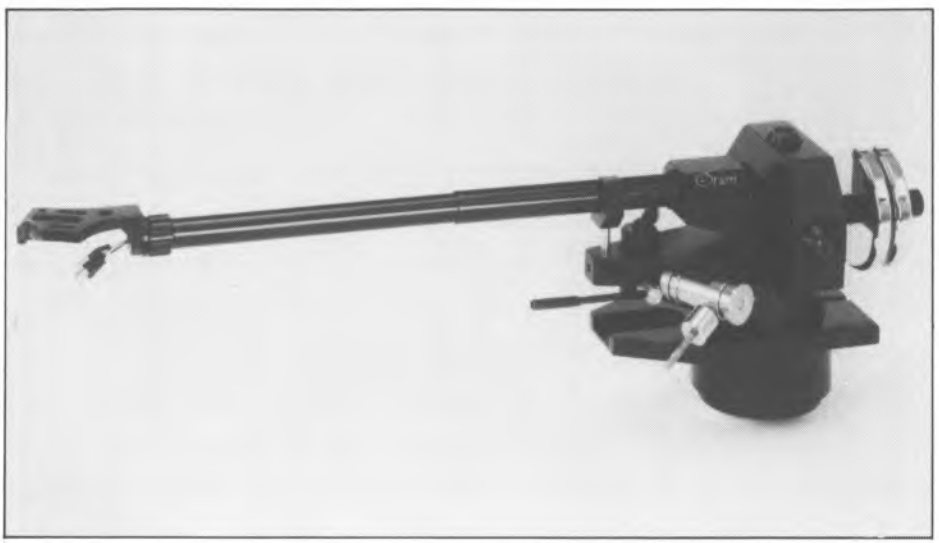
Alphason Designs Limited, 190-192 Wigan Road, Euxton, Nr. Chorley, Lancs. England PR7 6JW.
Telephone: Chorley (02572) 76626

USA & CANADA: May Audio Marketing, 646 Boul, Guimond, Longueuil, Quebec, J4G IP8.
Telephone: 514 651 5707.

RECOMMENDED

HELIUS ORION 2

HELIUS DESIGNS, THE WHITE HOUSE, ALDINGTON, EVESHAM, WORCS WR11 5UB.
TEL: (0386) 830083



The *Orion*'s most obvious feature is the massive bearing assembly, milled from a substantial aluminium block. And as with some Audio-Technica models, the bearing vertical pivot plane has been placed below the stylus tip to aid tracking stability. The bearing is an unusual design whereby the horizontal and vertical components are effectively concentrated on a single point. When correctly set, the Helius 'tri-ball' system provides zero play and no secondary rattles. Inertial masses may be balanced around this unified pivot (not to be confused with a 'unipivot' since this one is rigid except in the two desired planes), conferring benefits as regards the wider distribution of structural resonances.

A large threaded rod supports the rear counterweight assembly using multiple weights screwed on and contra-locked for final setting; synthetic inserts damp the rod and counterweight mass interface.

The alloy tube main arm beam, has a larger diameter first section to distribute vibrational modes. The standard Helius right-angled alloy cartridge platform is fitted.

Both the arm base and the cue platform are made of solid metal, possessing minimum self-resonance. Thread-and-weight lever bias compensation is fitted and, as with downforce, this is uncalibrated.

LAB REPORT

Effective mass was estimated at 11g, and the arm is therefore classed as a medium mass design. Helius stress the concept of differential masses, giving an effective mass of 8g in the vertical plane and 12g laterally. They state that the arm will accept cartridges from 5-40cu compliance — in effect almost any modern design.

Geometric accuracy was excellent, the slotted headshell providing ready adjustment of offset angle and overhang. Although no slack whatsoever was detectable in the bearings, friction levels in both planes were exemplary.

Set to 'minimum' the bias was found to be appropriate for a 1.5g downforce, and little extra will be required for the usual 1.8-2.0g downforce moving-coil cartridge.

Resonant behaviour was well ordered, show-

ing a highly favourable energy trend. It did, however, demonstrate some resonances, with that at 200Hz probably a bearing/counterweight mode, and that at 800Hz the main tube — a usefully high frequency. The low capacitance leads were usefully flexible and carried good quality plugs.

Sound Quality

On audition there was little doubt concerning the high calibre of this tonearm. The bass was particularly good, showing depth, weight, evenness and good articulation. The midband was neutral as well as transparent, matching the unexaggerated musical treble register. Stereo was very good and the overall sound sweet and tonally well-balanced. Compared with certain other models, however, the Orion could sound less 'sharp', which some could interpret as 'softness' on its part.

Conclusions

The current series maintains Helius' reputation for fine sound quality. The arm is excellently engineered with rigid bearings, free from slack. It remains very expensive but the level of performance deserves recommendation.

Note: The height adjustment was extremely awkward.

Test Results

Approximate effective mass, inc screws, excl cartridge	12g
Type/mass of headshell	non-detachable
Geometric accuracy	excellent
Adjustments provided	height/overhang/offset
Finish and engineering	excellent/excellent
Ease of assembly/setting-up/use	very good/poor/average
Friction, typical lateral/vertical	<20mg/<20mg
Bias compensation method	uncalibrated thread and lever
Bias force, rim/centre (set to 1.5g elliptical)	175mg/225mg
Downforce calibration error, 1g/2g	uncalibrated
Cue drift, 8mm ascent/descent	0.75secs/10secs
Arm resonances	good
Subjective sound quality	very good
Arm damping	none
Estimated typical purchase price	£490 standard

For graph references see issue No. 40

RECOMMENDED

HEYBROOK TT2

MECOM ACOUSTICS, KNIGHTON HILL, WEMBURY, PLYMOUTH, DEVON.
TEL: (0752) 863188

Heybrook have recently introduced an optional electronic power supply upgrade, but it arrived too late to assess its performance.

The very strongly constructed plinth is only cut away for the arm leads, motor and associated wiring. Suspended on three multi-turn coil springs, the subchassis can be aligned from above.

The closely-toleranced main bearing consists of a steel shaft supported on a hardened thrust ball, running in plain bronze sleeves. The alloy two-piece platter weighs 2.8kg, and the inner section forms the drum on which the belt runs. A felt mat is standard. The *TT2* suspension is set on the firm side, to provide better control, while a fairly stiff short belt has been chosen as likely to minimise wow effects. The main subchassis modes are in the 4.5 to 5Hz range, and correct arm lead dressing offers good control of higher frequency rotational modes.

Arms tried with the *TT2* included the Linn *LVX* and the Alphason, but perhaps the most obvious choice was the Rega *RB300*.

LAB REPORT

A fine weighted wow and flutter figure was recorded, with equally good results for the flutter and wow separately. The deck ran fast by an acceptable 0.5%, while high torque was shown by the good 0.18% slowing under load test.

DIN B weighted rumble was very low, but spectrum analysis did show some moderate motor-related mechanical frequency components.

SOUND QUALITY

Pitch stability, rhythm and timing were all very good, while the bass was a strong point, with welcome firmness coupled with good extension to lower-bass frequencies. Solo singing focused well in the stereo sound stage, the latter exhibiting good space and depth.

CONCLUSIONS

One cannot help but be impressed by the fine finish and construction of this durable subchassis design, as well as by its competitive pricing and good performance both in the laboratory and in the listening room.

TEST RESULTS

	Motor unit
Type	belt-drive, subchassis
Platter mass/damping	2.6kg/average+
Finish and engineering	very good/excellent
Type of mains connecting leads	3 core
Speed options	manual change, 33/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.065%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.07%/0.08%
Absolute speed error	+0.5%
Speed drift, 1 hour/load variation	<0.1%/−0.18%
Start-up time to audible stabilisation	3.8 secs
Rumble, DIN B wtd, L/R average	−80/−78dB
Size (w×d×h)/clearance for lid rear	44×37×15.5cm/6cm
Ease of use	good
Typical acoustic breakthrough and resonances	very good
Subjective sound quality of complete system	good
Hum level/acoustic feedback	very good/very good
Vibration sensitivity/shock resistance	very good/fairly good
Estimated typical purchase price	£259

For graph references see issue No 43

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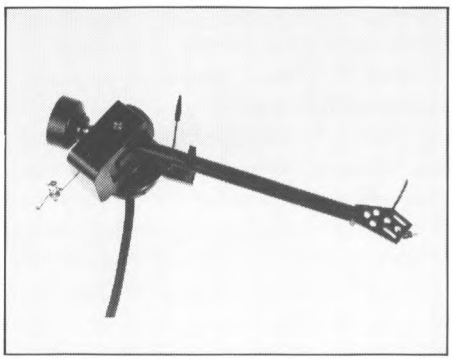
RECOMMENDED

KUZMA

AUTOMATION SCIENCES CO, 20 LITTLE GADDESDEN, BERKHAMSTED, HERTS HP4 1PA.
TEL: (044284) 2786



Built like a tank (or a tractor according to one disenchanted dealer whose bias and cue fell apart), this £250 Yugoslavian arm could be the audiophile bargain of 1987. Its macho build and stove-enamelled finish makes *Zeta* and the *Mechanic* look puny — not just in terms of the dimensions of the beam and bearing housing, but in the generous, high contact area bearings themselves, which showed no evidence of play. The massive stainless steel main pillar is compatible with Linn mounts, though the high total mass of this arm (c1kg) could give balancing problems with some sprung subchassis turntables. The large diameter main tube looks very strong, the counterweight is clamped rigid, and a cast headshell is fixed in place. And the icing on the cake is the fitting of full van den Hul cable as standard.

LAB REPORT

The bearings were free of play, yet also had low friction. Despite appearances, effective mass is only 14.5g, so cartridge compatibility is good. The resonance spectrogram is quite promising: the 480Hz counterweight is a little severe, as is the main beam at a high 1kHz, but energy is well maintained and controlled in the upper range.

SOUND QUALITY

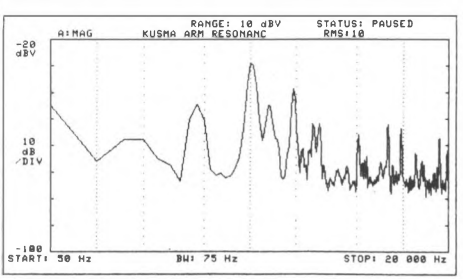
The Kuzma gave the classic performance expected of a good heavyweight, rating 'very good' overall. Solid and dynamic, it also conveyed delicacy and subtlety, assisted by the high quality wiring. Exceptional bass weight and 'speed' plus fine transparency were accompanied by minor coloration and 'untidiness'.

CONCLUSIONS

It may not match the lighter subchassis turntables too well, and we have some misgiving regarding consistency of build, but this massively built arm has practically all the right ingredients plus a fine sound at a very realistic price, and may be firmly recommended.

TEST RESULTS

Tonearm	
Effective mass (approx)	14.5g
Type/mass headshell	fixed
Geometric accuracy	v good
Adjustments provided	height,overhang, lateral
Finish/engineering	good/average
Ease of/set-up/use	/average
Friction (typical lat/ver)t	60mg/10mg
Bias method	thread & lever
Bias force (rim/centre, 1.5gE)	150mg/200mg
Downforce error 1g/2g	uncalibrated
Cue drift, 8mm up/down	slight/1 sec/8 secs
Arm resonances	v good
Sound quality	v good
Arm damping	none
Typical price	£250

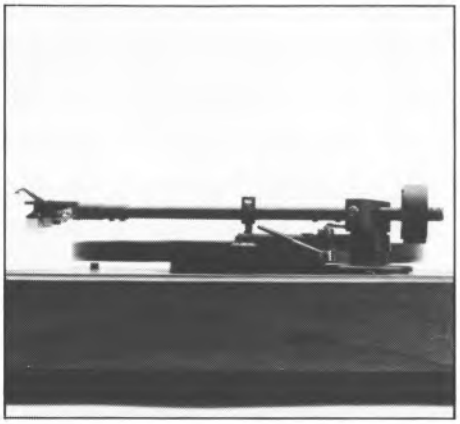


Tonearm structural resonances.

BEST BUY

LINN LV PLUS

LINN PRODUCTS LTD, 257 DRAKEMIRE DRIVE, CASTLEMILK, GLASGOW G45 9SZ.
TEL: (041) 634 0371



Linn felt that the detachable headshell fitting on their *LVX* represented a weakness, so decided to produce the *Plus*. Here the headshell has been rigidly and permanently factory fitted and is rigidly as well as permanently fixed. A feature of this relatively inexpensive Japanese-made product is the inclusion of the current *Basik* cartridge, a competent performer which retails at £18 when purchased as a separate item.

LAB REPORT

Effective mass with hardware was around 13g, balancing a typical cartridge and suited to low or medium compliance. The geometry was fine, and it proved easy to set up, and a current sample showed fine friction levels. The bias correction was estimated at an appropriate 230mg rim and 260mg centre.

Downforce calibration was fine, though cue descent a trifle slow. Measured with the *Basik* cartridge installed, the cartridge-coupled arm resonances were charted. The result was notably smooth, showing good resonance behaviour with the first mode at 620Hz.

SOUND QUALITY

Comparative listening tests showed an improvement over the *LVX*. Midrange coloration was reduced, with an improvement in clarity, detail and punch. Upper bass transients were more articulate, while the treble sounded better integrated as well as more incisive. The arm attained a fine standard for the price.

CONCLUSIONS

A worthwhile revision, the *Plus* was a fine tonearm, which in its latest form, and taking into account the inclusion of the *Basik* cartridge, earns a warm recommendation.

TEST RESULTS

Arm section	
Approximate effective mass, inc screws, excl cartridge	13g
Type/mass of headshell	fixed
Geometric accuracy	very good
Adjustments provided	height/overhang/offset
Finish and engineering	very good
Ease of assembly/set-up/use	very good
Friction, typical lateral/vertical	35mg/10mg
Bias compensation method	internal spring
Bias force, rim/centre (set to 1.5g elliptical)	230mg/260mg
Downforce calibration error, 1g/2g	+0.1g/+0.15g
Cue drift, 8mm ascent/descent	1.0 secs/3.5 secs
Arm resonances	good
Subjective sound quality	good+
Arm damping	decoupled counterweight
Estimated typical purchase price	£129

For graph references see issue No. 40

RECOMMENDED

LINN SONDEK LP12

LINN PRODUCTS LTD, 257 DRAKEMIRE DRIVE, GLASGOW G45 9SZ.
TEL: 041-634 0371

Now well into a second decade of production, the Linn has become something of an institution. The design was originally quite closely based on the classic Thorens *TD150*, but Linn's policy of continuous development means that current *Sondek* capabilities are far removed from the earliest examples, even though the appearance has been pretty well unchanged over the years. While Linn have continued to make detail revisions, it is now some four years since the last major modification, known as 'Valhalla', which effectively isolated the motor electronically from the mains supply.

To return to basic features, the *LP12* comprises a straightforward full subchassis belt-driven turntable unit capable of accepting a variety of high quality tonearms. Deceptively simple in design, long experience with the product has shown that it has been subjected to such a high level of detailed development and refinement that almost every component down to the humblest screw fixings can be shown to have a significant effect on the performance of the whole.

A substantial main bearing has a hardened spindle ground to a slightly radiused point bearing on a thrust plate. High density PTFE sleeves in the bearing provide sufficient rigidity and very low rotational noise levels. The two-piece platter of considerable mass, is cast in Mazak and turned to close tolerances, and a special grade of black felt is used for the mat. Even now, considerable care is needed in setting up an *LP12* in a final installation, and the help of an experienced dealer is virtually mandatory.

LAB REPORT

Our assessment of disc damping showed that although the initial transient was poorly damped by the felt mat, the impulse died away quickly thereafter; this a good result. Earlier measurements comparing the frequency transform of the felt mat versus an absorbent one showed that while the 'composition' mat produced greater attenuation, its frequency response was uneven, while that of the felt was more uniform, suggesting lower overall coloration.

'Valhalla' has made its mark on the motor results with excellent wow and flutter, plus significantly lower linear wow. Absolute speed and accuracy was satisfactory, while loss under load was a very good 0.13%, and DIN weighted rumble was a superb −80dB. In fact the spectrograms for residual measuring system noise and for the *Sondek* itself were very similar, and to check this result the two were submitted to subtraction — no mains related rumble components remained!

As regards vibration isolation or acoustic breakthrough, the *LP12* was not the very best we have tested, but measurements did confirm a high standard for these parameters nonetheless. Shock resistance was also quite good, with both acoustic feedback and hum very good.

SOUND QUALITY

A decade ago it was considered heresy to suggest that turntables could make a 'sound' at all, but the *Sondek* has been the leading exponent in demonstrating just how different the subjective performances can actually be. It scored a very fine rating on audition, notwithstanding some mild spectral imbalance and coloration; a consumer who feels that absolute tonal neutrality is paramount is entitled to reject the *LP12*, but should be made aware of the importance of certain other factors. For example, the *LP12* has

long generated a feeling of 'involvement' with the music for reasons that are only partly becoming understood.

After careful and prolonged listening the *LP12* was found to excel in its ability to retain the timing, tempo, rhythm and pitch of complex percussive sections, failure here producing some loss of interest on the part of the listener. Additional qualities included good post-transient decay producing 'transparent silences' between successive notes, and these were all too often obscured by 'hangover' in other models. The felt mat also provided a level of tonal integration of bass and treble now considered optimum for the deck. The improvements have noticeably helped control the mild upper bass excess, particularly when used with a current *Ittok*. The *Ittok* arm still produces a top class sound with the *Sondek*; the SME *V* arm also matched it well.

Conclusions

While many other analogue turntable companies appear to be treading water, Linn have continued to advance the standard of their *LP12*, offering better focus, intertransient silences, stability and solidity. Pitch and rhythm remain excellent, though this does depend on precise dressing of the arm cable. Alternatively, very stiff or very compliant arm cables may affect the subchassis dynamics, but a good dealer should be able to sort this out. A strong recommendation is maintained for this fine turntable.

Test Results

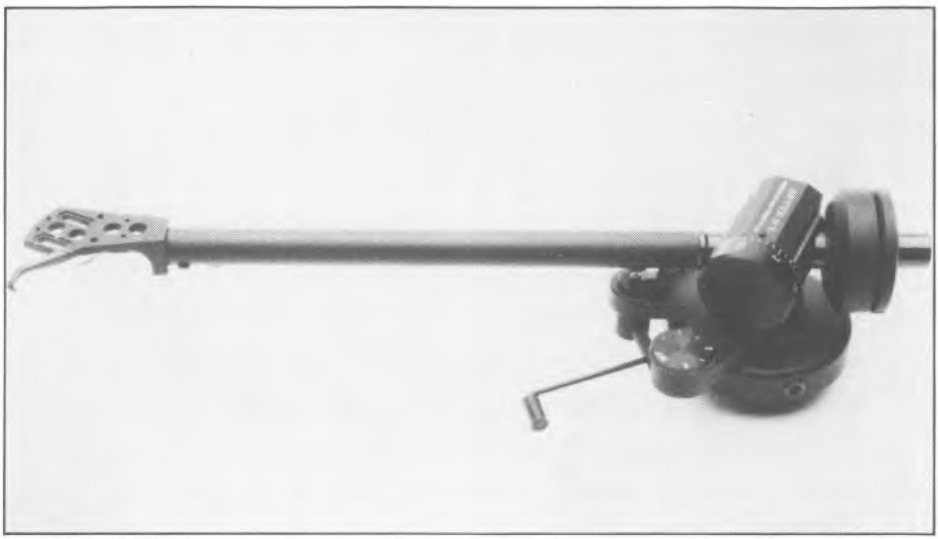
Type	manual, belt-drive, synchronous motor, subchassis
Platter mass/damping	4.1kg/good
Finish and engineering	excellent/excellent
Type of mains connecting leads	2 core
Speed options	33rpm
Wow and flutter (DIN peak wtd sigma 2)	0.06%
Wow and flutter (LIN peak wtd 0.2-6Hz/6-300Hz)	0.09%/0.05%
Absolute speed error	−0.2%
Speed drift, 1 hour/load variation	quart-locked/−0.13%
Start-up time to audible stabilisation	6 secs
Rumble, DIN B wtd, L/R average	−80dB
Size (w×d×h)/clearance for lid rear	44.5×36×15cm/5.5cm
Ease of use	good
Typical acoustic breakthrough and resonances	very good
Subjective sound quality of complete system	excellent
Hum level/acoustic feedback	very good/very good
Vibration sensitivity/shock resistance	very good/good
Estimated typical purchase price	afromosia, £450
(other finishes: walnut, £462; black, £474; rosewood, £495)	

For graph references, see issue No. 43

RECOMMENDED

LINN ITTOK LVII

LINN PRODUCTS LTD, 257 DRAKEMIRE DRIVE, GLASGOW G45 9SZ.
TEL: 041-634 0371



When first released, the *LVII* immediately established an enviable reputation for excellent engineering, sound quality and technical performance. The current version still resembles the original arm, despite some minor constructional changes which have helped maintain a competitive state of 'tune'.

This rigid fixed-head tonearm carries the relatively truthful label 'Direct Coupled' referring to its ability to directly couple the cartridge mounting to the subchassis arm board. Considering the requirements for high sensitivity in two planes of freedom at the bearings, this is no mean feat of engineering. While we would not encourage careless handling, experience of a number of *Ittoks* suggests that they are not only consistently well adjusted but also fairly robust compared with many other models.

At close on a 14g effective mass including hardware, this design fits the upper end of the medium-mass group, best suited to cartridges in the 8-16cu compliance range. Providing a strong foundation for cartridge mounting, the cast magnesium headshell carries a very well designed non-resonant finger lift.

This arm proved convenient to use, effective cueing system that avoids unwanted subchassis shock effects. In marked contrast to the majority of upmarket audiophile designs, the *Ittok* comes fitted with well calibrated and respectably accurate dials for both downforce and bias, the latter adjustable during play.

LAB REPORT

Geometric accuracy was considered excellent, with a properly square headshell and adjustment for overhang, lateral angle and height. The alignment is in fact virtually optimised for our two point minimal subjective distortion criterion. Finish and engineering were both excellent and the arm proved easy to assemble, set up and use. Friction was superb at around 10mg or less in both planes, with no detectable slack. Biasing was in the correct ratio if marginally low in our estimation (based on a normal elliptical stylus), but downforce was well within the required tolerance. The cue worked well with a sensible rate and negligible drift.

Arm resonances were classed as very good with the first main flexure deferred to a high 1kHz, suggesting remarkable rigidity.

As has been noted previously, the close nature of the coupling between arm and mounting board means that the latter becomes influential on the final sound quality.

Sound Quality

The overall rating remains a secure 'very good', but as with all acoustic components the final result obviously represents some sort of balanced compromise. In our view the *Ittok's* strengths lie in its subjective speed of response to transients, its fine transparency, and its ability to reveal atmosphere, depth and fine detail. On audition, the bass achieved a fine standard with good extension and drive, while the treble was also revealing of detail if very slightly brash and forward at times. A trace of upper-mid hardness was also noted, with stereo focus suffering mild dilution. The importance of this depends on the final combination of equipment chosen.

Conclusions

A top-quality universal tonearm, recent minor improvements in fixings, counterweight tightness and form, plus a revised cable with superior fittings have all helped maintain a highly competitive performance. Suitable for many turntables, it performs at its best on the current *LP12*, where the combination exceeds the sum of the parts.

This superbly engineered and finished arm remains strongly recommended. Experiments with alternative cables may prove rewarding but beware of upsetting the suspension dynamics of the *LP12*.

Test Results

	Tonearm
Approximate effective mass, inc screws, excl cartridge	est. 13.5g
Type/mass of headshell	non-detachable
Geometric accuracy	excellent
Adjustments provided	height/overhang/lateral angle
Finish and engineering	excellent/excellent
Ease of assembly/setting-up/use	very good/v.good/v.good
Friction, typical lateral/vertical	less than 10mg/less than 10mg
Bias compensation method	internal spring
Bias force, rim/centre (set to 1.5g elliptical)	175mg/195mg
Downforce calibration error, 1g/2g	less than 0.03g/0.038g
Cue drift, 8mm ascent/descent	negligible, 0.8 secs/1.8 secs
Arm resonances	very good
Subjective sound quality	very good
Lead capacitance/damping method	100 pF/none
Estimated typical purchase price	£399, black £458

For graph references see issue No. 40

BEST BUY

LINN AXIS

LINN PRODUCTS LTD, 257 DRAKEMIRE DRIVE, CASTLEMILK, GLASGOW G45 9SZ.
TEL: 041-634 0371

Doubtless driven by the determinism of a decade's healthy growth, Linn have finally released a medium priced integrated turntable, their unparalleled reputation ensuring that it recieves considerable attention. From first sight the £300 *Axis* is immediately and obviously a Linn, neater, smaller, more compact and modern-looking than the timeless *Sondek*. The plinth is finished in a classy textured 'black ash' vinyl; the top plate is a chameleon grey piece of 12mm MDF; and the lid is a cheap polystyrene affair. The arm is the familiar detachable-head *Basik LVX* model, with a neat leadout wire clip on the plinth.

Internal design and engineering shows a thoroughly impressive combination of innovation, cost effectiveness and excellence. The motor (a series wound version of that used in the *LP12*) and elaborate power supply are PCB-mounted with heatsink cooling at the rear of the plinth. The 33/45 supply uses a bi-phase oscillator and voltage ramping to provide high initial start-up voltage, reducing the power and consequent vibration when the player is up to speed. The crown wheel pulley, hub, bearing and platter are all familiar to those who know the *LP12* — the only significant compromise being the substitution of less dense aluminium for Mazak in the platter/hub.

Instead of *Sondek's* classic suspended subchassis operating below the arm/cartridge resonance, *Axis* has a clever system which isolates the top plate, platter and arm above about 20Hz, using a self-centring rubber membrane arrangement, a foolproof (even dealer-proof) arrangement that should ensure a long term accurate set-up.

LAB REPORT

The arm has been covered extensively in the past. The detachable head comprises tube rigidity and resonance behaviour compared to the *Basik Plus* and others in its class, but bearing quality, geometry, calibration and the like are all up to the mark.

Rumble measured well enough, higher frequency motor breakthrough being notably absent. Start-up time was slow, and slowing

under load only reasonable. Weighted wow and flutter was very good, but linear wow measured a poorer than average 0.24%. The disc impulse showed the expected felt mat effect on the initial transient, with only slight, low amplitude ringing thereafter. The breakthrough results were both very good, except at very low frequencies.

Sound Quality

Axis not only looks like a Linn, it sounds like one as well, rating 'good' overall, which is impressive for the price. Lacking the full weight and authority of the *LP12*, the bass was still very even and tuneful.

Essentially lively in character, with good dynamics, 'speed' and timing, there was slight treble 'coarseness' and midband 'thickening'. Stereo imaging was a little 'forward', but with decent focus and depth.

Conclusions

Setting new performance standards for £300 this cleverly engineered and thoroughly competent performer has a sound quality that is not far behind the *LP12* in many respects. The hassle free set-up is a major consistency benefit, and the competitive price could give new impetus to the vinyl disc medium. Frankly, it deserves the *Basik Plus* tonearm, but is strongly recommended nonetheless.

Test Results

Motor section

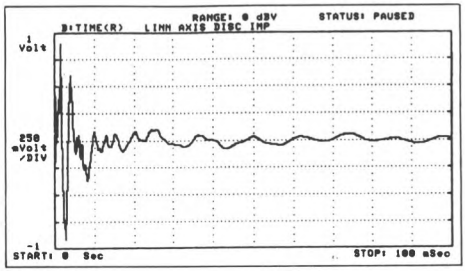
Type	electronic, belt, semi-subchassis
Platter mass/damping	1.5kg/good
Finish and engineering	v good
Type of mains connecting leads	3-pin socket/phonos and earth
Speed options	variable, 33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.05%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.24%/0.07%
Absolute speed error	+0.47%
Speed drift, 1 hour/load variation	0%/−0.2%
Start-up time to audible stabilisation	10 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−74/−78dB

Arm section

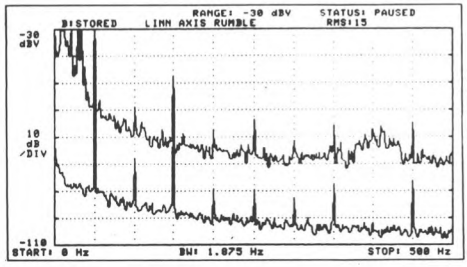
Approximate effective mass	12.5g
Type/mass of headshell	special detachable/7g
Geometric accuracy	v good
Adjustments provided	height, overhang, lateral
Finish and engineering	v good/good
Ease of assembly/set-up/use	good/v good
Friction, typical lateral vertical	50mg/10mg
Bias compensation method	dial spring
Bias force, rim/centre (set to 1.5g elliptical)	150mg/150mg
Downforce calibration error, 1g/2g	−0.1g/−0.1g
Cue drift, 8mm ascent/descent	negl, 1 secs/3 secs
Arm resonances	good
Subjective sound quality	good
Arm damping	c/wt decoupling

System as a whole

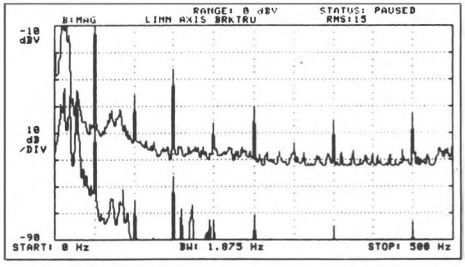
Size (w×d×h)/lid at rear	44.5×14.5×36cm/6cm
Ease of use	v good
Typical acoustic breakthrough and resonances	v good
Sound quality	good
Hum level/acoustic feedback	good+
Vibration sensitivity/shock resistance	v good/good
Estimated typical purchase price	£300



Disc edge mechanical shock



Rumble, mechanical above electrical hum



Breakthrough, acoustic above vibration

BEST BUY

LOGIC TEMPO/ELECTRONIC/DATUM II

LOGIC INTERNATIONAL LTD, 19 HURLBUTT ROAD, HEATHCOTE INDUSTRIAL ESTATE, WARWICK CV34 6TD. TEL: (0926) 20302

Back after a brief absence, Logic have revived the *Tempo* as their popular-priced turntable, and offer it with mains or electronic drive, and with *Datum II* or *Datum S* arms, at a corresponding range of price points, none of which makes reviewing any easier. For convenience we cover the *Tempo/Datum II* here, while the *S* arm can be found over the page.

Tempo is unusual in having a large solid plinth which floats on softly sprung legs. This confers slightly inebriate handling qualities but also gives good vibration rejection. And fine arm termination afforded by inch thick MDF. The plinth-mounted motor is carefully decoupled at its mounting, and the lid is good quality vinyl with sensible hinges, but the main bearing did allow 1mm play at the platter edge. Suspension adjustment is straightforward.

Datum II has a highish effective mass better suited to lowish compliance cartridges. If lacking some of the engineering subtlety of the S, it offers the same rigid tube and bearings with a substantial headshell and tightly decoupled counterweight. The compact base matches a Linn cutout.

LAB REPORT

The *II* had tight bearings and negligible friction. Geometry and downforce calibration were both accurate, but bias compensation was a little high and cue descent rather slow. The resonance trace shows the first main mode at a high c900Hz, with quite good control through the midband, and rather 'peaky' but well maintained treble energy.

Rumble was quite respectable, on figures and analysis. Wow and flutter was good though linear wow could be improved. Slowing under load was also below par, and recovery caused some overshoot. The system's good stability and the vinyl damping effectiveness of the phenolic platter is seen in the disc impulse spectrogram. Both acoustic and vibration breakthrough were very good, and largely comparable with a good subchassis design.

SOUND QUALITY

The various *Tempo* variations ranged from 'above average' through to 'good,' largely according to price but also depending upon personal preferences — the turntable upgrade tending to imp-

rove bass and mid, the arm change mid and top. The general character is lively and exciting, a little 'full' perhaps, but with a solid, clear and open midband, with good stereo staging. Treble was a bit 'tizzy' and lacked a little 'crispness' (*Datum II*), but was still better than most at its price.

Conclusions

The complications of permutations are made easier to handle when it is clear that all work very well at their respective price points, and the various upgrades were logical and effective. Good engineering and presentation, simple set-up, decent measured performance and fine sound quality for the price merit Best Buy rating, each and severally . . .

Test Results

Motor section

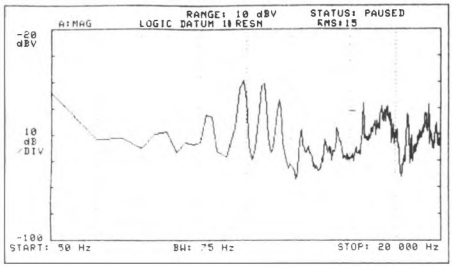
Type	manual electonic belt, decoupled plinth
Platter mass/damping	1.5kg/good
finish/engineering	v good
Mains/connecting leads	2 core/phonos and earth
Speed options	variable, 33⅓/45rpm
Wow & flutter (DIN pk wtd)	0.06%
Wow/flutter (lin pk wtd)	0.18%/0.06%
Absolute speed error	+0.05%
Speed drift/load variation	negl/0.3%
Start-up to stability	3.5 secs
Rumble L/R (DIN B wtd)	−72/−76dB

Tonearm

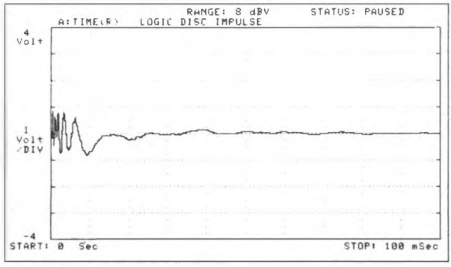
Effective mass (approx)	15g
Type/mass headshell	fixed
Geometric accuracy	v good
Adjustments provided	height overhang,lateral
Finish/engineering	excellent
Ease of set-up/use	good
Friction (typical lat/vert)	20mg/10mg
Bias method	dial spring
Bias force (rim/centre, 1.5gE)	225mg/275mg
Downforce error 1g/2g	0/+0.1g
Cue drift, 8mm up/down	mild, 1 secs/4 secs
Arm resonances	f good
Subjective sound quality	good
Arm damping	none

Whole system

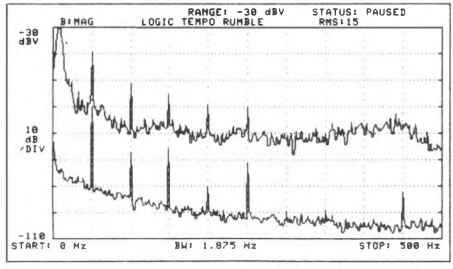
Size (w×d×h)/lid at rear	46.5×36×15cm/5.5cm
Ease of use	f good
Acoustic breakthrough, resonances	v good
Sound quality	above average good+ (see text)
Hum/acoustic feedback	v good
Vibration shock sensitivity	v good/fair
Typical price	from £240 manual inc *DII*



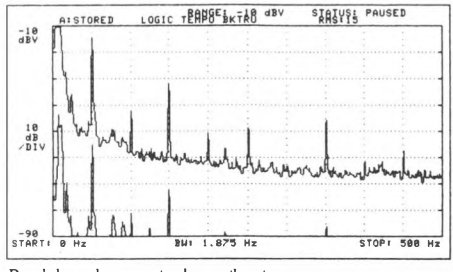
Tonearm structural resonances.



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

RECOMMENDED

LOGIC GEMINI/DATUM S

LOGIC INTERNATIONAL LTD, 19 HURLBUTT ROAD, HEATHCOTE INDUSTRIAL ESTATE, WARWICK CV34 6TD.
TEL: (0926) 20302

Available with *Datum S* or *Datum II* arms at £700 and £600 respectively, *Gemini* is a brand new and elaborate subchassis turntable. Two synchronised motors are sited either side of the bearing/hub to 'counterbalance the variable torque forces that can otherwise operate asymmetrically on the suspension system'. Regrettably, a side effect is high hum beneath the cartridge.

The universally applicable *Datum S* arm includes the generous aluminium tube and bearing housing of *Datum II*, but with more tightly toleranced bearings, a tungsten counterweight and milled headshell with stronger arm bonding. Internal and connecting wiring are both high quality van den Hul, and the mounting base is Linn-compatible, though pillars are not interchangeable. Effective mass is on the high side, only really suited to the less compliant moving-coil cartridges.

Our pre-production *Gemini* is a neat unit, well finished in black with a worthwhile attempt at styling. Electronic twin quartz speeds are selected from a top control panel. The platter is a filled phenolic plastic, properly balanced with an integral aluminium hub to match the crowned motor pulleys, and with a textured top surface for use without a mat (with access holes for belt fitting). The belt is soft and flexible, and the main bearing has a hardened steel captive ball and low friction plastic liners. The aluminium girder subchassis is suspended on three foam-damped springs, finger adjustable from beneath. The compact design requires circular arm mounting bosses, and constricts lead dressing.

LAB REPORT

The arm measured very well on friction, and was generally well finished, with slightly high bias compensation. The resonance trend looks very good, with well-controlled breaks in the midband but a little extra 'liveliness' in the treble.

The electronic rumble shown in the spectrogram is a function of the second motor lying too close to the arm traverse. The main bearing alone only contributed −77/−81dB, but the extra hum resulted in an unacceptable 66/66dB.

Wow and flutter was also unexceptional, and again one wonders about the two motors. Acoustic breakthrough measured very well, but vibration showed some LF breakthrough below 100Hz. The disc impulse shows good initial damping but some low frequency 'float'.

Sound Quality

Assessed on *Gemini* and elsewhere, the *Datum S* arm sounds a little bit special, helped undoubtedly by its high quality cabling to a very good rating. Fine extended bass with a well controlled midband provides a solid foundation for fine depth, focus and transparency. Not the tidiest-sounding arm the treble was a little explicit, but with good air and life.

The *Gemini* as a whole fared less well, but still managed a 'good' rating overall. Tonally neutral, the sound was a little relentless and a bit 'slow', lacking full integration and somewhat muddled in the bass, without real authority and 'slam'. The mid was clear and clean, quite airy with some sparkle.

Conclusions

Whereas the *Datum S* is a clear recommendation, joining a select handful that offer very good sound quality, the *Gemini* is currently disappointing. It has the potential to make a good turntable, but is currently the victim of its own cleverness, and in need of further development.

Test Results

Motor section

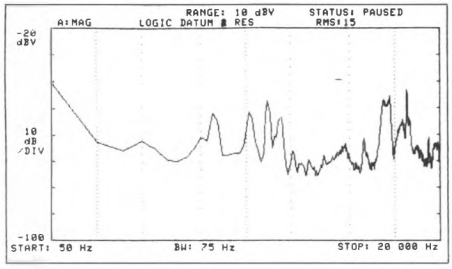
Type	electronic, belt, subchassis
Platter mass/damping	1.5kg/good
Finish/engineering	v good
Mains/connecting leads	3 core
Speed options	variable, 33⅓/45rpm
Wow & flutter (DIN pk wtd)	0.17%
Wow/flutter (lin pk wtd)	0.24%/0.06%
Absolute speed error	+0.21%
Speed drift/load variation	−0.08%/−0.2%
Start-up to stability	3.5 secs
Rumble L/R (DIN B wtd)	−66/−66dB(see text)

Tonearm

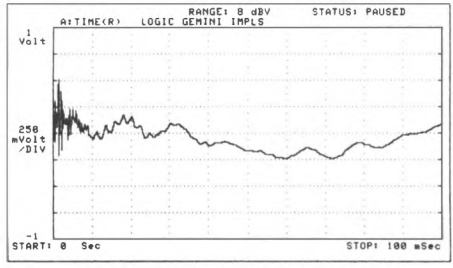
Effective mass (approx)	15g
Type/mass headshell	fixed
Geometric accuracy	v good
Adjustments provided	height, overhang, lateral
Finish/engineering	excellent
Ease of set-up/use	good
Friction, (typical lat/vert)	20mg/<10mg
Bias method	dial spring
Bias force (rim/centre, 1.5gE)	225mg/275mg
Downforce error, 1g/2g	0%/+0.2%
Cue drift, 8mm up/down	some, 1 secs/3 secs
Arm resonances	v good
Sound quality	v good
Arm damping	some cw

Whole system

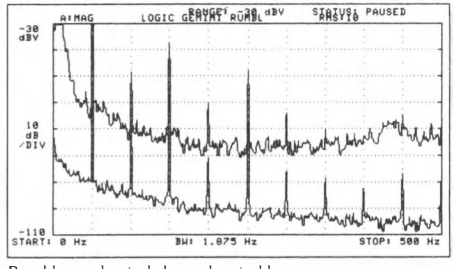
Size (w×d×h)/lid at rear	43×35×13.5cm/6cm
Ease of use	good
Acoustic breakthrough resonances	v good
Sound quality	good
Hum/acoustic feedback	poor/v good
Vibration, shock sensitivity	good/f good
Typical price	£700 (see text) (Datum S £230)



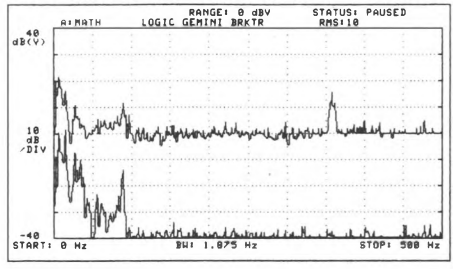
Tonearm structural resonances.



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

BEST BUY

MANTICORE MANTRA

MANTICORE SYSTEMS ENGINEERING LTD, THE COURTYARD, 56c SHORTMEAD STREET, BIGGLESWADE, BEDFORDSHIRE SG18 0AP.

TEL: 0767 318437

Manticore is a new name to *Hi-Fi Choice*, though their principals have had a somewhat chequered history over a number of years, and the *Mantra* too has evolved over several years. This £300 integrated subchassis player has a version of the fine Rega *RB250* tonearm, and was also supplied with an *AT95E* cartridge. While the black wood veneer finish is rather bulky and severe, initial inspection was very promising from an engineering point of view. Rega's influence is again seen in the thick plate glass platter and felt mat. These rest on three metal studs in the top of the belt-carrying plastic inner hub; the tight main bearing is a hardened steel shaft running on a thrust ball in a brass housing.

The motor has a stepped crowned pulley, allowing manual speed change by moving the fairly elastic flat belt. The subchassis is metal, with additional girder reinforcement, and was properly set-up with generally favourable spring characteristics. The armboard is MDF wood composite, the lid heavy, non-resonant PVC, and the overall standard of finish entirely presentable.

LAB REPORT

The arm is already well known. It has fine, tight, low-friction bearings and good calibration and ergonomics. The single-casting headshell/beam/bearing housing shows impressive rigidity with good resonance properties, albeit with minor awkwardness in adjusting arm height. An effective mass of 12g suits most good cartridges.

Most of the rumble spectrum spikes are hum-related and due to the test rig, but the motor contributed a −46dB component at 200Hz. In other respects the rumble performance was very competent. Though start-up is quite slow, variation under load is commendably slight, indicating good motor torque characteristics. Absolute speed is very slightly slow, while wow and flutter speed variations measured very well.

The acoustic breakthrough spectrum is very good indeed, while the vibration breakthrough is also good though it is possible to detect some spring harmonics of the main 3-5Hz subchassis modes. The mechanical disc impulse test shows an initial behaviour typical of a felt mat system,

plus some continuing mild platter rocking.

Sound Quality

Used 'straight from the box', the results were surprisingly good, considering the very modest cartridge fitted. Replacing the latter (with something costing about 100 times the price!) confirmed the favourable initial impressions. All listeners commented on the clarity and openness of the sound, particularly in the midrange, where detail and focus are pretty good by even the best standards. The bass received a little criticism, 'speed' and 'slam' being rated a trifle below the best.

Conclusions

Whatever water may have run under the bridge, it is clear that the *Mantra* is a very fine package, deserving strong recommendation. Sound and sensible engineering is reflected in the competent lab performance, while its own particular character gives a sound quality as good or better than its immediate price competition, and better than a number of more costly designs. The fine tonearm completes the player.

Test Results

Motor section

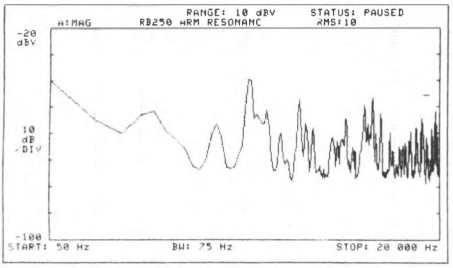
Type	manual, belt-drive, subchassis
Platter mass/damping	2.46kg/average
Finish and engineering	very good
Type of mains connecting leads	3 core/phonos
Speed options	33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.05%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.16%/0.08%
Absolute speed error	−038%
Speed drift, 1 hour/load variation	−0.13%/−0.10%
Start-up time to audible stabilisation	5 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−72/−76dB

Arm section

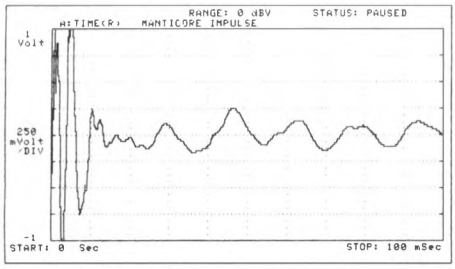
Approximate effective mass, inc screws, excl cartridge	12g
Type/mass of headshell	n.a.
Geometric accuracy	very good
Adjustments provided	overhang, lateral angle
Finish and engineering	excellent
Ease of assembly/set-up/use	very good/good
Friction, typical lateral vertical	<20mg/<20mg
Bias compensation method	magnetic
Bias force, rim/centre (set to 1.5g elliptical)	150mg/220mg
Downforce calibration error, 1g/2g	<0.15g/<0.2g
Cue drift, 8mm ascent/descent	low, 1 sec/3 secs
Arm resonances	good+
Subjective sound quality	good
Arm damping	some c/wt decoupling

System as a whole

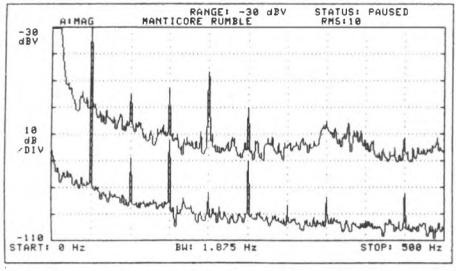
Size (w×d×h)/clearance for lid rear	46×78×15cm/7cm
Ease of use	average
Typical acoustic breakthrough and resonances	very good
Subjective sound quality of complete system	good
Hum level/acoustic feedback	good+/very good
Vibration sensitivity/shock resistance	good/good
Estimated typical purchase price	£300



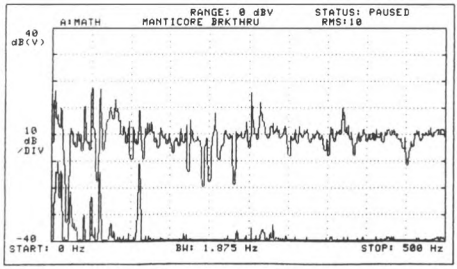
Tonearm structural resonances.



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

MICHELL SYNCHRO

J.A. MICHELL ENGINEERING LTD, 2 THEOBALD STREET, BOREHAMWOOD, HERTFORDSHIRE WD6 4FE.
TEL: 01-953 0771

The Michell *Synchro* has been around some time now, but for 1987 it is fitted with the fine Rega *RB250* arm as a £300 package, or for £230 without, and has changed spring rates for the subchassis suspension. It is a most distinctive design — glass sculpture is not everyone's cup of tea — but it will certainly enhance some types of decor, and is exquisitely finished.

The motor unit is based on a thick, green acrylic platform with multi-turn springs supporting a cast 'steering wheel' subchassis with an outrigger extension for the tonearm on a circular disc. A plate glass platter fits almost flush with the 'wheel', and takes its drive from a peripheral O-ring belt and a stepped pulley synchronous motor; the main bearing is tightly toleranced. However, the platter is only lightly damped by the felt mat and is inclined to 'ring'. And while the subchassis does guard against vibration, its dynamics provide virtually no stability. The whole unit is preferably cone-mounted, and is supplied with a nice, acoustically 'dead' lid.

LAB REPORT

The arm is already well known. It has fine, tight, low-friction bearings and good calibration and ergonomics. The single-casting headshell/beam/bearing housing showed impressive rigidity with good resonance properties, albeit with minor awkwardness in adjusting arm height. An effective mass of 12g suits most good cartridges.

The motor was less encouraging. Mild subchassis instability is reflected in a poor wow and flutter figure of 0.18%, which must be regarded as marginal in high fidelity terms. Rumble was reasonable but showed a significant channel imbalance. while the spectrogram reveals a motor component of 60Hz periodicity at −36dB. The disc mechanical impulse test showed pretty good early control, typical of the felt mat, but some mild prolonged ringing at 100Hz. Vibration and acoustic breakthrough were overall pretty good, though a spring problem is revealed at 200Hz.

SOUND QUALITY

The *Synchro* scored a straight average rating,

which is fair enough considering the price and beautiful presentation, but which must also be considered disappointing in view of the promising ingredients. The *RB250* does not seem to give of its best in this combination, and the sound was mildly coloured by overhang in the midband, a loss of dynamics, space and 'air', and suppressed depth. The bass was a strong feature, but the overall effect was somewhat uninvolving.

Conclusions

Well you pays your money so yours is the choice. The *Synchro* doesn't quite make it on sound quality, and shows a few technical weaknesses. But it doesn't disgrace itself either and the standards of finish and presentation are superb, so if the eye of the beholder is suitably seduced, then why not...?

Test Results

Motor section

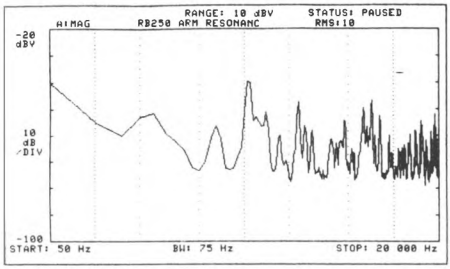
Type — manual, belt-drive, subchassis
Platter mass/damping — 2.1kg/average
Finish and engineering — excellent/very good
Type of mains connecting leads — 2 core/phonos
Speed options — 33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2) — 0.18%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz) — 0.18%/0.08%
Absolute speed error — +0.16%
Speed drift, 1 hour/load variation — +0.33%/−0.2%
Start-up time to audible stabilisation — 4 secs
Rumble, DIN B wtd, L/R average (see spectrum) — −73/−82dB

Arm section

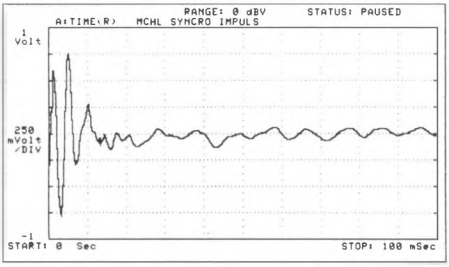
Approximate effective mass, inc screws, excl cartridge — 12g
Type/mass of headshell — fixed
Geometric accuracy — very good
Adjustments provided — lateral, overhang
Finish and engineering — excellent
Ease of assembly/set-up/use — very good
Friction, typical lateral vertical — <20mg/<20mg
Bias compensation method — magnetic
Bias force, rim/centre (set to 1.5g elliptical) — 160mg/225mg
Downforce calibration error, 1g/2g — <0.15g/<−0.2g
Cue drift, 8mm ascent/descent — mild, 1 sec/3 secs
Arm resonances — very good
Subjective sound quality — average (in system)
Arm damping — decoupled counterweight

System as a whole

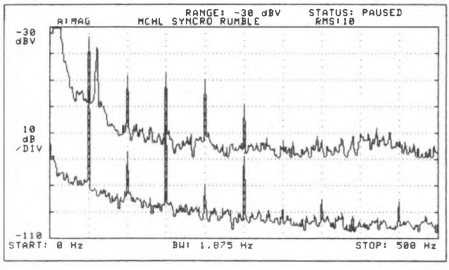
Size (w×d×h)/clearance for lid rear — 46×37×14.5cm/8cm
Ease of use — good
Typical acoustic breakthrough and resonances — very good
Subjective sound quality of complete system — average
Hum level/acoustic feedback — good/very good
Vibration sensitivity/shock resistance — good+/fair
Estimated typical purchase price — £300 (inc. arm)



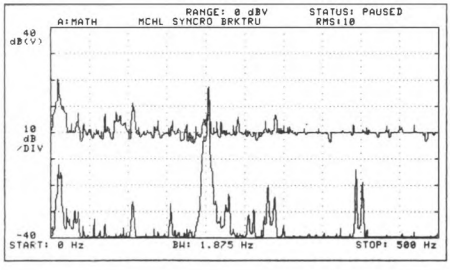
Tonearm structural resonances.



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

MICHELL GYRODEC

J.A. MICHELL ENGINEERING LTD, 2 THEOBALD STREET, BOREHAMWOOD, HERTFORDSHIRE WD6 4FE.
TEL: 01-953 0771

Now with different subchassis springs and a new acrylic mat, the *Gyrodec* offers something different in style with fine finish at a high but not exceptional price. Mounted on a substantial acrylic base/lid which has spiked feet, a large metal cast subchassis sits on widely spaced springs around the platter periphery. However, any problems of high stiffness are largely avoided by the very high total mass — the platter weighing 4.5kg with its additional spinning weights. A disc clamp stresses the disc into close mat contact.

Setting up is pretty simple with everything exposed. The substantial Papst motor has a small stepped pulley and drives the outside of the platter directly using twin rubber cords, with manual speed change. Michell have been researching different materials for optimum arm termination, and can supply a wide range to suit different models.

LAB REPORT

A partial retest was carried out on this model which has already measured well in most respects in earlier reviews. Start up time and slowing under load are both now sensible, their previous figures halved, while rumble, wow and flutter are all good. The two disc impulse graphs show the improvement in initial platter damping with the acrylic mat, but the platter rocking mode is still a minor weakness. Acoustic breakthrough is excellent, but the vibration tests show up a slight subchassis spring resonances.

SOUND QUALITY

Rated 'good' overall, the *Gyrodec* has a decent, extended, powerful bass and a generally neutral midrange, but somehow lacks the 'see through' transparency of the very best current systems, and is inclined to sound slightly slow and lacking in 'life'.

CONCLUSIONS

On straightforward price versus sound quality the *Gyrodec* misses by a small margin, but it is a doughty performer nonetheless, and is far from overpriced when considering its finish. If the appearance appeals, it is a very realistic option.

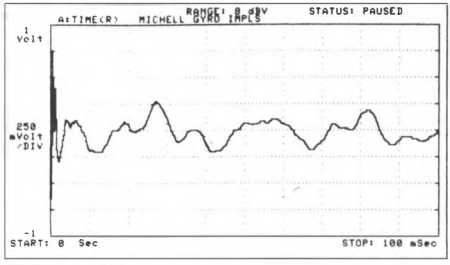
Test Results

Motor section

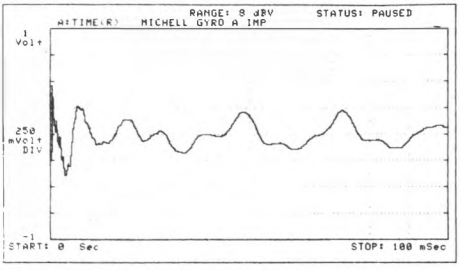
Type	manual, belt-drive, subchassis
Platter mass/damping	4.5kg/excellent
Finish and engineering	very good/excellent
Type of mains connecting leads	2 core remote
Speed options	33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.1%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.06%/0.04%
Absolute speed error	−0.08%
Speed drift, 1 hour/load variation	−0.004%/−0.15%
Start-up time to audible stabilisation	3.5 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−77dB

System as a whole

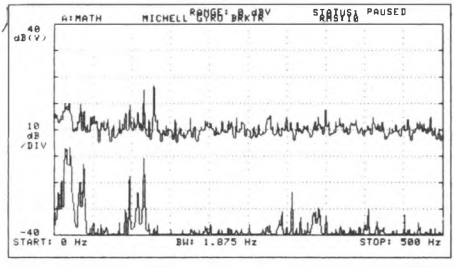
Size (w×d×h)/clearance for lid rear	53×42×19cm/14cm
Ease of use	good
Typical acoustic breakthrough and resonances	excellent
Subjective sound quality of complete system	good
Hum level/acoustic feedback	very good/excellent
Vibration sensitivity/shock resistance	excellent/very good
Estimated typical purchase price	£595



Disc impulse, old rubber mat



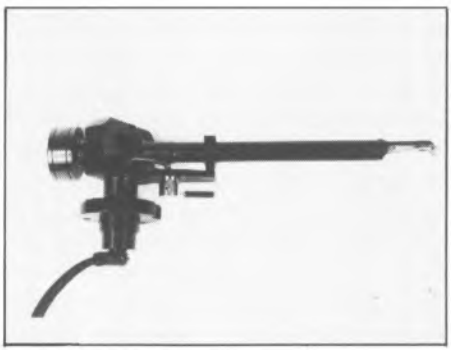
Disc impulse, new acrylic mat



Breakthrough, acoustic above vibration.

MISSION MECHANIC

MISSION ELECTRONICS, STONEHILL, HUNTINGDON, PE18 6ED.
TEL: (0480) 57477



After a number of false starts and delays, the long promised Mission *Mechanic* tonearm has appeared, in what looks like a full production form. With ex-Zeta personnel involved a common heritage is unmistakeable. The *Mechanic* shares the same massive build, has a 'squared off' bearing housing and even larger diameter arm tube — and even the same spring bias arrangement. Nostalgia brought a tear to the eye as a cartridge tag duly fell off after the first cartridge change — just as it did on the first *Zetas!*

In other respects the *Mechanic* is fairly conventional, has a rigid coupled counterweight, and uses bearings that are on the small side for the scale of the rest of the structure, plus a cheap Japanese leadout set. In many respects it looks the business, but flatters to deceive. No downforce calibration is provided, and the mounting is Linn-compatible.

LAB REPORT

Though the bearings were tight, they also gave very high friction levels, which were 'notchy' in the lateral plane. Bias compensation values were wrong as well. The effective mass is a high 16.5g, well suited to top moving-coil cartridges. The resonance trace was quite good, with the main beam modes at a high 1.2-1.4kHz, though clumped somewhat together.

SOUND QUALITY

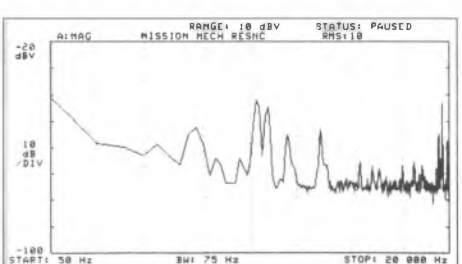
Considering its pretensions and price, it was disappointing that the *Mechanic* only just scraped a 'good' rating. There was praise for the powerful bass and impressive speed and dynamics, offset by criticism of wayward imagery and loss of space and depth. The midrange sounded forward and hollow, the treble slightly 'gritty'.

CONCLUSIONS

How much of the disappointment resulted from the high friction bearings and how likely these are to recur will have to remain unanswered this time around. For the present the *Mechanic* doesn't really make it at its high price, though it is clearly a potentially good performer.

TEST RESULTS

Approximate effective mass, inc screws, excl cartridge	16.5g
Type/mass of headshell	fixed
Geometric accuracy	very good
Adjustments provided	height, overhang, lateral
Finish and engineering	excellent
Ease of assembly/setting-up/use	good
Friction, typical lateral/vertical	180mg/100mg
Bias compensation method	dial spring
Bias force, rim/centre (set to 1.5g elliptical)	200mg/80mg
Downforce calibration error, 1g/2g	n/a
Cue drift, 8mm ascent/descent	moderate, 0.5 secs/2.5 secs
Arm resonances	good but 'clumped'
Subjective sound quality	good
Arm damping	none
Estimated typical purchase price	£600



Tonearm structural resonances.

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NAD 5120

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Tel: (0923) 26499

With its price slashed a further 20 per cent, the Czech-built NAD *5120* is now significantly cheaper than its obvious German rival, the Dual 505. The NAD is now £90, including an Ortofon *OM10* cartridge. We have re-auditioned it and checked the earlier arm friction problem incorporating the results in the existing review.

Amazing considering the price, this Czech built turntable has a true floating subchassis. The suspension needs no alignment, employing B&O style leaf springing. The lightweight pressed alloy platter is beefed up by a substantial hard mat insert, bringing total mass to a still-modest 1.15kg. The moulded plastic inner platter drum is belt-driven from a slow speed synchronous motor of the usual type. One control actuates the speed change and another cueing; stop and lift-off are automatic. The non-resonant lid is acrylic and the plastic plinth is supported on hard rubber feet.

Lab Report

This player achieved presentable wow and flutter results, 0.1% DIN peak weighted, while the separate flutter and wow contributions were well balanced. Absolute speed was acceptably close and slowing under load a satisfactory −0.28%. Rumble was poorer than expected at −68/−64dB, DIN B weighted; spectral analysis showed some motor harmonics at 100 and 200Hz, sufficient to affect the DIN reading.

Vibration isolation was pretty good, but the light platter did not provide very strong acoustic breakthrough rejection, which peaked at 360Hz. The disc impulse response was also unpromising; the initial transient was handled well, but the platter continued ringing at several frequencies thereafter. Suspension dynamics were fairly good, if a touch 'whippy' in rotation.

Arm effective mass was 9.0g suiting the supplied cartridge, while lateral friction measured a rather high 0.3g; as a result the bias compensation value had to go unrecorded. Downforce calibration was on the low side, which is not the best direction in which to err. The arm's resonant behaviour was considered poor, the graph being charted with the supplied Ortofon cartridge and hence representative of typical use conditions. The major break at 350Hz was particularly severe, but there were no problems over

the rest of the range. When used as instructed the damper proved effective and was a useful extra in improving tracking and stability.

Sound Quality

Rating below average, this is still a fine result for the price, and comfortably better than the immediate competition. There is some sense of scale, and balance, coloration and articulation are quite competent. The bass is bouncy enough, but also in a 'rubbery' sense, and imagery and focus are rather 'softened'.

Conclusions

Clearly a Best Buy offering 'near hi-fi' sound quality at an almost ludicrously low price, the reservations are the rather indifferent build quality and poor horizontal arm friction, which the customer should try to personally check. (Get the arm zero-balanced, using the stylus guard, and Blu-tack if necessary, and check for lateral freedom from friction.)

For graph references see issue No 40

Test Results

Type	semi auto, belt-drive, subchassis
Platter mass/damping	1.15kg/average
Finish and engineering	very good/good
Type of mains connecting leads	2 core/phonos and earth
Speed options	33/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.1%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.12%/0.12%
Absolute speed error	+0.25%
Speed drift, 1 hour/load variation	synchronous/−0.28%
Start-up time to audible stabilisation	2.5 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−68/−64dB
Arm section	
Approximate effective mass, inc screws, excl cartridge	9.0g
Type/mass of headshell	non-detachable/-
Geometric accuracy	good
Adjustments provided	overhang/offset
Finish and engineering	good/fairly good
Ease of assembly/set-up/use	very good
Friction, typical lateral vertical	320mg/<20mg
Bias compensation method	spring
Bias force, rim/centre (set to 1.5g elliptical)	see text
Downforce calibration error, 1g/2g	−0.15g/−0.3g
Cue drift, 8mm ascent/descent	<0.5 secs/2.5 secs
Arm resonances	poor
Subjective sound quality	average−
Arm damping	effective silicone dashpot
System as a whole	
Size (w×d×h)/clearance for lid rear	42×35.5×11cm/3cm
Ease of use	very good
Typical acoustic breakthrough and resonances	average+
Subjective sound quality of complete system	below average
Hum level/acoustic feedback	good/good
Vibration sensitivity/shock resistance	good/fairly good
Estimated typical purchase price	£89 (inc. OM10 cart.)

OAK/MOTH ARM

MOTH MARKETING, 47 ARMSTRONG CLOSE, WILSTEAD, BEDFORD.
TEL: (0234) 741152

Now priced at £165, the latest *Oak* is fitted with a Moth (Rega *RB250*) arm, with claimed improvements in suppressing the motor-vibration rumble that has plagued this model in our past tests. This is a solid plinth design, with an inverted main bearing and red O-ring drive to the platter edge from a stepped pulley and powerful synchronous motor. The lid, which couples to the plinth and arm, is a cheap resonant affair.

LAB REPORT

The arm is already well known. It has fine, tight, low-friction bearings and good calibration and ergonomics. The single-casting headshell/beam/bearing housing shows impressive rigidity with good resonance properties, albeit with minor awkwardness in adjusting arm height. An effective mass of 12g suits most good cartridges.

The motor vibration rumble problem is as bad as ever, as the spectrogram shows all too clearly. The relevant figures are now: total, −62/63dB; motor on, belt off, −66/−66dB; motor off, belt off, −76/−77dB; Disc damping was quite reasonable, but with some attendant platter rocking. Wow and flutter was quite inadequate, and the spectrograms show plenty of acoustic and even worse vibration breakthrough.

SOUND QUALITY

Despite the prospect of an improvement by reason of the fine arm which is now fitted as standard, this merely provided a clearer window onto the shortcoming of the motor unit. Limited bass extension and a certain treble confusion is accompanied by motor drone and lack of pitch stability, together with an unpredictable dependency on siting.

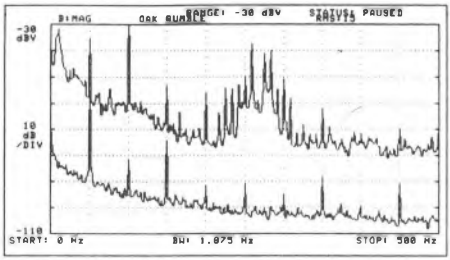
CONCLUSIONS

New arm notwithstanding, our serious reservations regarding motor performance are perpetuated yet again, and in this respect the Oak fails to measure up to the improvements in performance found elsewhere in the market. Indeed it is a salutary lesson on the primacy of turntable over arm and cartridge. As a separate item the Moth arm is a clear Best Buy.

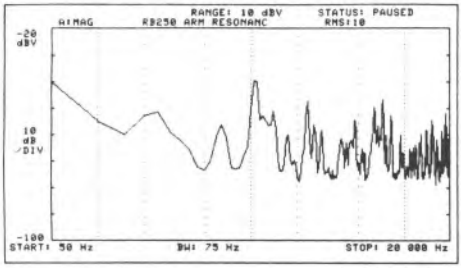
TEST RESULTS

Motor section	
Type	manual, belt, solid
Platter mass/damping	1.5kg/fairly good
Finish and engineering	very good/good
Type of mains connecting leads	2 core/phonos
Speed options	variable, 33/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.3%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.46%/0.1%
Absolute speed error	0.2%
Speed drift, 1 hour/load variation	+0.1%/−0.2%
Start-up time to audible stabilisation	3 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−62/−63dB
Arm section	
Approximate effective mass, inc screws, excl cartridge	12g
Type/mass of headshell	n.a.
Geometric accuracy	very good
Adjustments provided	overhang, lateral angle
Finish and engineering	excellent
Ease of assembly/set-up/use	very good/good
Friction, typical lateral vertical	<20mg/<20mg
Bias compensation method	magnetic
Bias force, rim/centre (set to 1.5g elliptical)	150mg/220mg
Downforce calibration error, 1g/2g	<0.15g/<0.2g
Cue drift, 8mm ascent/descent	low, 1 sec/3 secs

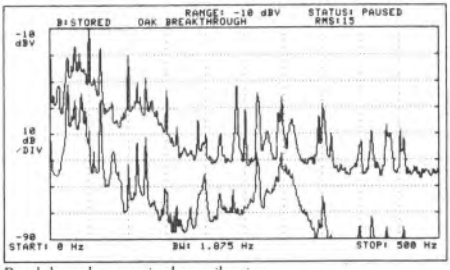
Arm resonances	good+
Subjective sound quality	good
Arm damping	some c/wt decoupling
System as a whole	
Size (w×d×h)/clearance for lid rear	46×35×14.5cm/7cm
Ease of use	good
Typical acoustic breakthrough and resonances	well below average
Subjective sound quality of complete system	below average
Hum level/acoustic feedback	below average
Vibration sensitivity/shock resistance	poor/good
Estimated typical purchase price	£165



Rumble, mechanical above electrical hum.



Tonearm structural resonances.



Breakthrough, acoustic above vibration.

RECOMMENDED

PINK TRIANGLE PT TOO

PINK TRIANGLE PROJECTS LTD, 4 BRUNSWICK VILLAS, CAMBERWELL, LONDON SE5 7RR.
TEL: 01-703 5498

Having gone through a bad patch a year or so ago, *Pink Triangle* is back, featuring a new electronic 2-speed power supply, a high power, low noise synchronous motor and a large acrylic drive pulley. The turntable uses a remote power supply, but speed switching is fitted on the plinth, using a special sensing lead. The familiar neat styling and bare acrylic platter with black plinth and Pink logos were reinforced on our sample by distinctive pink edging within the heavy fabricated cover, giving both good performance and a contemporary 'Art Deco' appearance.

The Pink people have been paying much attention to the terminations required to optimise the performance of various top arms, our sample being fitted with a baseplate for fitting the SME V. Another change is the fitting of phono sockets to the plinth and special flexible arm wiring within the plinth, so as to have as little influence as possible on the dynamics of the very lightweight Pink subchassis. The new motor too seemed notably free of vibration, but a mild disappointment involved the failure of the power supply on one (early) sample.

The Triangle's formula involves using lightweight materials throughout the suspension and platter — to the extent that the subchassis only levels itself properly when a disc is on the platter. The subchassis itself is an ovoid piece of Aerolam honeycomb, giving high stiffness with low mass, and this is suspended from three narrow springs, giving an inherently stable configuration adjustable from nuts set in the plinth sides. The tight, high quality main bearing is similarly unusual, being an inverted self-stabilising single point design, with ruby bearing surface.

LAB REPORT

When properly levelled, the *PT TOO* gave a very good rumble figure and an encouraging spectrum, the only significant mechanical contribution being a −43dB spike at 100Hz. The more powerful, better coupled motor ensures that the original *Pink*'s 'slowing under load' bogey is now entirely a thing of the past. Torque is fine, and indeed the speed characteristics throughout are very good indeed:

negligible absolute error and drift, and fine wow and flutter performance, with quick start up.

The breakthrough characteristics are also generally very good, albeit with some vibration coupling around 60Hz and very mild acoustic and vibration at 390Hz. The fine mechanical disc impulse test result showed the effectiveness of the mat-less acrylic platter in damping disc vinyl. It also reveals the quick decay of the subchassis modes, and confirms the quality of the bearing platter engineering by the lack of rocking modes.

Sound Quality

The *PT TOO* was particularly well received on the listening tests, and was immediately recognised as a major point of reference, giving a uniquely attractive combination of midrange transparency and exciting, lively dynamics. The sound was a little 'light' in character, lacking the 'weight' and 'slam' of some alternatives perhaps, but the lack of coloration plus fine midrange depth, focus, detail and air, was more than compensation for listeners in the context of the system used. In the bass it was notably even and articulate.

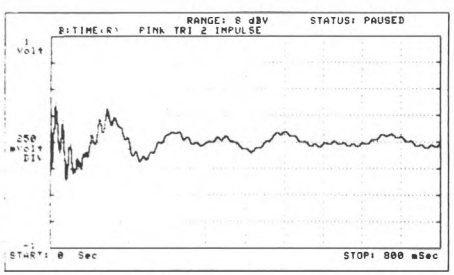
Conclusions

The *Pink* is back, and with something of a vengeance, offering a smart and attractive package with some exceptional strengths and very few weaknesses. The light suspended mass does not suit it to parallel tracking arms (sadly, for an *Airtangent* could be a mouthwatering combination), but even quite heavy pivoted arms (eg SME *V*) are accommodated without difficulty. Assuming the power supply problem was an isolated case, the lab performance confirms that earlier weaknesses are no more and overall performance is very good indeed. Listening suggests that the *PT TOO* is the best we have heard in many areas, and a good match for the competition in other respects, so this revitalised motor unit merits firm recommendation.

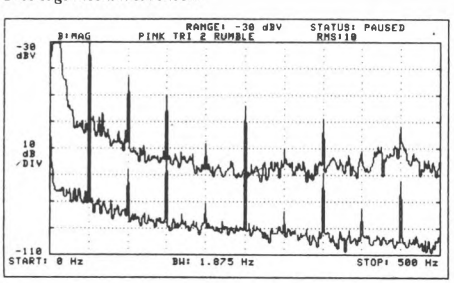
Test Results

Motor section

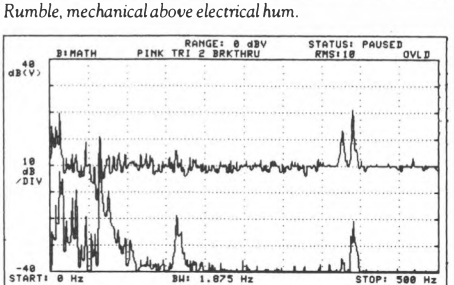
Type	electronic, belt-drive, subchassis
Platter mass/damping	1.7kg/very good
Finish and engineering	very good
Type of mains connecting leads	3 core remote
Speed options	33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.04%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.13%/0.05%
Absolute speed error	+0.08%
Speed drift, 1 hour/load variation	−0.13%/−0.15%
Start-up time to audible stabilisation	3 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−77/−78dB
Size (w×d×h)/clearance for lid rear	45×39×15.5cm/7cm
Ease of use	good
Typical acoustic breakthrough and resonances	excellent
Subjective sound quality of complete system	very good
Hum level/acoustic feedback	very good/excellent
Vibration sensitivity/shock resistance	very good/fair
Estimated typical purchase price	£500



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.

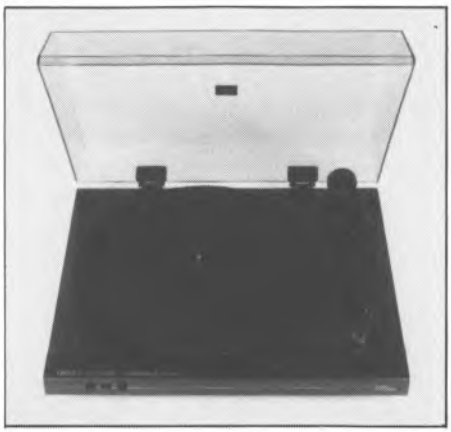


Breakthrough, acoustic above vibration.

RECOMMENDED

QED R232EN

QED AUDIO PRODUCTS LTD, 12 ASHFORD INDUSTRIAL ESTATE, SHIELD ROAD, ASHFORD, MIDDLESEX TW15 1AU. TEL: ASHFORD 46236



Essentially unchanged from the year before, the 1987 *QED* does show clear all round improvements in manufacturing tolerances, to the benefit of its performance and appearance. Available in standard and electronic versions, we have re-auditioned the *R232EN*.

Like the *232*, the *'EN* is founded on a substantial solid plinth supported on resilient vibration-absorbing feet. A glass platter is used with a belt-driven inner hub. The main bearing is well toleranced while a black felt mat provides disc support. The overall finish — satin black with gold lettering — is very good, while operating speeds are conveniently set by front panel push buttons.

The tonearm is a modern design and now has slotted headshell fixings for more accurate alignment. It comes fitted with a moving magnet cartridge custom-built by Goldring. The strongly-constructed and rigid headshell is permanently fixed to the main arm beam, the latter supported on strong gimbal bearings adjusted to be free from play.

The design objective was to offer a complete and foolproof integrated player with all components properly fitted, aligned and sonically balanced.

LAB REPORT

While the cartridge was not subjected to full test it was found to give a more than satisfactory frequency response with worthwhile separation, plus good trackability at the chosen downforce; it also matched the arm well. The latter proved to be more than competent with regard to arm resonances, showing good control with the major mode of 600Hz. Effective mass lay in the medium category at approximately 12g, including hardware. Well-aligned, the arm showed moderate friction levels, sensible degrees of downforce and bias correction, and the cue operated well.

The resilient feet of the motor unit provided good isolation at low mid frequencies, while the impaired bass isolation was nearer the norm for the type. Acoustic breakthrough was well handled though not to subchassis standards (note that the graph was taken with lid detached).

Speed measurements showed marginally better results than those of the non-electronic version. Wow and flutter, DIN-weighted, was fine at 0.12%, with the linear wow result predominant at a moderate 0.2%. Given the quartz motor reference, the absolute speed was a somewhat low −1.6%. Slowing under load was a moderate 0.3%, and the DIN-weighted rumble levels were rather better than for the non-electronic version, improving to a good −70dB with the main rumble components at 100Hz and 200Hz. Start-up to audible speed stabilisation was also quite rapid.

SOUND QUALITY

With some panel disagreement, the *232EN* just scraped into this year's above average category (a rather tougher task than it was a year ago). The sound was impressively 'tight' and tidy, with good focus, imagery and transparency. Slightly 'splashy' in the treble, the bass was lively and well differentiated, lacking a little in weight and extension.

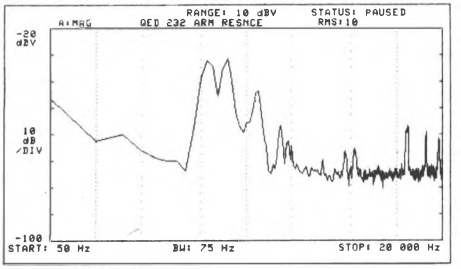
Conclusions

Scoring only fractionally behind the top marks in its class, the *QED* is a decent well-balanced and nicely presented all-rounder. This latest sample shows fine finish and build quality, so our recommendation continues, with the non-electronic version representing the better value.

Test Results

Motor section	Integrated turntable
Type	belt-drive, electronic
Platter mass/damping	1.0kg/fair
Finish and engineering	fairly good/fairly good
Type of mains connecting leads	3 core/phonos
Speed options	33/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.12%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.20%/0.10%
Absolute speed error	−1.6%
Speed drift, 1 hour/load variation	−1.0%/−0.3%
Start-up time to audible stabilisation	3.0 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−70.5/−69.5dB
Arm section	
Approximate effective mass, inc screws, excl cartridge	12g
Type/mass of headshell	fixed
Geometric accuracy	very good
Adjustments provided	none
Finish and engineering	good/good
Ease of assembly/set-up/use	excellent/excellent/very good
Friction, typical lateral vertical	30mg/<20mg
Bias compensation method	thread and lever
Bias force, rim/centre (set to 1.5g ellitical)	100mg/180mg
Downforce calibration error, 1g/2g	uncalibrated
Cue drift, 8mm ascent/descent	negligible, 1.5 secs/4.0 secs
Arm resonances	average+
Subjective sound quality	good
Arm damping	decoupled counterweight
System as a whole	
Size (w×d×h)/clearance for lid rear	40×30×11cm/6cm
Ease of use	very good
Typical acoustic breakthrough and resonances	fairly good
Subjective sound quality of complete system	above average
Hum level/acoustic feedback	good/average+
Vibration sensitivity/shock resistance	average+/average
Estimated typical purchase price	inc cartridge £199, £149

For graph references see issue No. 43



Tonearm structural resonances.

BEST BUY

REGA PLANAR 2 and 3

REGA RESEARCH LTD, 119 PARK STREET, WESTCLIFFE-ON-SEA SS0 7PD.
TEL: (0702) 333071

Since 1984 the *RB300* arm has been a standard fitting on the *Planar 3* deck. The *Planar 2* now comes with a simplified version of the new *RB300* arm, called the *RB250*.

This simple turntable design comprises a solid chipboard plinth covered in tough matt black laminate. Three fairly stiff stepped rubber feet provide a stable tripod foundation while the high quality lid is directly hinged to the chassis plinth with neither springs nor isolation. A plain main bearing with thrust ball showed close tolerances, with no detectable play. Belt-driven *via* a rubber cord, the inner platter hub is a reinforced plastic moulding, the uppermost projection forming the tapered centre spindle and the outer platter boss. The platter is made of heavy plate glass (less thick in the *Planar 2*), surmounted by a thick felt mat. In a simple and ingenious gravity suspension, a second drive belt is looped to support the slow speed synchronous drive motor and suppress vibration coupling to the platter.

The *Planar 2 RB250* arm has the same excellent bearings and one-piece cast arm tube as the *RB300* but has been simplified by using a conventional rotating counterweight which is partly decoupled. The leadout cable is fixed and the chassis earth combined with one of the signal grounds; phono plugs are fitted. Effective mass is around 11.5g including the supplied stainless steel mounting hardware, suitable for moderate compliance cartridges or even modest moving coils.

Rega recommend that the deck should be placed on a light wall mounted shelf, rather than 'coffee table' or floor cabinet; this we found to be good advice.

LAB REPORT

The platter was clearly well founded as the minimal low frequency ringing on the disc impulse response showed. The initial transient was poorly damped, however, a characteristic of thick felt mats.

Almost no metalwork was present in the unit and this meant very little humfield screening was provided. Consequently hum levels were poorer than average and the choice of cartridge will need a little care. Weighted wow and flutter was satisfactory but linear wow was on the high side at 0.21%, this measured without the mat as the felt is of slightly variable thickness. Speed was fairly accurate, but slowed a significant 0.4% under load, with some overshoot after recovery due to motor suspension tension rocking. Start-up was average for a belt-drive at 4.5 seconds.

Rumble levels were just satisfactory for the price averaging −71dB with the motor off. Acoustic breakthrough was about average and the lid was found to be influential here; results were better when it was entirely removed. Vibration isolation was also poorer than average.

The arm was well finished with very good geometry. It was easy to set up and use, and demonstrated low bearing friction. Bias compensation was set to sensible levels and the cue worked well. Downforce calibration proved satisfactory.

SOUND QUALITY

Belying traditional assumed relationships between a number of technical parameters and sound quality, the Rega proves that a well-developed, subjectively-assessed balance of performance counts for more than technical excellence with regards to any one parameter. On the debit side the Rega did suffer from a

modicum of programme wow, particularly on rock programme, but this was not considered serious at this price level; a mild loss of stereo depth was also noted, together with an accompanying impairment of low bass definition and evenness. Conversely it sounded 'musical' in a balanced and coherent manner.

With the latest arm the *Planar 2* sounded more confident. In the upper bass it was surprisingly articulate while mid and treble were notably smooth and sweet with better detail than before. Presentation of detail was considered well above average and little inferior to 'super-fi' models.

Conclusions

The *Planar 2* offers a fine subjective performance and is both very well made and finished, which places it firmly in the Best Buy category. The *Planar 3* is also good, but does not offer quite the same value, though a Best Buy rating is also appropriate here, noting the excellent *RB300* arm.

For graph references see issue No. 43

Test Results

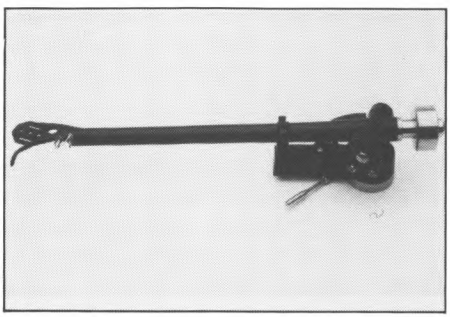
Motor section	Integrated turntable
Type	manual, belt-drive
Platter mass/damping	2.2kg/good
Finish and engineering	very good/very good
Type of mains connecting leads	2 core phones
Speed options	33/45 rpm
Wow and flutter (DIN peak wtd sigma 2)	0.09%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	*0.21%/0.45%
Absolute speed error	+0.4%
Speed drift, 1 hour/load variation	synchronous/−0.4%
Start-up time to audible stabilisation	4.5 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−72/−70dB
Arm section	
Approximate effective mass, inc screws, excl cartridge	11.5g
Type/mass of headshell	universal detachable/8.0g
Geometric accuracy	very good
Adjustments provided	overhang/lateral angle
Finish and engineering	excellent/very good
Ease of assembly/set-up/use	very good/very good/very good
Friction, typical lateral vertical	less than 25mg/15mg
Bias compensation method	internal magnet
Bias force, rim/centre (set to 1.5g elliptical)	300mg/310mg
Downforce calibration error, 1g/2g	−0.1g/−0.07g
Cue drift, 8mm ascent/descent	negligible 0.5 secs/1.5 secs
Arm resonances	very good
Subjective sound quality	very good
Lead capacitance/damping method	70pF/counterweight decoupling
System as a whole	
Size (w×d×h)/clearance for lid rear	45×36×12.3cm/7cm
Typical acoustic breakthrough and resonances	average
Subjective sound quality of complete system	above average
Hum level/acoustic feedback	average−/fairly good
Vibration sensitivity/shock resistance	average−/good
Estimated typical purchase price	Rega 2 £125; Rega 3 £188

**worsened by unevenness of thick felt mat*

BEST BUY

REGA RB300

REGA RESEARCH LTD, 119 PARK STREET, WESTCLIFFE-ON-SEA SS0 7PD.
TEL: (0702) 333071



This Rega-made product uses a very rigid one-piece arm beam/headshell, which unusually is constructed from a hollow aluminium casting. No joins are present between cartridge platform and pivot. The bearings themselves are highly pre-loaded and yet mounted to such a high tolerance that friction is negligible while play is physically undetectable.

Rega's traditional magnetic frictionless bias compensator is employed, with a novel touch present in the design of the downforce mechanism. When set to zero, the carefully designed coil spring mechanism exerts a minus force of 3g, so reducing the counterbalance requirements.

The bearing gimbal is itself a substantial casting and the usual adjustable vertical pillar design has been omitted, being regarded as a structural weakness. The alternative is a threaded stem and large locknut; vertical height adjustment is only possible using various washers.

LAB REPORT

Tests showed the *RB300* has some of the finest bearings in the business; furthermore it was very competent in the important area of beam/headshell rigidity. Friction was very low in both planes, without a trace of play, and while biasing worked well, the calibrated figures were a little on the high side (by about 25%). Downforce calibration was accurate and cue operation fine. Geometric accuracy was to a high standard, while the effective mass was a moderate 10.5g. A wide range of cartridges are judged suitable in the 8-22cu range.

The structural resonance picture suggested good control and excellent rigidity. The mild 400Hz mode was probably the counterweight, while the first bending or torsional mode was deferred until a remarkably high 1.5kHz. The treble was also remarkable for its absence of resonances after 4kHz.

SOUND QUALITY

It was clear after only a few minutes audition, that the *RB300* was a top flight performer. Depending on the chosen player, it proved quite comfortable in the company of other reference tonearms in the £250-£400 range.

The sound was notably dry and neutral with excellent control throughout the range. Transients were judged excellent, while it offered a very well-focused sound stage with very good depth. Its only significant failing was a slight muddling of detail on complex musical passages.

CONCLUSIONS

The *RB300* is an excellent product of which Rega can be justly proud. Despite its modest price it sets new standards in performance, and a Best Buy rating is obviously appropriate.

TEST RESULTS

Approximate effective mass, inc screws, excl cartridge	10-11g
Type/mass of headshell	non-detachable
Geometric accuracy	very good
Adjustments provided	overhang/offset
Finish and engineering	very good/excellent
Ease of assembly/set-up/use	very good/excellent/very good
Friction, typical lateral vertical	150mg/15mg
Bias compensation method	magnetic
Bias force, rim/centre (set to 1.5g ellipical)	340mg/330mg
Downforce calibration error, 1g/2g	+0.05g/+0.03g
Cue drift, 8mm ascent/descent	negligible, 0.5 secs/3.0 secs
Arm resonances	see graph
Subjective sound quality	very good
Arm damping	none
Estimated typical purchase price	£90

For graph references see issue No. 43

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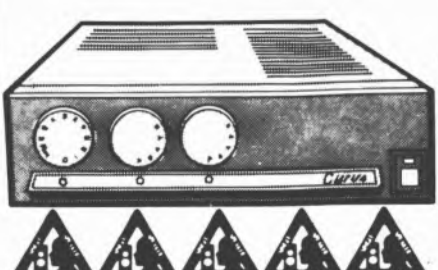
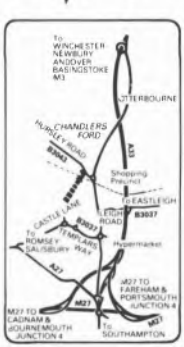


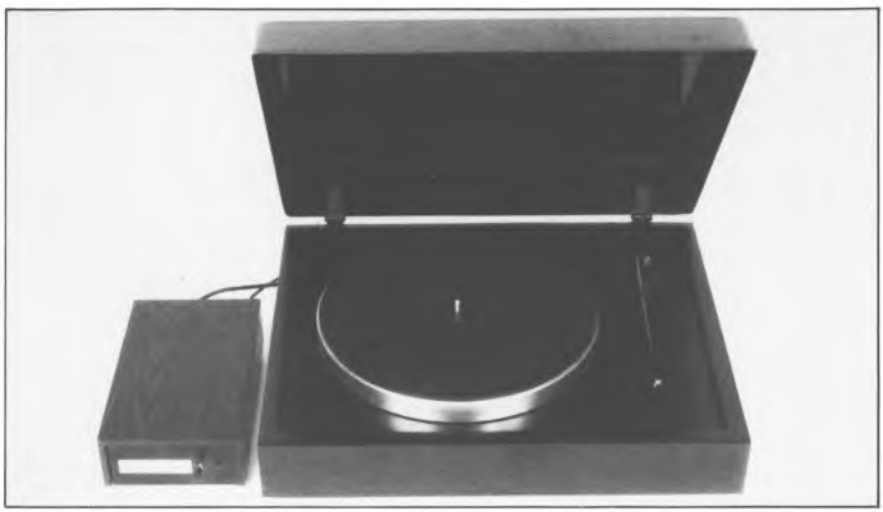


OPENING HOURS
TUES–SAT 10-6 THURS 10-8
CLOSED MONDAYS
(EXCEPT IN DECEMBER)

RECOMMENDED

ROKSAN XERXES

ROKSAN, THE TURNMILL, 63 CLERKENWELL ROAD, LONDON EC1 5BH.
TEL: 01-251 1021



Named after a prominent deceased Persian (like Mission's *Cyrus* series), *Xerxes* emphasises its Iranian principals, who also have links with London's engineering shrine, Imperial College. There is a *Darius* loudspeaker and they plan a Cambyses tonearm (*manana*). Despite being a newcomer competing directly on price with established favourites like the *Sondek* and *Pink*, *Xerxes* has had a very successful first year, though this is probably its first full technical review. A likely package partners it with the Rega *RB300*, though we used a SME *V*, and have seen it with an *Eminent*. The construction would suit parallel trackers very well if there were some levelling provision; as there is not, arm set up becomes a pain, though some turntable supports can provide this.

Large, black and four-square, *Xerxes* is substantial and rather severe-looking, with a dark smoked lid reinforcing the impression. At first sight it looks like a solid plinth design, but although it offers such a system's set up and ease of use benefits, the design is actually more subtle. The peripheral 'picture frame' supports the quality lid and sits on the base, but stays just clear of the platter/arm mounting plate. This in turn sits on slightly compliant mountings and is cut through with runic patterns which seem to provide a near ideal arm termination. A two-speed outboard electronic box supplies power, and gets quite warm in the process.

The platter and motor are unusual too. The former is a substantial two-piece hub and rim casting, with a large contact area between them and with felt mat standard. The central hub has a recessed centre section and removable centre spindle: the patient or practised user can centre his discs more accurately than the manufacturer bothered to, but unfortunately the spindle sleeve is slightly undersized so there is a risk of making things worse. More important, it is claimed to sound better, as direct contact between main bearing and disc is avoided. Even more unusual, the small motor is mounted on a vertical bearing, but tethered from spinning by a spring between its outside and the base. Changes in motor demand are reflected in the extension of the spring which effectively smooths power

delivery — allowing the motor to vibrate instead of the belt. Roksan claim to have taken close account of the highly complex interaction of the different inertias and compliances involved — and for the moment at least we're not proposing to dispute this!

Lab Report

Rumble was good enough, though not exceptional, the spectrogram revealing a significant 100Hz motor component (−33dB) but clean results elsewhere. Start up to stabilisation took a long 7.5 secs, absolute speed was a little fast, and slowing under load a little poorer than average. Wow and flutter together were good, but linear wow was on the high side. The disc mechanical impulse was admirably handled: the initial ringing is typical of felt mats, while decay was fast with excellent long-term damping. With notably aperiodic acoustic breakthrough measured very well and vibration breakthrough was also quite good, if a little limited at low frequencies.

Sound Quality

Much liked for its handling qualities (provided one remembers to remove the centre each time), *Xerxes*/SME *V* was swiftly pressed into service for cartridge audition, acquitting itself admirably and confirming that it is one of the few top class designs regardless of price. The dynamic range was very fine and broadband, with extended, clean, powerful bass, clear well-focused low coloration midband and lively treble. Depth was fair and stereo stable, but upper bass sounded a little 'boxy' and overall balance was a trifle 'forward'.

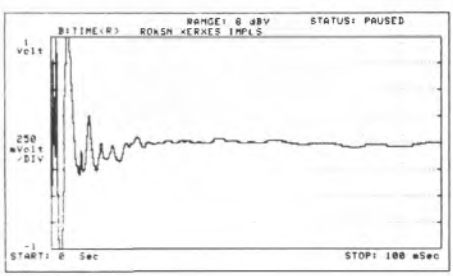
Conclusions

While a few little details and certain aspects of the lab performance could be tightened up to advantage, *Xerxes* is the most creative and interesting turntable to emerge for some years. The overall sound is top drawer, reflecting its particular original contribution to arm termination, while comparatively simple set up is an added bonus, ensuring recommendation.

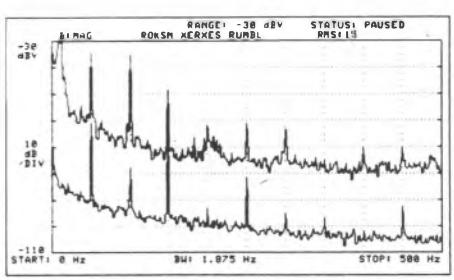
Test Results

Motor section

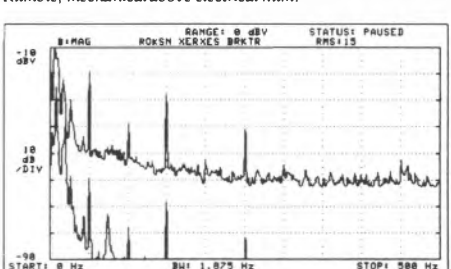
Type	electronic, belt, 'solid subchassis'
Platter mass/damping	2kg/v good
Finish/engineering	v good
Mains/connecting leads	3 core remote
Speed options	variable, 33⅓,45rpm
Wow & flutter (DIN pk wtd)	0.07%
Wow/flutter (lin pk wtd)	0.25%/0.08%
Absolute speed error	+0.5%
Speed drift/load variation	0%/−0.2%
Start-up to stability	7.5 secs
Rumble L/R (DIN B wtd)	−74dB/−76dB
Size (w×d×h)/lid at rear	48×39×14cm/5cm
Ease of use	v good
Acoustic breakthrough, resonances	v good
Sound quality	v good
Hum/acoustic feedback	excellent
Vibration, shock sensitivity	v good/v good
Typical price	from £545



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

ROTEL RP850

ROTEL HI-FI LTD, 2-4 ERICA ROAD, STACEY BUSHES, MILTON KEYNES, BUCKS MK12 6HS.
TEL: (0908) 317707

Outwardly quite conventional, the Rotel *RP850* in fact shows much evidence of careful design, and attains correspondingly fine results. Priced at £180, it is a very different kind of product from the visually similar but much less competent *RP830*.

The heavy, solid plinth makes a good foundation for arm and platter, and is supported on moderately compliant feet. The deck is fitted with a rather resonant polystyrene lid, but Rotel were quick to point out that they recommend critical listeners should remove it during play. A fairly generous die cast aluminium platter weighs 1.8kg, and the main bearing was well toleranced with negligible slack. A thick rubber mat covers the platter, helping to mask any effects of the two apertures provided in the platter surface for drive belt access. The player is powered by a large synchronous motor with double crowned pulley. Speed changeover is by hand, only requiring the mat to be lifted.

The arm is rather better than those usually encountered on integrated players, having well adjusted slack-free bearings. The light alloy tube has an adjustable die-cast metal headshell which is clamped in position using a proper sleeve clamp with socket-head bolt tightening. This arm is in the medium-to-high effective mass range, so cartridges with compliances of the order of 8-20cu should prove suitable.

LAB REPORT

The motor proved well isolated from vital vibration-sensitive points, as shown by the fine −80dB DIN B-weighted rumble. Spectral analysis revealed a couple of harmless motor harmonics at 25Hz, and 200Hz, but electrical hum was fairly low.

A high-powered motor enables this player to reach rated speed in a fast 1.7 seconds, and its good torque was confirmed by very mild slowing under test loading, measuring 0.2%. Consequently pitch stability was very good, while DIN peak wow and flutter was a fine 0.07% with equally promising flutter and wow when separately assessed.

The *RP850* did fairly well on acoustic breakthrough which was noticeably improved by removing the lid. The feet afforded some vibration isolation — poorer than most subchassis types, but beneficially even. Shock resistance was better than average. The disc impulse response showed good initial damping followed by some low frequency platter ringing at 40Hz; this is likely to be a rocking mode.

Arm performance was above average showing good alignment and adjustments. Minor modes at 100 and 280Hz were probably due to the counterweight, but the main break at a commendably high 1kHz was rather severe. Arm adjustments included level, angle overhang and rotation. Friction was a low 25/10mg lateral/vertical, while the bias compensator offered appropriate values. Downforce error was minor, and the cue worked well.

SOUND QUALITY

The sound was more than satisfactory with the lid on and improved still further when it was removed, gaining an above average rating.

Pitch was secure and stable with inaudible wow or rumble, and the sound seemed tonally well balanced, with a clean detailed midrange

plus good treble and only slight imprecision heard as a touch of fizz. Bass was reasonably defined, albeit with some loss of attack noted as a 'rubbery' quality. However, it did at least show reasonable tune playing abilities. Stereo was to a good standard with solid focusing and fair depth.

Conclusions

This surprising player offered a good all-round performance at a competitive price. The above average tonearm complemented the motor well and was good enough for some modest moving-coil cartridges. Enthusiasts may run the deck with the lid off for the very best results, but at £180, the *RP850* is clearly a strong contender, comfortably gaining our recommendation.

Test Results

Motor section

Type ____ manual., belt-drive
Platter mass/damping ____ 1.8kg/fairly good
Finish and engineering ____ very good
Type of mains connecting leads ____ 2 core/phonos and earth
Speed options ____ 33/45rpm
Wow and flutter (DIN peak wtd sigma 2) ____ 0.07%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz) ____ 0.05%/0.08%
Absolute speed error ____ +0.25%
Speed drift, 1 hour/load variation ____ <0.06%/−0.2%
Start-up time to audible stabilisation ____ 1.7 secs
Rumble, DIN B wtd, L/R average (see spectrum) ____ −79/−81dB

Arm section

Approximate effective mass, inc screws, excl cartridge ____ 13g
Type/mass of headshell ____ special detachable/9.5g
Geometric accuracy ____ very good
Adjustments provided ____ tilt/overhang/offset
Finish and engineering ____ good/very good
Ease of assembly/set-up/use ____ very good
Friction, typical lateral/vertical ____ 25mg/10mg
Bias compensation method ____ internal spring
Bias force, rim/centre (set to 1.5g ellitical) ____ 190mg/225mg
Downforce calibration error, 1g/2g ____ −0.05g/−0.04g
Cue drift, 8mm ascent/descent ____ negligible, 0.8 secs/1.8 secs
Arm resonances ____ see graph
Subjective sound quality ____ good
Arm damping ____ none

System as a whole

Size (w×d×h)/clearance for lid rear ____ 43.5×37×14.5cm/6cm
Ease of use ____ good
Typical acoustic breakthrough and resonances ____ fairly good
Subjective sound quality of complete system ____ good(lid off)
Hum level/acoustic feedback ____ very good/fairly good
Vibration sensitivity/shock resistance ____ fair/good
Estimated typical purcahse price ____ £180

For graph references see issue No 40

SEE REVOLVER

SEE LTD, 49 FOLLY LANE, WARRINGTON WA5 5ND.
·———TEL: (0925) 571173———·

Now a well-established and popular model, the *Revolver* is a British designed and built motor unit, which can be supplied factory-fitted with the *Revolver* arm, or (at slightly higher cost) the Linn *LVX*.

Essentially a solid-plinth design, the *Revolver* is founded on a substantial Medite (MDF) board. This in turn is mounted on three rubber feet, one at the rear and two at the front, looking rather similar to those used by Rega.

A secondary plinth element, namely the top plate on which the arm and platter are mounted, provides some decoupling from the plinth-mounted motor and lid. This plate is marginally isolated with stiff foam rubber strips joining it to the plinth proper. A hidden feature of the top plate is the rumble vibration canceller, which comprises a pair of lead weights mounted under the rear corners to avoid a coincident resonance and hence improve the signal-to-noise ratio.

The platter is rather light in weight and is cut from MDF. It is driven at its periphery by a long endless belt, power being provided by the usual double-pulley synchronous motor. The main bearing is a simple design with a steel shaft and brass sleeve, run 'wet' with a charge of oil supplied. The main bearing tolerance on our samples was very good, with no significant slack.

From its introduction, the *Revolver* featured a striking finish in first-class red or grey hammer paintwork — it is now additionally available in black ash. SEE also supply the 'PIG' rubber record clamp, along with their Starmat impregnated felt platter mat.

LAB REPORT

The *Revolver* ran slightly fast, on the 1984 sample by an acceptable 0.4%. Wow and flutter was a little below par at 0.18%, with both wow and flutter components in evidence. Slowing under load was, however, negligible. Platter mass was quite low and the disc damping result fairly typical for the type. On an early sample, rumble was also below par at −62/65dB, with 200Hz motor rumble apparent. Acoustic and isolation breakthrough were not particularly good, though

shock resistance was quite good.

Sound Quality

On listening tests the *Revolver* scored 'average plus', and clearly benefitted from the competent performance of the chosen tonearm. The overall sound was nicely balanced, though mild wow was occasionally heard, while neither pitch nor timing in music seemed too secure. The bass was free of boom or emphasis, but also lacked attack and weight and consequently sounded a bit 'soft'. Stereo depth was good, however, and had pleasant perspectives.

Conclusions

The current *Revolver* features a thicker top deck, and build quality is much improved compared with the earliest examples. The main bearing still needs a period of running in. Priced at a little over £200 with Linn *LVX* arm, this model provides a decent sound quality and is worth considering.

Test Results

Motor unit/integrated player

Motor section

Type	plinth, belt-drive, synchronous
Platter mass/damping	1.0kg/fair
Finish and engineering	good
Type of mains connecting leads	3-core
Speed options	manual change, 33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.18%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.15%/0.14%
Absolute speed error	+0.4%
Speed drift, 1 hour/load variation	negligible/−0.12%
Start-up time to audible stabilisation	2.0 secs
Rumble, DIN B wtd, L/R average (see spectrum)	62/65dB
Size (w×d×h)/clearance for lid rear	42×36×13cm/8.5cm
Ease of use	average
Typical acoustic breakthrough and resonances	average−
Subjective sound quality of complete system	average+
Hum level/acoustic feedback	fairly good/average
Vibration sensitivity/shock resistance	fair/good
Estimated typical purhcase price	£123; with Revolver tonearm £180; with LVX £220

(Note: measurements relate to an earlier sample)

For graph references see issue No 43

RECOMMENDED

SME SERIES V

SME LTD, STEYNING, SUSSEX BN4 3GY.
TEL: (0903) 814321

AT the phenomenal price of £1138, this arm's design technology, engineering finish and sound quality are all directed towards justifying that cost. Previous SME designs employed a gravity loaded knife edge for the vertical plane bearing, but the 'V uses firmly preloaded, stainless steel ball race bearings of the highest quality, offering zero detectable play.

The main beam or tube, in thinwall cast magnesium, is a complex one-piece structure including the shell/cartridge platform, the massive beam, the yoke bearing assembly and the rear section slide for the counterweight. The beam is heavily tapered both externally and in wall thickness. No joins are present from end to end though the high density tungsten counterweight block is joined *via* a cam lock system. A thumbscrew sets zero balance, while downforce and bias correction are set by calibrated dials.

While the mounting hardware is compatible with previous SME arms — the familiar oval hole with the four point fixing — the 'V has a rigid vice-like clamp system which nevertheless includes easy adjustment of overhang and offset geometry. Height adjustment is facilitated by a detachable control, which may be temporarily operated during play for fine tuning. Vertical tilt cannot be adjusted.

The special van den Hul type cable is connected *via* a Japanese style 5 pin plug. The right angle type socket arm has viscous-damped free rotation, allowing the cable to take up a natural 'set' in subchassis turntables.

The arm has a moderate effective mass, suited to medium compliance cartridges in the 8-30cu range; the top limit is assisted by the arm's damping feature. A calibrated damper engages in a horizontally acting silicone fluid trough, permitting a wide range of damping, with the suggestion that it is used with great moderation.

LAB REPORT

This arm was well calibrated with accurate downforce and sensible levels of bias correction. Effective mass typically measured 11g including fixings. Various fluid choices enable any required damping to be achieved.

Arm resonance impulse analysis showed a well damped main arm mode at a high 1.6kHz, but the combination of rigidity and damping made it hard to identify on a conventional graph. In

comparative terms, this suggests notably clean behaviour.

Sound Quality

Perhaps confirming its aspiration to set a new reference standard, this arm has the ability to show just how coloured and tonally unbalanced many other arms are. It appears to have very little of its own false emphasis, and subjectively it reveals the black disc to a surprising degree. For example, stage width is notably increased, yet central focusing is more precise over a wide frequency range. Tonally even, previously 'difficult' musical passages such as certain female vocal tracks soar through the frequency range without any hindrance or any suspicion of a 'forced' quality. Stage depth is remarkably good, with harmonic perspectives convincingly maintained in free space. Fine detail was excellently resolved — indeed certain detail was heard for the first time on many records. The bass was agreeably firm and extended, lacking any particular emphasis, while the treble was sweet and airy, and slightly rich tonally compared with other arms.

Conclusions

The *Series V* is an excellent tonearm in terms of design, engineering, build, and sound quality. While the high price constrains considerations of value, it can be argued that this arm does just what it set out to do, namely establish a new reference standard regardless of price. In our view the '*V* has a good chance of re-establishing the old SME slogan, 'The Best Pickup Arm in the World', and demands recommendation.

Test Results

Tonearm

Approximate effective mass, inc screws, excl cartridge	11g
Type/mass of headshell	fixed
Geometric accuracy	excellent
Adjustments provided	height/overhang/offset/damping
Finish and engineering	excellent/excellent
Ease of assembly/setting-up/use	very good/good/very good
Friction, typical lateral/vertical	40mg/30mg
Bias compensation method	internal spring
Bias force, rim/centre (set to 1.5g elliptical)	150mg/210mg
Downforce calibration error, 1g/2g	+0.02g/−0.07g
Cue drift, 8mm ascent/descent	negligible, 1.5secs/3secs
Arm resonances	very good
Subjective sound quality	excellent
Arm damping	special structure; adjustable viscous damping
Estimated typical purchase price	£1138

For graph references see issue No. 43

RECOMMENDED

THE SOURCE

SOURCE-ODYSSEY LTD, 157 CURLE STREET, GLASGOW G14 0TS.
·———TEL: (041) 881 1664———·

Superbly finished, the *Source* is a substantially built belt-drive sprung subchassis design. An electronic power supply feeds the substantial motor and provides for two speed operation, changing at a flick of the front mounted switch.

The subchassis is a thick steel plate, asymmetrically shaped and supported in a surprisingly complex manner by five carefully located coil springs. Vertical subchassis motion is excellent at 3-4Hz, but the system is rather stiff in the rotational mode. The main bearing is superb, and supports an amazing two part bronze platter weighing 7.5kg. A soft felt mat supports the record's.

LAB REPORT

Absolute speed was a touch slow at −1.1% (belt properly crowned). Wow and flutter was a satisfactory 0.13%, but could have been better, while the unweighted wow result of 0.23% suggested possible belt imprecision. Drift was negligible, slowing under load a satisfactory −0.3%. and start-up was a slow 7.5 seconds. The rumble results were fine, with dB figures in the mid 70s for an average of the channels.

The disc impulse response was typical for a felt mat type, showing clean decay with negligible delayed resonances. Acoustic and vibration breakthrough were both very low, though some mild spring resonance effects could be seen in the 300Hz region. Analysed for rumble, the main bearing was clearly excellent, but a motor vibration component was evident at 25Hz, though not at a serious level.

SOUND QUALITY

This turntable gave a solid, 'weighty' foundation to the reproduction. Bass was open and extended, and the whole effect was an easy relaxed neutrality. In this respect it is probably unrivalled, though it was not felt to be as strong in terms of 'foot-tapping' timing and rhythm; pitch stability also suffered slightly if the player was subjected to the effects of footfalls or other similar subsonic disturbances.

CONCLUSIONS

Finely engineered, this heavyweight turntable did well on test, offering a fine foundation for many tonearms and providing a distinctive standard with respect to bass extension and power. It did, however, prefer a firm support to maximise its speed stability. A further strength of this large design was its ability to accept several tonearms which do not fit well on smaller subchassis models.

TEST RESULTS

Type	belt-drive, subchassis
Platter mass/damping	7.5kg/average
Finish and engineering	excellent/excellent
Type of mains connecting leads	remote transformer
Speed options	33/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.13%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.23%/0.12%
Absolute speed error	−1.1%
Speed drift, 1 hour/load variation	0.01%/0.3%
Start-up time to audible stabilisation	7.5 secs
Rumble, DIN B wtd, L/R average	−77/−74dB
Size (w×d×h)/clearance for lid rear	50×40×15cm/4cm
Ease of use	very good
Typical acoustic breakthrough and resonances	excellent
Subjective sound quality of complete system	very good+
Hum level/acoustic feedback	negligible/low
Vibration sensitivity/shock resistance	very good/fair
Estimated typical purchase price	£900

For graph references see issue No. 43

The Story So Far...

RAY CHURCHOUSE – MD (LONDON)

HI-FI EXPERIENCE – LION HOUSE

JON VIZOR (DIRECTOR) TALKING WITH FARAD AZIMA (MISSION'S MD) IN THE MISSION ROOM IN LION HOUSE

EXPERIENCE AT THE BEGINNING

The men behind HI-FI EXPERIENCE are from the Nations leading SPECIALIST retailers. The Managing Director is RAY CHURCHOUSE (ex REW, GALE & UNILET) and his Co-Directors are COLIN MACKENZIE (HI-FI CORNER), JON VIZOR (JCV HI-FI SUPERSTORES), GRAHAM RADFORD (RADFORD HI-FI), ALAN ABRAMS (SUPERFI), TERRY HAINSWORTH (ERRICKS') & RAY MCKENNA (MCKENNA & BROWN).

The first HI-FI EXPERIENCE opened in May 1985 in the basement of Lion House Tottenham Court Road London where no less than 6 demonstration rooms were fitted out by some of the Countrys leading manufacturers such as MISSION, LINN, HEYBROOK, QUAD, KEF and B&W. The venture was such an unprecedented success hailed by both Press and public alike that other similar SPECIALIST HI-FI in-store departments were planned elsewhere in the Country. The second HI-FI EXPERIENCE opened in WARWICK followed shortly by both BRADFORD and MILTON KEYNES and December 1986 is the planned opening of the latest HI-FI EXPERIENCE also in the West End of LONDON. The factors that make HI-FI EXPERIENCE stores somewhat unique are the almost unequalled demonstration facilities which we believe are vital in showing the very real differences between items of Audio Equipment which you our customers might have shortlisted, and the enthusiastically knowledgeable staff always on hand to assist and advise.

"HI-FI EXPERIENCE IS A NEW CONCEPT IN AUDIO RETAILING" Hi-Fi News.

"BY THE STANDARDS OF THE ROAD IT TRADES IN HI-FI EXPERIENCE COULDN'T BE MUCH MORE OUT OF THE ORDINARY" New Hi-Fi Sound.

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HI-FI EXPERIENCE

- **Hi-Fi Experience at Lion House, 227 Tottenham Rd., London W1 ☎ (01) 580 3535**
- **Hi-Fi Experience at JCV House, Wharf St., Warwick, CV34 5FQ ☎ (0926) 493796**
- **Hi-Fi Experience at JCV, Dukes Drive, Bletchley, Milton Keynes ☎ (0908) 367341**
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SOUTHER TRI-QUARTZ

VITAL SYSTEMS, 38a THE MEADOW WAY, HARROW WEALD, MIDDLESEX HA3 7BW.
TEL: 01-863 8988

This extraordinary looking device can scarcely be called a tonearm, though it fulfills broadly the same function. The linear tracking avoids the need for bias compensation, but tends to be trickier in set up, and sometimes poses other problems besides. The *Souther* bridges the record surface with a gantry hinged from a conventional enough pillar/armboard at one end, and resting on the rotating centre spindle at the other end.

The title refers to the gantry's three precision quartz rails on which a little 'railway carriage' runs carrying a very short counterbalanced arm, with vertical bearings only; the carriage has to be dragged along the rails to play a disc. The gantry has a perspex cover and incorporates an effective cue, though initially it looks a little alarming when the gantry is raised to change a disc. The unit was supplied mounted on a Michell *Gyrodec* with fitted Clear Audio cartridge. Set up is difficult, with no downforce calibration, and the arm is frankly awkward to use, though the cue worked well.

LAB REPORT

Such is our faith in tonearm designers we would not normally bother to check their products for rumble or wow and flutter, but here our confidence would have been misplaced. The centre spindle bearing may be better than before, but is still nowhere near good enough, resulting in fluctuating broadband rumble averaging between −59 and −68dB (see spectrogram). The Souther gave 0.35% linear warp wow with a very flat master lacquer disc; the *Gyrodec* rated 0.06%.

The railtrack approach ensures the bearings are inherently loose, and give a high lateral friction figure of around 250mg. Arm resonances included a broad perturbed region from a lowish 250Hz, and then some isolated high frequency resonances around 5-8kHz, in the sibilance region.

SOUND QUALITY

Despite the above, the *Souther* didn't sound too bad in practice, just scraping into the good class second time around. But it did take a lot of extra

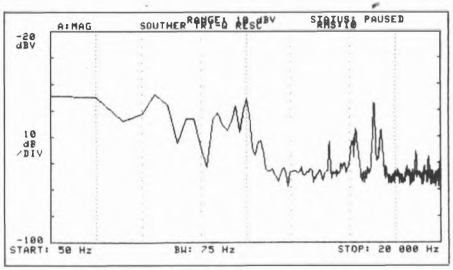
set up care, and at least one false start. The sound was rather lightweight and lacking in bass power, but quite lively further up. Midrange was notably clean with wide staging. Depth and focus were a little weak and some 'zing' was added at higher frequencies. Both pitch instability and rumble were noted.

Conclusions

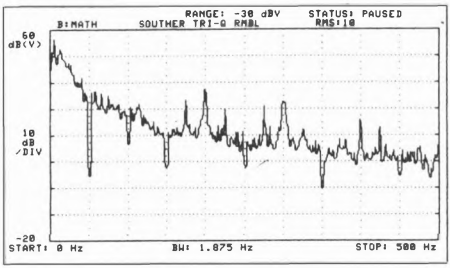
Although the designer has clearly listened and worked hard to create a good sounding product, the inherent design framework is too seriously flawed for serious consideration.

Test Results

Effective mass (approx)	3-4g
Type/mass headshell	detachable tube
Geometric accuracy	excellent
Adjustments provided	height, tilt
Finish and engineering	excellent
Ease of set/use	difficult
Friction (typical lat/vert)	app. 250mg/<20mg
Bias method	n/a
Bias force, (rim/centre 1.5gE)	n/a
Downforce error, 1g/2g	n/a
Cue drift, 8mm up/down	negl, 0.5 secs/0.5 secs
Arm resonances	above average
Sound quality	good (careful setup)
Arm damping	none
Typical price	£850



Tonearm structural resonances.

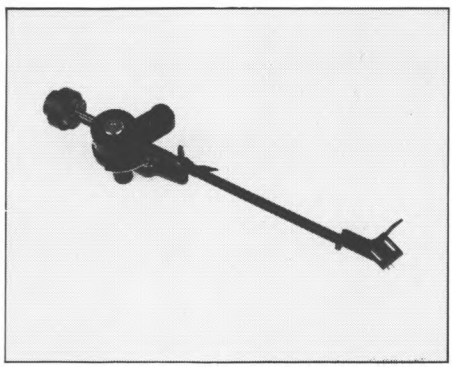


Mehanical rumble spectrum

RECOMMENDED

SUMIKO LMT ARM

RUSS ANDREWS TURNTABLE ACCESSORIES, EDGEBANK HOUSE, SKELSMERGH, KENDAL, CUMBRIA LA8 GAS. TEL: 05398 3247



Sumiko is a US operation with great tonearm and cartridge experience, whose products are now handled by RATA in the UK. The *LMT* is a reasonably priced (£127) tonearm sourced from Japan, but with a degree of US design input. In a sense it looks a bit expensive, for the £90 Mission *LC* was clearly based on the same Japanese parts bin, but of course physical commonality doesn't take account of quality control, bearing adjustment and so on.

The *LMT* is similar to the much more expensive *FT3*, but is less engineered, particularly in the beam, and lacks such niceties as the reinforced headshell web. The counterweight decoupling is spongy, but the bearings are nice and tight, with no detectable play.

LAB REPORT

Good bearing integrity all too often leads to high friction, and the 100mg recorded horizontally is really a little too high for comfort. The bias settings did not give quite enough compensation. The resonance trace shows a number of modes, with a first break at 450Hz, and a second series 1-2kHz — it is obviously less well damped than the *FT3*, but shows slightly better maintained treble.

SOUND QUALITY

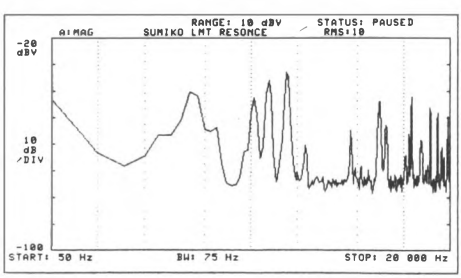
Though the *LMT* was not considered quite as good as the *FT3*, it still rated 'good' and was not all that far behind. The sound was powerful and clear, with good detail and a slight 'sheen' at high frequencies. Depth and focus were both good, the bass extended if a little uneven, and the overall balance fine, if a little on the light side.

CONCLUSIONS

This basic Sumiko offers a fully competitive sound quality at a quite reasonable price, with a general performance that is well balanced and merits recommendation.

TEST RESULTS

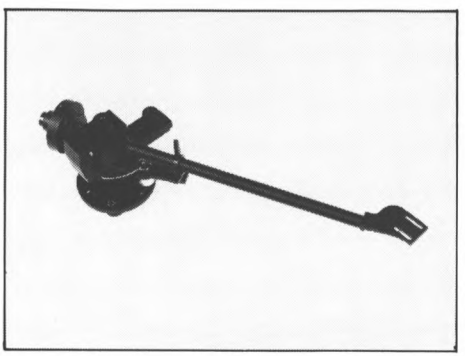
Effective mass (approx)	13.5g
Type/mass headshell	fixed
Geometric accuracy	v good
Adjustments provided	height, overhang, lateral
Finish/engineering	v good
Ease of setup/use	v good
Friction (typical lat/vert)	100mg/<20mg
Bias method	dial spring
Bias force (rim/centre, 1.5gE)	110mg/110mg
Downforce error 1g/2g	−0.1g/−0.2g
Cue drift, 8mm up/down	slight, 0.5 secs/1.5 secs
Arm resonances	above average
Sound quality	good
Arm damping	cwt decoupling
Typical price	£128



Tonearm structural resonances.

SUMIKO FT3

RUSS ANDREWS TURNTABLE ACCESSORIES, EDGEBANK HOUSE, SKELSMERGH, KENDAL, CUMBRIA LA89AS. TEL: 05398 3247



Sumiko is a US operation with great tonearm and cartridge experience, now handled by RATA in the UK. The *FT3* is an expensive (£427) tonearm sourced from Japan, but with much US design input. Initial impressions were not too encouraging in view of the price. The basic arm looks fairly nondescript, and the matt black finish was marred by a porous pillar casting which should have been rejected on aesthetic grounds, even though it will be hidden in use.

However, the detail engineering looks good — the reinforced headshell web, for example. And the arm is well loaded with 'extras', such as internal tube damping and a horizontal plane fluid damper. Not to mention the awkward double-locking arrangement for adjusting vertical tracking angle (VTA) — a device beloved by American audiophiles. Otherwise conventional enough, the mounting arrangements are non-standard and no arm lead is provided — so you have to buy your own.

LAB REPORT

Bearing quality was good, with no detectable play and decently low friction values. Downforce calibration was accurate, but bias was applied in the wrong ratio. Effective mass was on the high side, well suited to the sort of m-c cartridges likely to be used. The resonance sweep was reasonably tidy, indicating good quality. The main mode at 500Hz was well damped, but at a lower frequency than more rigid designs.

SOUND QUALITY

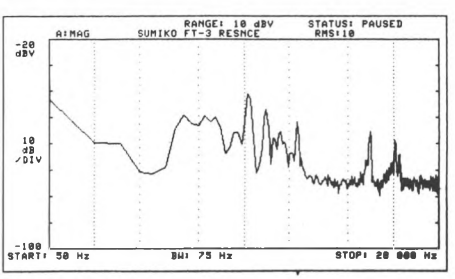
Sound quality rated 'good' — as it should at this sort of price. The sound was powerful if a little uneven in the bass, had a clear, open midrange, and a slightly bright 'edgy' treble. It tended to sound a little too 'loud', and focus could have been better.

CONCLUSIONS

This is a perfectly good tonearm, but overdressing has inflated the price to the point where it is not fully competitive.

TEST RESULTS

Effective mass (approx)	14g
Type/mass headshell	fixed
Geometric accuracy	v good
Adjustments provided	height, overhang, lateral
Finish/engineering	v good
Ease of setup/use	good/v good
Friction, (typical lat/vert)	40mg/<20mg
Bias method	dial spring
Bias force (rim/centre, 1.5g E)	180mg/130mg
Downforce error, 1g/2g	0g/+0.05g
Cue drift, 8mm up/down	slight, 0.5 secs/2 secs
Arm resonances	good
Sound quality	good
Arm damping	some cwt, laterall fluid damping
Typical price	£427 (lead extra)



Tonearm structural resonances.

BEST BUY

SYSTEMDEK/II/IIX

SYSTEMDEK LTD, UNIT, 34, KYLE ROAD, IRVINE INDUSTRIAL ESTATE, IRVINE, SCOTLAND.
TEL: (0294) 71251

Seeking to lower the entry price for serious turntables, Systemdek introduced the *II* a few years ago. But its 'kitchenware' styling was not an overwhelming success, so along came the slightly more expensive *IIX*, with conventional plinth and cover and an improved 'hanging' suspension. Whether it was the changed appearance or the improved subchassis performance that did the trick is impossible to say, but the *IIX* performed comfortably better, in the marketplace and the listening room. So now they've transferred the X suspension onto the relaunched *II*. An electronic power supply is an optional extra, and you can now have a new Systemdek arm to round out the package. We have fully auditioned and partly retested a new *II*, grafting the results into the original *IIX* review.

This player has a plate glass turntable with felt mat, and uses a steel subchassis suspended from longish, foam-damped, top-adjustable springs, driven from a synchronous motor via an O-ring, with manual (or electronic) speed change. The Japan-sourced arm is typical of a number offered by various manufacturers, usually at under £100, with fixed headshell, open gimbal bearing and quite substantial main beam. Effective mass is quite high, so low compliance cartridges should be used.

LAB REPORT

The new subchassis was not quite as stable as the *IIX*, so wow and flutter is up a bit, but is still not serious. A similar impression is gained from the disc impulse spectrogram, where the initial transient is damped in a typicical felt mat manner, but some LF rocking follows. The other speed characteristics and rumble are fine, while acoustic breakthrough was good, vibration pretty good, with some below 100Hz and a few higher spring modes. The arm was a good example of the type, with tight bearings and low friction, good calibration and reasonable resonance behaviour — fairly lively but well balanced with a mildly 'brash' upper range, with the first main break around 800Hz-1.3kHz.

SOUND QUALITY

Rating a solid above average, the 1987 *II* set a very decent standard for its price. The sound was quite open and clear with some life, but bass and focus were both a little softened, and the system seemed to become a little congested

when dealing with very complex material.

Conclusions

The *II/IIX* continues to improve in detail and so has managed to remain fully competitive in this fast changing market. The new arm is good value for low compliance cartridges, and the basic synchronous motor unit is particularly good value, if a rather spartan appearance.

Test Results

Motor section (IIX figures bracketed)

Type	manual or elec., belt, subchassis
Platter mass/damping	1.8kg/f good
Finish/engineering	v good
Mains/connecting leads	3 core/phonos and earth
Speed options	33½/45rpm
Wow and flutter (DIN pk wtd)	0.14% (0.08)%
Wow/flutter (lin pk wtd)	0.16 (0.14)%/0.17 (0.05)%
Absolute speed error	−0.25% (+0.05)%
Speed drift/load variation	−0.08%/−0.1 (−0.16)%
Start-up to stability	4 (4.3) secs
Rumble L/R (DIN B wtd)	(−76dB/−78dB)

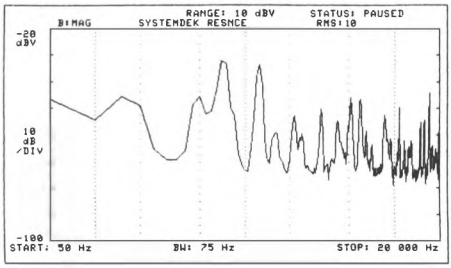
Tonearm

Effective mass (approx)	15g
Type/mass headshell	fixed
Geometric accuracy	v good
Adjustments provided	height, overhang, lateral, tilt
Finish/engineering	v good
Ease of set-up/use	v good
Friction (typical lat/vert)	20mg/40mg
Bias method	dial spring
Bias force (rim/centre, 1.5gE)	130mg/170mg
Downforce error 1g/2g	0g/0g
Cue drift, 8mm up/down	slight, 1 secs/2 secs
Arm resonances	f good
Sound quality	above average
Arm damping	slight c/wt decoupled

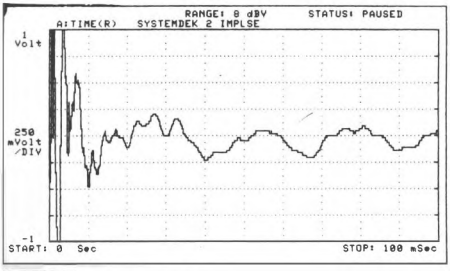
Whole system

Size (w×d×h)/lid at rear (IIX)	41×34×16.5cm/16.5cm*
Ease of use	v good
Acoustic breakthrough, resonances	v good
Sound quality	above average
Hum/acoustic feedback	v good/excellent
Vibration, shock sensitivity	good (excellent)/f good
Typical price	£215/£199

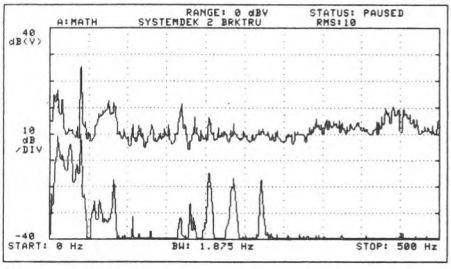
** II is skeletal*



Tonearm structural resonances.



Disc edge mechanical shock.



Breakthrough, acoustic above vibration.

ECOMMENDED

TECHNICS SLBD-22

PANASONIC (UK) LTD, 300-318 BATH ROAD, SLOUGH, BERKS SL1 6JB.
TEL: (0753) 34522

Technics is the hi-fi division of Matsushita, who probably make more turntables than the rest of the world put together. The *SL-BD22* is a straightforward budget (£80) semi-automatic player, traditionally finished in Technics' grey/brown, of traditional size and with a traditional pivoted arm — albeit with a P-mount fitment incorporating an *EPS-24CS* cartridge. Finish and appearance are to the expected high standards, and the simple controls are placed on a front ledge, giving speed selection and pitch adjustment, cueing and stop; start is initiated by removing the arm from its rest, automatics handling stop and return.

Having a P-mount cartridge, downforce and bias compensation are factory set. The arm is a fairly low mass affair, but showed quite good bearing integrity considering the low cost of the unit. The cast aluminium platter has a beautifully cut rim strobe to confirm speed, but is inclined to ring and the mat is very thin. The main bearing mounting showed some rocking tendency too, though the bearing itself was good. The main plastics moulded plinth and tinny resonant cover are coupled direct to the platter and arm, the whole sitting on four vestigial sprung feet. Set-up was nice and simple, straight from the box.

LAB REPORT

The arm bearings were impressively free of play and also gave low friction, but the lightweight construction — giving an estimated effective mass of 6g, suited to highish compliance T4P cartridges — certainly contributed towards the fairly poor resonance performance, which showed plenty of discontinuities and a suppressed treble.

The basic rumble figures are respectable, but the spectrogram shows numerous motor harmonics and 100Hz interference, probably from the mains transformer. Wow and flutter was average, with significant slowing under load. Neither breakthrough test gave good results, the structure being unusually 'live' acoustically in the midband, and very susceptible to vibration at low frequencies; sometimes you just can't win. The disc impulse test was similarly traumatic, with substantial complex rocking.

Sound Quality

Notwithstanding the indifferent results on our more complex lab tests, the sound of the *SL-BD22* was not badly received. It did not quite attain the standards of the two '33 models, but left the *L20* for dead. Though rated well below average, this is still not a bad result for an £80 player, and is probably better than most or all at a similar price. It received the criticisms expected at this level, a degree of coarseness, coloration and constricted depth, with high frequency untidiness, but did at least convey a little atmosphere and 'air', and only started to become unpleasant with heavy rock sources.

Conclusions

Though this player did not perform well enough to qualify for Best Buy rating, it still did a decent enough job for the price to merit Recommendation, bearing in mind the high standards of finish and build, despite the sonic weaknesses.

Test Results

Motor section

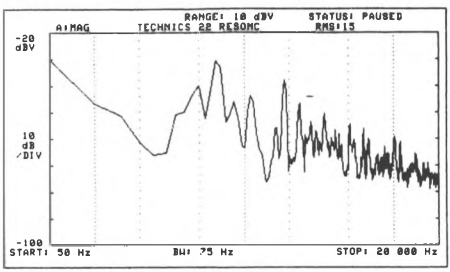
Type	semi auto, electronic, belt-drive, solid
Platter mass/damping	0.52kg/poor
Finish and engineering	very good
Type of mains connecting leads	Sockets: 2 core/phonos and earth
Speed options	33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.07%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.2%/0.15%
Absolute speed error	+0.01%
Speed drift, 1 hour/load variation	−0.17%/−0.4%
Start-up time to audible stabilisation	1.5 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−72/−73dB

Arm section

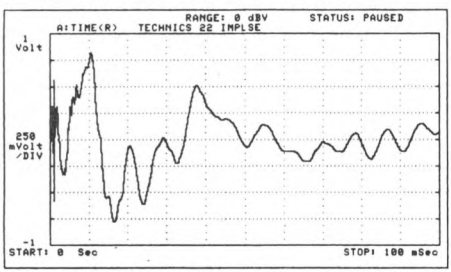
Approximate effective mass, inc screws, excl cartridge	approx 6g
Type/mass of headshell	P-mount
Geometric accuracy	excellent
Adjustments provided	none
Finish and engineering	very good
Ease of assembly/set-up/use	excellent
Friction, typical lateral vertical	20mg/30mg
Bias compensation method	spring
Bias force, rim/centre	100mg/170mg
Downforce	fixed at 1.25g
Cue drift, 8mm ascent/descent	negligible, 1 sec/3 secs
Arm resonances	below average
Subjective sound quality	well below average
Arm damping	some c/wt decoupling

System as a whole

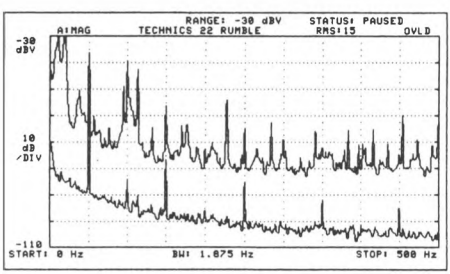
Size (w×d×h)/clearance for lid rear	43×38×9.5cm/4cm
Ease of use	very good
Typical acoustic breakthrough and resonances	poor
Subjective sound quality of complete system	well below average
Hum level/acoustic feedback	good/below average
Vibration sensitivity/shock resistance	poor/fairly good
Estimated typical purchase price	£80



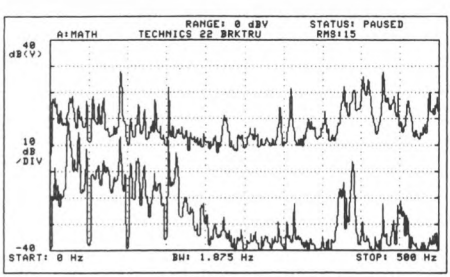
Tonearm structural resonances.



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

TECHNICS SL-L20

PANASONIC (UK) LTD, 300-318 BATH ROAD, SLOUGH, BERKS SL1 6JB.
TEL: (0753) 34522

This £100 belt-drive budget model combines parallel tracking with a *P30S* P-mount cartridge in a fully automatic complete player. Neatly styled, if wider than strictly necessary to match appropriate equipment, the traditional grey/brown Technics finish is to the usual exceptionally high standards — assuming you don't mind plastic of course — the front panel styled as much like a tuner as a turntable. The powered parallel tracking arm has automatic repeat and powered cue, while start and stop alongside double to drive the arm either way across the disc when kept depressed; speed and record size are selected just above on the top plate. A disc sensor in the platter surface prevents inadvertent mat cueing.

The construction throughout is disturbingly lightweight, the 'solid' moulded plinth construction suspended on vestigial coil sprung feet and coupled to the rather 'clangy' cover, but reinforced somewhat by a hard, braced resin base. Though still lightweight, the platter at least sat on a high quality main bearing. The plastic arm was quite flexible, showing some apparent bearing play, though it is difficult to assess the horizontal friction; being a P-mount, tracking weight is pre-set; being linear, bias compensation is unnecessary.

LAB REPORT

The arm has a low estimated effective mass of 5g, suited to higher compliance cartridges of the *T4P* persuasion. The motor drive prevented a number of measurements, but the arm resonance assessment — using the fitted cartridge — was generally unpromising, showing plenty of discontinuities from a low 200Hz, plus somewhat suppressed high frequencies. Rumble was just satisfactory, due to a number of motor harmonic modes revealed on the spectrogram. Absolute speed was 1.3% too fast, and although wow and flutter were fairly decent, slowing under load was an excessive 0.45%. The mechanical disc impulse result was shocking, showing a large platter rocking mode at around 18Hz. Vibration and acoustic breakthrough looked fairly reasonable, but low frequency acoustic problems (c60Hz) and midrange vibration breakthrough (150-200Hz) were less

than ideal.

Sound Quality

Scoring a little better than the bottom reference does nothing to disguise the poor overall rating for this player. Lack of bass weight, sparkle replaced by splatter in the treble, plus a smeared 'hard' midrange without depth or air gave rise to ennui and provoked adjectives like 'small' and 'squeaky'.

Conclusions

Good build quality and ergonomics, plus idiot-proof set-up and a generally respectable lab performance are not enough to rescue this poor-sounding design, which perhaps pays too much attention to linear tracking and facilities at the expense of the overall engineering.

Test Results

Motor section

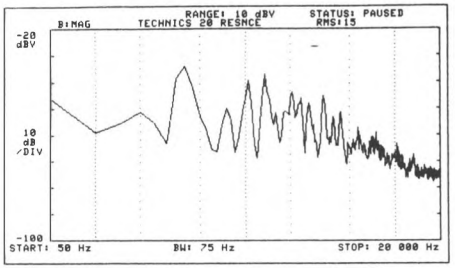
Type	electronic, belt-drive, solid
Platter mass/damping	0.44kg/well below average
Finish and engineering	very good/average
Type of mains connecting leads	Sockets: 2 core/phonos and earth
Speed options	33/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.06%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.16%/0.14%
Absolute speed error	+1.29%
Speed drift, 1 hour/load variation	+0.08%/−0.45%
Start-up time to audible stabilisation	2 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−69/−75dB

Arm section

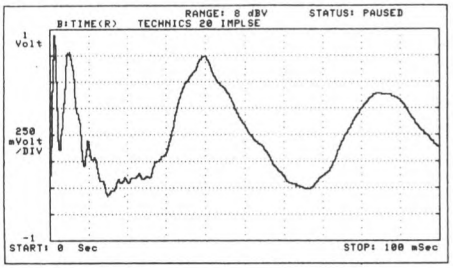
Approximate effective mass, inc screws, excl cartridge	approx 5g
Type/mass of headshell	P-mount
Geometric accuracy	excellent
Adjustments provided	none
Finish and engineering	very good
Ease of assembly/set-up/use	excellent
Friction, typical lateral vertical	n.a.
Bias compensation method	n.a.
Bias force, rim/centre (set to 1.5g elliptical)	n.a.
Downforce calibration error, 1g/2g	set to 1.3g
Cue drift, 8mm ascent/descent	none, 2 secs/2 secs
Arm resonances	below average
Subjective sound quality	poor
Arm damping	none

System as a whole

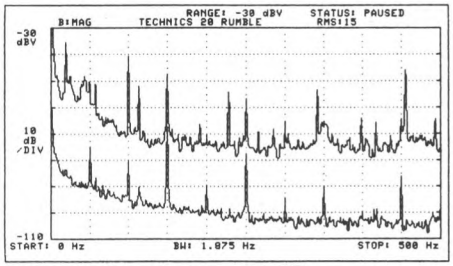
Size (w×d×h)/clearance for lid rear	43×35×10cm/1cm
Ease of use	excellent
Typical acoustic breakthrough and resonances	below average
Subjective sound quality of complete system	poor
Hum level/acoustic feedback	average/average
Vibration sensitivity/shock resistance	below average/good
Estimated typical purchase price	£100



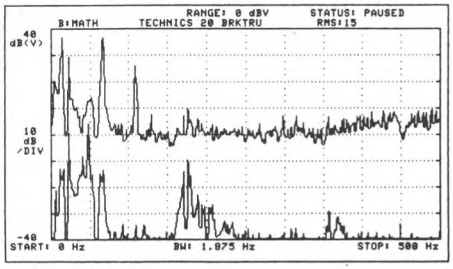
Tonearm structural resonances.



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

BEST BUY
RECOMMENDED

TECHNICS SL-DD33/SL-QD33

PANASONIC (UK) LTD, 300-318 BATH ROAD, SLOUGH, BERKS SL1 6JB.
TEL: (0753) 34522

These two low-cost integrated players are virtually identical apart from the motor systems used. The *DD* model costs £100 and has a conventional direct drive motor, whereas the £130 *QD* has quartz crystal speed reference. Compared with specialist hi-fi products they simply bristle with features. Automatics include start, stop and return, with plinth front selection of cueing, auto-repeat, and two (fixed) speeds. The platter rim has beautifully machined strobe markings — of no apparent value as the speeds are fixed. The platter also has disc size sensing to assist the automation and make sure that nasty mistakes (cueing the mat) cannot happen.

This player comes complete with a Technics *P30S* cartridge, and has a P-mount type arm which is not suitable for traditional half-inch screw-mount cartridges. An advantage is that the tracking weight is standardised at 1.25g, so both downforce and bias can be factory set. The low mass arm has good gimbal bearings with no evidence of play, and plinth phono sockets replace the arm lead.

Finished to a high standard in Technics' traditional dark brown/grey, high production volume encourages the extensive use of plastics mouldings, so the plinth and base are determinedly lightweight. The platter is a lightweight aluminium casting, covered in a ribbed mat, but the main bearing is a quality item, with no sign of play. The whole unit stands on fixed, spring/rubber feet, and the lid is a resonant affair. Despite obvious cost-conscious manufacturing, there was also evidence of sound engineering.

LAB REPORT

Tight arm bearings plus good geometry and calibration suggest a quality arm, but it was very difficult to check the lateral friction because of the fixed bias compensation, and there seemed to be some suggestion of sticking here. The tough resonance sweep test is slightly scrappy, with unwanted activity at 500Hz, but the overall result is quite well-damped and balanced.

Rumble is pretty good, and both units showed fine speed stability and control — ironically the *DD* model (bracketed in data) giving the superior wow and flutter. Acoustic breakthrough

was only fair, vibration isolation quite poor at low frequencies, while the disc mechanical impulse showed good initial damping, followed by severe platter rocking.

Sound Quality

While the Technics 33s fall short of the standards achieved by models whose main emphasis is on sound quality, they at least make a reasonable attempt. The sound is generally quite well controlled, with fair focus and a little depth, but some 'hollow' and 'nasal' midrange coloration. Bass is below average, slightly soft and 'thick', while the treble is rather untidy, if balanced, emphasising surface noise.

Conclusions

Though these players stress appearance, build quality and features at the expense of sound quality, there is good sound engineering in many places, good lab performance, and a sound that is respectable enough, if rather uninvolving. The *DD* version clearly offers the better value for money, but both merit recommendation.

Test Results

Motor section (DD33 in brackets)

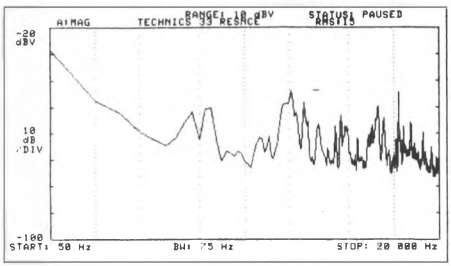
Type	automatic, electronic, direct drive, solid
Platter mass/damping	1kg/below average
Finish and engineering	very good
Type of mains connecting leads	2 core/phonos and earth (sockets)
Speed options	33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.15% (0.04%)
Wow and flutter (lin peak wtd)	0.13% (0.08%)/0.12% (0.08%)
Absolute speed error	−0.2% (−0.17%)
Speed drift, 1 hour/load variation	0% (0%)/0% (0%)
Start-up time to audible stabilisation	2 (1.5) secs
Rumble, DIN B wtd, L/R average (see spectrum)	−75/−79dB

Arm section

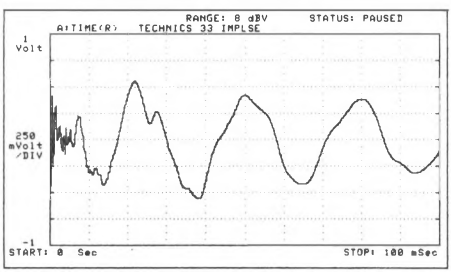
Approximate effective mass, inc screws, excl cartridge	7.5g
Type/mass of headshell	fixed, P-mount
Geometric accuracy	very good
Adjustments provided	none
Finish and engineering	very good
Ease of assembly/set-up/use	excellent
Friction, typical lateral vertical	see text/20mg
Bias compensation method	fixed spring
Bias force, rim/centre	130mg/190mg
Downforce	0.1g/0.03g
Cue drift, 8mm ascent/descent	very slight, 1 secs/1 secs
Arm resonances	above average
Subjective sound quality	below average
Arm damping	slight counterweight decoupling

System as a whole

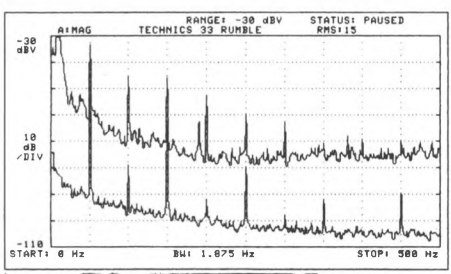
Size (w×d×h)/clearance for lid rear	43×38×10cm/3cm
Ease of use	excellent
Typical acoustic breakthrough and resonances	average
Subjective sound quality of complete system	below average
Hum level/acoustic feedback	good/average
Vibration sensitivity/shock resistance	below average/good
Estimated typical purchase price	£100, £130



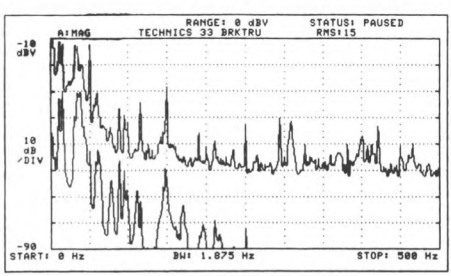
Tonearm structural resonances.



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

THORENS TD280

PORTFOLIO MARKETING, RIVER WALK, TONBRIDGE, KENT TN9 1DT.
TEL: (0732) 365071

Unmistakeably a Thorens, the *TD280* has that familiar square, slightly squat appearance, finished in matt black with detail brightwork. It is the cheapest Thorens integrated player at £155, some £15 less than the revived *TD166*, and is distinguished by the lack of a subchassis, which is something of a Thorens hallmark.

The simple arm has a nominally fixed head with continuous wiring, but a collar retains the head itself which can be removed to facilitate cartridge fitting. Construction seemed a little lightweight, and the vertical bearing showed a little play. Simple controls are sited along the front of the top deck, and feel rather 'clunky'; mechanical levers select speed and cue, and a push button starts the motor. A photoelectric velocity sensing mechanism monitors the arm, providing automatic stop and lift off at end of side.

The plinth is solid chipboard, fitted with a hardboard base and a light, resonant styrene lid (which is coupled to the active part of the player in this solid plinth design). The only gesture towards environmental isolation consists of rubber feet with inbuilt coil springs. The platter itself is a substantial Mazak casting, running on a plastic inner hub with high quality 7mm bearing; pushed through the plinth, the bearing housing is retained by a substantial circlip. A plastic pulley provides drive from the motor.

LAB REPORT

Helped by the slight bearing slackness, friction was commendably low, and the basic arm parameters generally satisfactory, though a 3 secs cue descent demands a little patience. The resonance trace showed a main mode at 500Hz and a further spike at 3.3kHz, but seemed quite controlled and well damped elsewhere. Effective mass is a medium 12.5g, well suited to the majority of cartridges with high compliance types better avoided.

The rumble figures were satisfactory enough, while the spectrogram revealed a number of motor harmonics at around −50dB. Start up to stabilisation took a long 7 secs and speed was slightly slow, but wow and flutter measured quite satisfactorily; the −0.35% slowing under load

was a little too high for comfort. The disc mechanical impulse was not too well handled at first, but settled down quickly. Vibration breakthrough was not too good at low frequencies, but acoustic breakthrough was generally satisfactory.

Sound Quality

Scoring below average, this is a not unreasonable result for the price, but was clearly disappointing in the context of the much better results for the only slightly more expensive *'166*. Depth was poor, dynamic range limited, the bass generally unconvincing, and definition vague. Pitch was good, the general balance OK, and the overall sound lively if somewhat coarse and brash.

Conclusions

Satisfactory enough in the context of mass market players, the *'280* lies firmly in the shadow of its stablemates, and did not deliver a sufficiently good overall performance.

Test Results

Motor section

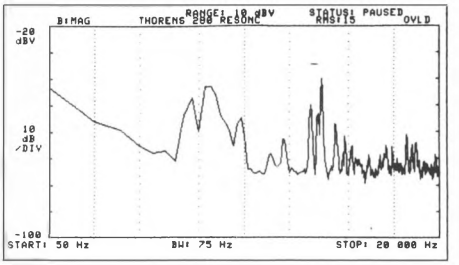
Type	electronic, belt-drive, solid
Platter mass/damping	1.5kg/good
Finish and engineering	very good/good
Type of mains connecting leads	2 core remote/phonos and earth
Speed options	33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.06%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz)	0.14%/0.06%
Absolute speed error	0.2%
Speed drift, 1 hour/load variation	0%/−0.35%
Start-up time to audible stabilisation	7 secs
Rumble, DIN B wtd, L/R average (see spectrum)	−74/−76dB

Arm section

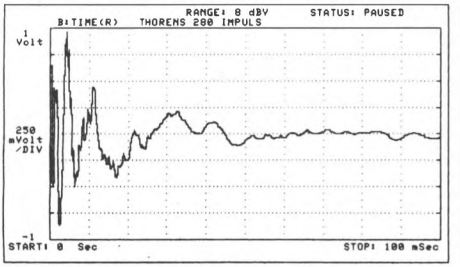
Approximate effective mass, inc screws, excl cartridge	12.5g
Type/mass of headshell	see text, fixed (7g)
Geometric accuracy	very good
Adjustments provided	height (spacers), overhang, lateral, tilt
Finish and engineering	good/average
Ease of assembly/set-up/use	very good
Friction, typical lateral vertical	10mg/10mg
Bias compensation method	dial spring
Bias force, rim/centre (set to 1.5g elliptical)	170mg/140mg
Downforce calibration error, 1g/2g	−0.15g/−0.3g
Cue drift, 8mm ascent/descent	very slight, 1.5 secs/3 secs
Arm resonances	average
Subjective sound quality	below average
Arm damping	some c/wt decoupling

System as a whole

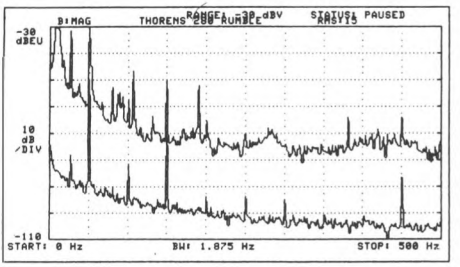
Size (w×d×h)/clearance for lid rear	44×35.5×13.5cm/6cm
Ease of use	very good
Typical acoustic breakthrough and resonances	average
Subjective sound quality of complete system	below average
Hum level/acoustic feedback	good/average
Vibration sensitivity/shock resistance	average/good+
Estimated typical purchase price	£155



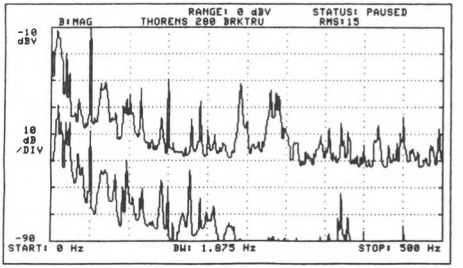
Tonearm structural resonances.



Disc edge mechanical shock.



Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

BEST BUY

THORENS TD166III

PORTFOLIO MARKETING, RIVER WALK, TONBRIDGE, KENT TN9 1DT.
TEL: (0732) 365071

Thorens are always trying to kill off the '166, but the market won't let them. Now it's revived again for 1986, as a £169 integrated player, based on a low cost version of the classic *TD150/160* subchassis motor unit plus Thorens' own arm. It provides auto stop/lift and has cue and speed control along the front of the top plate. The arm is a low mass affair, better suited to more compliant cartridges, and is a cross between fixed and detachable heads — the wires remain continuous and in situ, but a strong collar releases the head for cartridge mounting. The complex gimbal bearings were set slightly loose, and armheight can only be adjusted using shims.

The motor is essentially the same as that produced over many years, albeit now using a low voltage motor fed via a transformer. The metal platter sits on a plastic hub, driven by a compliant belt from a plastic clutch pulley, while the rubber mat surface is now flat (the ribs are found on the underside!). The subchassis springing has foam damping, the lid is cheaper polystyrene, and finish is spartan but clean.

LAB REPORT

The arm bearings were a bit sloppy, but showed good friction levels and geometry. Downforce calibration was 20 per cent light, but bias was about right. Resonances included the main, quite severe, torsional mode at around 600Hz, plus an isolated high Q peak at 3kHz, while high frequencies were suppressed.

Based on earlier findings, the motor section has a generally decent lab performance in all departments, including breakthrough, rumble and speed stability.

SOUND QUALITY

Though the competition is now much tougher, this latest *TD166* reincarnation still delivers the sonic goods, rating firmly above average with the new arm. This has clearly raised the standard a little, though it is still probably the weakspot, and contributed to a degree of treble 'roughness' and 'splash' that might be ameliorated with a kinder moving magnet cartridge. Depth, focus, ambience, resolution and dynamics were all liked, bass was pretty good, though some mid coloration was criticised.

Conclusions

Old turntables never die, and fortunately Thorens are persuaded of the fact. This revived '166 yet again takes its place near the top of its class, as a practical, sensibly engineered, and well balanced player.

Test Results

Motor section

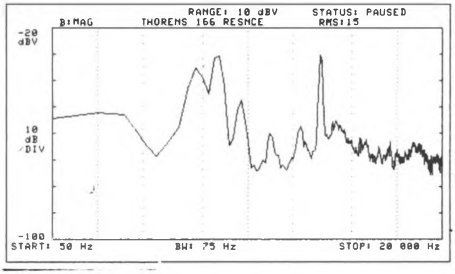
Type — auto-lift, belt-drive, subchassis
Platter mass/damping — 2.5kg/below average
Finish and engineering — good
Type of mains connecting leads — 2 core/phonos and earth
Speed options — 33⅓/45rpm
Wow and flutter (DIN peak wtd sigma 2) — 0.08%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz) — 0.15%/0.06%
Absolute speed error — +1.4%
Speed drift, 1 hour/load variation — %/−0.18%
Start-up time to audible stabilisation — 3.5 secs
Rumble, DIN B wtd, L/R average (see spectrum) — −72dB

Arm section

Approximate effective mass, inc screws, excl cartridge — 7g
Type/mass of headshell — fixed
Geometric accuracy — very good
Adjustments provided — overhang, lateral, tilt
Finish and engineering — good
Ease of assembly/set-up/use — very good/good/good
Friction, typical lateral vertical — 20mg/20mg
Bias compensation method — thread & weight
Bias force, rim/centre (set to 1.5g elliptical) — 120mg/170mg
Downforce calibration error, 1g/2g — −0.2g/−0.4g
Cue drift, 8mm ascent/descent — negligible, 1 secs/2 secs
Arm resonances — above average
Subjective sound quality — average
Arm damping — some c/wt decoupling

System as a whole

Size (w×d×h)/clearance for lid rear — 43×35×15cm/8.5cm
Ease of use — very good
Typical acoustic breakthrough and resonances — good
Subjective sound quality of complete system — above average
Hum level/acoustic feedback — very good/good
Vibration sensitivity/shock resistance — good/fairly good
Estimated typical purchase price — £169



Tonearm structural resonances.

RECOMMENDED

THORENS TD316

PORTFOLIO MARKETING LTD, RIVER WALK, TONBRIDGE, KENT TN9 1DT.
TEL: (0732) 365071

This new turntable is a higher-quality replacement for the old *TD166*, a deck which offered excellent value and has since been resurrected. The *316* carries forward the established *166* arm, now fitted to the latest subchassis and drive system of the *320* series. One cost concession is seen in the change to black ash vinyl for the plinth exterior, a substitute for the real veneer of the *320*; while the inner platter hub is now made from reinforced plastic, the outer ring is still Mazak.

Features include an electronic motor control with convenient two-speed switching on the plinth, plus the comparative luxury of a plinth-mounted cue control which allows jiggle-free operation despite the suspended subchassis. The arm has been improved by replacing the old headshell with a new cast metal design, offering sensible cartridge fitting and a firm locking collar. Bias compensation is by thread and weight, with downforce set by a calibrated dial and rotating counterweight.

SOUND QUALITY

Good points included a strong stable sound with good pitch and speed stability. The bass was weighty and extended with the mid moderate in coloration and good on detail. The treble was a touch exuberant but quite well focused. Stereo images were well presented in the width dimension but lacked some measure of depth transparency; overall it sounded a little less dynamic than top rated alternatives.

CONCLUSIONS

Undoubtedly competitive, the lower cost *316* integrated player offers traditionally good Thorens engineering. Arm mass is on the low side, suited to some of the more delicate moving magnet cartridges, and is also well calibrated and convenient. In contrast to some of the competition, this player also offers a good lab performance and two-speed electronic motor drive.

TEST RESULTS

Motor unit/integrated player	
Type	belt-drive, subchassis, manual
Platter mass/damping	3.0kg/good
Finish and engineering	excellent/very good
Type of mains connecting leads	remote transformer/plus earth
Speed options	33/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.06%
Wow and flutter (LIN peak wtd 0.2-6Hz/6-300Hz)	0.14%/0.14%
Absolute speed error	−0.5%
Speed drift, 1 hour/load variation	<0.1%/−0.34%
Start-up time to audible stabilisation	7.0 secs
Rumble, DIN B wtd, L/R average	−74/−76dB
Arm section	
Approximate effective mass, inc screws, excl cartridge	4.5g
Type/mass of headshell	fixed
Geometric accuracy	very good
Adjustments provided	height/overhang/lateral
Finish and engineering	good/good
Ease of assembly/set-up/use	very good/very good/very good
Friction, typical lateral vertical	45mg/<15mg
Bias compensation method	thread and weight
Bias force, rim/centre (set to 1.5g elliptical)	200mg/160mg
Downforce calibration error, 1g/2g	−0.075g/−0.15g
Cue drift, 8mm ascent/descent	good, 1.5 secs/3.5 secs
Arm resonances	good
Subjective sound quality	good
Arm damping	some counterweight decoupling
System as a whole	
Size (w×d×h)/clearance for lid rear	44×37×16cm/6.5cm
Ease of use	good+
Typical acoustic breakthrough and resonances	very good
Subjective sound quality of complete system	good+
Hum level/acoustic feedback	very good/very good
Vibration sensitivity/shock resistance	very good/average+
Estimated typical purchase price	£199

For graph references see issue No. 43

RECOMMENDED

THORENS TD320

PORTFOLIO MARKETING LTD, RIVER WALK, TONBRIDGE, KENT TN9 1DT.
TEL: (0732) 365071

The *320* is the top model in Thorens' new series, and is also available without arm (*321*). Following in the footsteps of B&O and Philips, Thorens have chosen to replace their usual coil spring suspension with one using flat leaf springs, these hung or cantilevered from the chassis allowing free movement. Centration and consistency are thus improved and the springs are easy to adjust from above.

The massive plinth is of solid MDF, 40mm thick. The section of material cut out for the arm mounting is used to construct a wood-based high-mass subchassis of low resonance properties. Arm mounting boards are interchangeable. Thorens' existing two-part Mazak platter and belt-drive has been retained, but a new low voltage synchronous motor has been fitted, fed by an electronically synthesised two phase power supply with the two speeds directly switched.

The *320* is engineered to a high standard with excellently toleranced main bearing and particularly good finish. The lid now sports spring loaded hinges. It proved easy to set up except for the restricted clearance available for dressing the arm cable inside the deck.

LAB REPORT

The clutch provided a judder-free start up at a slow 8.7 seconds. Rumble was a very low −76dB with no supply harmonics visible on the spectrogram. The new flat mat offered quite good platter damping with good termination of disc impulse energy. The suspension offered very good levels of vibration isolation while acoustic energy was also well rejected. No particular emphases were detected in the frequency range.

Wow and flutter was a very low 0.06%. The separate figures for wow and flutter were well balanced, while speed accuracy was good, and slowing under load a mild 0.25%. This player also provided quite good resistance to shock though the chassis proved to be a trifle 'whippy' in the rotational mode.

SOUND QUALITY

Performing very well in the listening tests, the *320* provided a stable, focused sound, with a feeling of substantial weight and solidity. Stereo images revealed fine depth and space while the pitch and rhythm were well maintained. Acoustic feedback was very low, while the player was also not too critical of siting, a good sign.

CONCLUSIONS

The *320* series improves on the traditional strengths of the *TD160* and offers a welcome advance in engineering, performance and finish. Competitive in their price category, this range of models is recommended.

TEST RESULTS

Motor unit/integrated player*	
Type	**electronic, belt-drive, subchassis**
Platter mass/damping	**3.7kg/good**
Finish and engineering	**excellent/very good**
Type of mains connecting leads	**2 core**
Speed options	**33/45rpm**
Wow and flutter (DIN peak wtd sigma 2)	**0.06%**
Wow and flutter (LIN peak wtd 0.2-6Hz/6-300Hz)	**0.1%/0.1%**
Absolute speed error	**−0.16%**
Speed drift, 1 hour/load variation	**<0.1%/−0.25%**
Start-up time to audible stabilisation	8.7 secs
Rumble, DIN B wtd, L/R average	−76dB
Size (w×d×h)/clearance for lid rear	44×37×16cm/6.5cm
Ease of use	good
Typical acoustic breakthrough and resonances	very good
Subjective sound quality of complete system	very good
Hum level/acoustic feedback	very good/very good
Vibration sensitivity/shock resistance	very good/fairly good
Typical price	£279

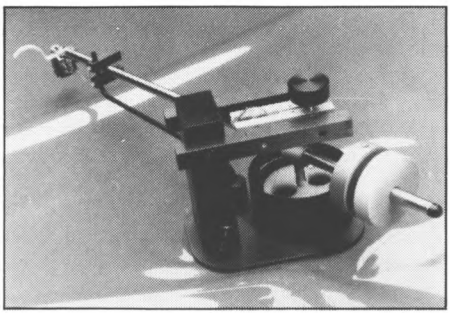
**supplied without arm (TD321BC)*

For graph references see issue No. 43

RECOMMENDED

WELL TEMPERED ARM

AUTOMATION SCIENCES CO., 20 LITTLE GADDESDON, BERKHAMSTED, HERTS HF4 1PA.
TEL: (044284) 2786



This arm is the fruit of many years of research conducted by US engineer, Bill Firebaugh. An unusual design, its closest relative would appear to be a fluid damped unipivot, but in fact, this model has managed to dispense with bearings altogether in the conventional sense. Diligent development has turned into reality the concept, mooted by several engineers, of an arm hanging on a thread. In this case, the use of two threads, or more properly nylon monofilaments, improves stability and provides an elegant method of aplying frictionless bias correction.

The arm has an undamped effective mass in the 10g range, and in use is heavily damped by a low-mass stabiliser working in a well of viscous silicone fluid, which, in a real sense, is the foundation for the arm. The subsonic arm/cartridge resonance is heavily damped.

It should be noted that the assembly is rather high and will not fit most turntables with their lids in position; for some models, modified lids may be available from the importer.

LAB REPORT

Arm resonances were well controlled, free from sharp breakups. In energy terms, some mid dominance was apparent but this was broad and thus of little consequence

Bias is set by a small thumbwheel, and when set at minimum, the measured bias correction value was appropriate for a typical cartridge of 1.5g tracking force. Rotated by one turn, 'anti-skating' of some 500mg or so was provided, appropriate to downforce in the 2.5 to 3.0g range. Checks confirmed the negligible stiction in the suspension and the damper assembly, so in practice friction values can be regarded as very low for small, slow arm movements.

SOUND QUALITY

Properly set up, this arm gave a highly neutral, low-coloration sound — one which was balanced throughout the audio range. Compared with most arms, it sounded 'quieter' in a subtle way — restrained yet finely detailed and extremely well focused through bass mid and treble registers. Images were unusually stable without the oft-heard stylus 'fluttering' and uncertainty.

CONCLUSIONS

The high standard of sound quality shown here demands recommendation. Stable and relaxed, its overall performance 'grows' on the listener with prolonged use. The average effective mass and high damping suits a wide variety of cartridges, ranging from the robust low compliance versions, to the more delicate moving-coils. While appearance may be off putting and there are admittedly some mounting complications, the end results certainly justify the extra effort required.

TEST RESULTS

Approximate effective mass, inc screws, excl cartridge	6.8g
Type/mass of headshell	fixed
Geometric accuracy	excellent
Adjustments provided	tilt, overhang, lateral
Finish and engineering	very good/very good
Ease of assembly/setting-up/use	difficult/average/average
Friction, typical lateral/vertical	none
Bias compensation method	twisted thread
Bias force, rim/centre	225mg-500mg (see text)
Downforce calibration error, 1g/2g	uncalibrated
Cue drift, 8mm ascent/descent	no cueing device, poor drift/0.5secs (inherent damping)
Arm resonances	excellent
Subjective sound quality	very good
Arm damping	very heavy damping
Estimated typical purchase price	£545

For graph reference see issue No. 43

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ZARATHUSTRA SOLILOQUY

AUTOMATION SCIENCES CO, 20 LITTLE GADDESDEN, BERKHAMSTED, HERTS HP4 1PA.
·———TEL: (044284) 2786———·

Utterly simple yet utterly extravagant, this skeletal Welsh built suspended motor unit is one of the most expensive around, due mainly to its massive constituent slate slab, supporting heavy plate glass sides and lid, a substantial cased synchronous motor with crowned pulley, and the suspension springs. Peripheral tower springs can result in high rotational stiffness, but *Zarathustra's* vast mass keeps all subchassis modes at respectably low frequencies. Power is delivered from an unmarked external electronic power supply — by trial and error until one cracks the code.

The subchassis is a substantial laminate, giving good arm/cartridge vibration termination. Two hands and keep your back straight, the platter is machined from 12kg solid stainless steel; the massive main bearing has a Glacier metal low friction sleeve, with the whole mass supported on point contact between two carbide balls (one with a flattened face).

Levelling is achieved by packing the suspension towers with spacers, but no arrangement has been finalised for armlead dressing. Our sample had a disc clamp and a cork mat with felt option, but an acrylic mat is planned for production. Oozing craftmanship, finish throughout is exceptional, enchanced by the inherent beauty of the high quality materials. The practical difficulties of siting (wall-mounting?) such a mass need taking into account, but it would be a mistake to dismiss this as a 'brute force and ignorance' device.

LAB REPORT

Rumble was very good, and wow and flutter (DIN wieghted) gave the lowest figure we have ever recorded, and the linear separate figures were exceptional too. The various speed characteristics depend somewhat on the 'set' of the subchassis springs, the consequent tightness of the fairly stiff drive belt, and hence delivered motor torque. The enormous inertia gives a slow start up time of 20-35 secs — conversely, you could carry on playing half an LP side with the beast turned off! With a tight belt, speed was 1% fast and slowing under load 0.3% — in practice this highish figure will not create dynamic wow because of the high platter inertia.

Disc mechanical impulse testing showed that the cork was better than the felt on handling the initial transient, but that it also left some higher frequency ringing; the planned acrylic mat should sort this out. The acoustic breakthrough was superb, and mechanical very good, particularly at low frequencies (note the isolated spring modes at c230 and 360Hz).

Sound Quality

Though not dramatically brilliant, *Zarathustra* joins a very select handful rated 'very good'. Its inherent quality is well illustrated by a sound which was quite susceptible to differences in mats (and we suspect supports, though this is difficult to check!) — the cork being comfortably preferred to the felt. Not surprisingly, solid stability was the great strength, with extended powerful bass, though a lack of 'speed' and some 'thickening' was also noted. Coloration was very low and the overall balance slightly 'soft'.

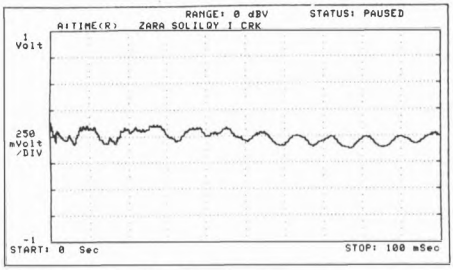
Conclusions

Turntables that combine brains with beauty and deliver the goods are rare enough to help justify *Zarathustra's* £2000 price tag though others can achieve as much overall with greater economy. We would like more evidence to confirm the life of the main bearing, and there is still some room for improvement in the consistency and disc damping. But as it is, this eminently sensible if stupidly named design has a sonic stability second to none, and deserves recommendation.

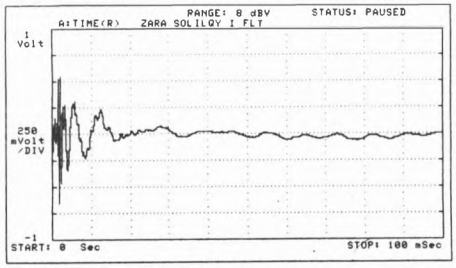
Test Results

Motor section

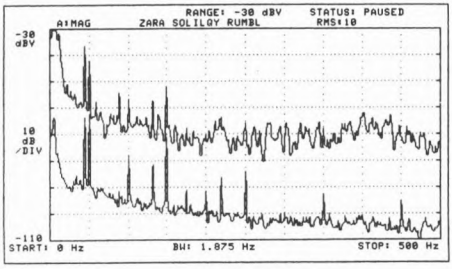
Type	electronic belt, subchassis
Platter mass/damping	12kg/satisfactory (see text)
Finish/engineering	excellent
Mains/connecting leads	remote 3 core
Speed options	33⅓/45rpm
Wow & flutter (DIN pk wtd)	0.02%
Wow/flutter (lin pk wtd)	0.05%/0.06%
Absolute speed error	+1%
Speed drift/load variation	+0.3%/−0.3%
Start-up time to stability	20-30 secs (see text)
Rumble L/R average (DIN B wtd)	−78/−82dB
Size (w×d×h)/clearance for lid rear	45×39cm/15.5cm
Ease of use	good
Acoustic breakthrough, resonances	excellent
Sound quality	v good
Hum/acoustic feedback	v good/excellent
Vibration, shock sensitivity	v good/good
Typical price	£1995



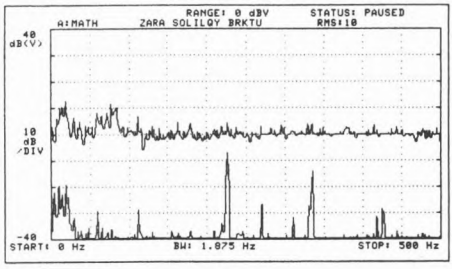
Disc edge mechanical shock (cork mat)



Disc edge mechanical shock (felt mat)



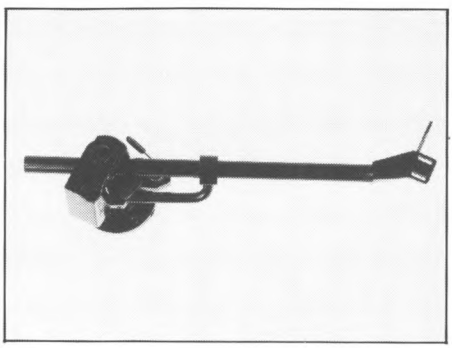
Rumble, mechanical above electrical hum.



Breakthrough, acoustic above vibration.

ZETA 2

MOTH MARKETING, 47 ARMSTRONG CLOSE, WILSTEAD, BEDFORD.
TEL: (0234) 741152



The original macho super-arm, the Mark 1 *Zeta* never quite fulfilled its promise in production, but is now being manufactured by a new engineering company, and distributed by Moth Marketing as the *Zeta 2*, priced at £459 with conventional cabling, and a steep £549 with van den Hul wires.

Changes are minor, the established high gloss buffed black creating a very smart external appearance. The bearings are now 3- rather than 7-ball types, but are still small considering the massiveness of the structural members: they felt pretty tight, but one sample gave rather high friction. The cartridge mounting area is ground flat. In other respects the familiar *Zeta* features of a massively constructed fixed head design are seen, uncalibrated for downforce or bias compensation.

LAB REPORT

The bearings felt pretty good, and friction on the second sample was quite low, but the vertical motion had a slightly notchy feel. The bias compensator gave sensible values at its mid position for a normal 1.8g downforce. The effective mass is a highish 16g suited to low compliance moving-coil cartridges. The resonance trace seemed a little less favourable on the *Mark 2* model, the main first mode at 900Hz/1kHz followed by a rash of multiple modes, giving a 'bright' effect up to 5kHz, above which energy is slightly 'dulled'.

SOUND QUALITY

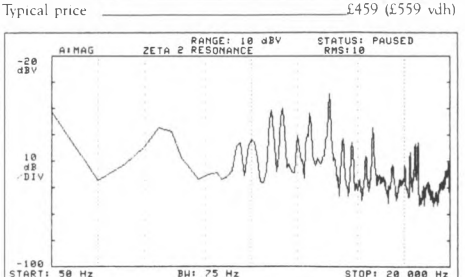
The sound of the Zeta is little changed from the original, which places it firmly in the very good class, limited perhaps to some degree in the standard model by the ordinary arm cable. The sound is powerful, 'weighty', even a bit 'heavy', but with considerable detail and fine focus and depth, occasionally a little bright and forward in the lower treble.

CONCLUSIONS

The *Zeta 2* remains a fine product, but cheaper alternatives can offer as much, and there remain some reservations about production consistency. Nevertheless, it certainly merits consideration, and has an overall balance which will suit some motors more than others.

TEST RESULTS

Effective mass (approx.)	16g
Type/mass headshell	fixed
Geometric accuracy	excellent
Adjustments provided	height, overhang, lateral
Finish/engineering	very good
Ease of set up/use	Good
Friction, (typical lat/vert)	20mg 50mg
Bias method	Dial spring
Bias force, (mid-setting)	130mg/170mg
Downforce error, 1g/2g	n/a
Cue drift, 8mm up/down	slight/2.5 secs
Arm resonances	good
Sound quality	very good
Arm damping	none
Typical price	£459 (£559 vdh)



Tonearm structural resonances.

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SUMMARY REVIEWS: TURNTABLES AND TONEARMS

Acoustic Research Legend (£200, with arm £260)
A completely modernised revival of the classic AR subchassis design, this model offered fine all round performance, with an airy, articulate sound. The AR arm is roughly equivalent to a Mission *774LC*. The *Legend* remains good value, though somewhat eclipsed in this respect by the cheaper *EB101*.

Audio Technica AT1120 (£132)
This low effective mass (5g) arm suits fairly high compliance cartridges, and sounded better than an unpromising resonance graph suggested. Tonal balance was quite pleasant, stereo image reasonably well defined, and treble inoffensive. Bass definition was below that of some 'super' arms though, and this model will not suit low-compliance moving coils. Well built and finished, with very low friction, it originally sold at around £110.

B&O TX-2 (£249)
This is a fully automatic integrated player which can interface to B&O's unique remote control system. Though more oriented towards convenience than audiophile sound quality, it still sounds respectable, with low coloration, and is attractively styled and well finished.

Decca International (£49)
With moderate 12g effective mass, this unipivot design gives a rather 'rich' tonal balance, with some bass muddling and mid-forwardness; it could be a good match for Decca's individual-sounding cartridges, but constructional quality is not good by modern standards.

Dual CS514 and CS515 (£80, £95)
Superficially resembling the 505 models, the inexpensive *CS514* and *'515* are based on lightweight plastic plinths and have only the most rudimentary isolation, via rubber grommets, of their steel 'subchassis'. Despite the nicely-made Dual tonearm, sound quality was not found very satisfactory, lacking dynamics and showing poor motor torque. Though the *514* could perhaps be worth considering for the least expensive systems, the '505 is clearly very much worth the extra money.

Grace G707
This long-established and elegant arm is a rigid yet low-mass (7g) design with a fixed plastic headshell. In terms of tonal balance it is slightly bright or coarse. While if offers tight, extended and powerful bass with good stereo depth and precision, recent introductions have reduced its competitiveness.

Harman Kardon T35C (£159)
In this rigid plinth design the springy feet provide some isolation but do not deal with acoustic breakthrough. The 1.33kg platter is driven by a small DC motor, allowing electronic speed change. The arm showed quite serious resonant breakup. Stereo focus was not very sharp, and the sound lacked attack or life. Tonally it was pleasant enough, neither seriously coloured nor unbalanced but by the standards of today this 'old-fashioned' performance is no longer adequate.

Harman Kardon T55C (£239)
The *T55C* has a suspended subchassis, and a heavy record clamp. Isolation and feedback resistance were much better than the '35. Subjectively, stereo images had greater width, and the sound showed more 'punch' and life with improved bass definition, but some muddling remained in the mid and treble. Barely above average sound quality at a well above average price, the *T55C* cannot be recommended.

Lux PD290)£145)
Beautifully finished and styled, the *PD290* is an integrated solid plinth design with a reasonable motor section but rather unimpressive tonearm. Sound quality was pleasant, if bland and rather two-dimensional.

Mission 775LCT (£200)
Fitted with the individually recommended *774LC* tonearm (12g eff. mass), this £200 player comes complete with a decent cartridge and gives a tidy, coherent sound with fine musical drive and integrity, albeit with some loss of transparency. Rated 'worth considering' at the stated price, with a slight reduction it would merit recommendation.

Oracle Alexandria/Prelude (£825/£1,290)
Generally supplied integrated with the Prelude tonearm, Alexandria is more conventionally styled and less expensive than Delphi, with a normal plinth but other typical Oracle features like the screw down record clamp. The 9g

effective mass arm performed well enough, and the turntable gave fine lab test results. Neutrally balanced with low coloration, the sound was well liked, the high overall performance rating indicated recommendation, but in view of its price it is now worth considering, though value for money is not particularly good.

SME 3009 II Improved (£112/£124)

The classic low-mass SME arm design still rated as 'worth considering' when last tested two editions ago, particularly in 'non-detachable' form. The *Improved* designation refers to a reduction in mass applied to the design in the early '70s, the higher-mass *3009R* being virturally a return to pre-*Improved* version! The *Improved* remains a well-built and finished product which may be available at an attractive price. Sound quality was characterised as somewhat brash and lacking in bass definition.

SME 3009 Series III and IIIS (£205/£147)

Designed to combine low mass (5g) with versatile cartridge matching, the *Series III* has extremely comprehensive adjustments; the simplified *IIIS* lacks some of the *III*'s features but sounded indistinguishable. The sound was characterised by a 'soft' balance, with a subdued treble. Coloration was comparatively low and the overall sound pleasantly relaxed. Accessory mass loading plates can be added, but even so the arm is not primarily suited to low compliance moving-coils. Respectable sound quality is combined with excellent construction and finish.

SME 3009R (£225)

This 'R' version of the *3009* offers higher mass primarily for lower-compliance moving-coil cartridges; it is in effect a revamping of the much earlier, heavier *3009* version which preceeded the *3009 II Improved*. While construction and finish are to the usual superb SME standard, the subjective performance was in the 'average' group and this did not in our view justify the price.

Systemdek IV (£448)

This recommended motor unit has electronic speed control, a heavy platter, and fine subchassis suspension. Lab performance was highly respectable and the sound was lively, dynamic and 'lean', a little lacking in bass impact, but with outstanding midrange and treble clarity and definition.

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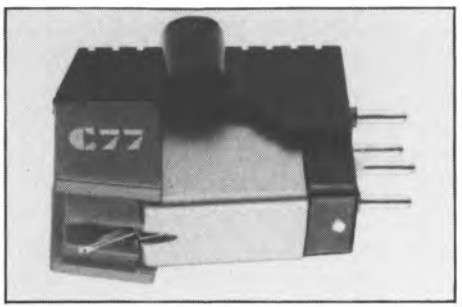
BEST BUY

A&R C77

A&R CAMBRIDGE LTD, DENNY INDUSTRIAL CENTRE, WATERBEACH, CAMBRIDGE CB5 9PB.
TEL: (0223) 861550



A&R's original cartridge policy was to take a fairly conventional moving magnet design and specify a very high quality stylus (Weinz Paroc on the original *P77*), while keeping the price quite modest.

The unassuming *C77* moving magnet model shows good mechanical integrity in body and stylus assembly. The latter has a spherical tip which was small, neat and well-mounted. Compliance is moderate with little damping, suited to the many arms in the effective mass range 7-15g. Tracking weight for this model is a sensible 1.8g, a figure which confers reasonable groove security.

LAB REPORT

Output is conveniently average, and amplifier input capacitance is quite uncritical (250pF increase adding 1dB to treble level).

Frequency response showed a fairly obvious broad 3dB suckout in the mid treble, followed by a mild rise to the 16/17kHz resonance. Channel balance improved steadily towards high frequencies, and the overall trace did in fact manage to look quite 'clean' even at high writing speeds.

The separation analysis showed decent enough figures which were generally pretty consistent down to low frequencies, though reducing somewhat at HF. Tracking abilities were fine.

SOUND QUALITY

The measured frequency balance was quite obvious in the sound quality, but this is something of a compliment to an inherently very clear and clean sounding cartridge, which in many respects sounds most impressive considering its price.

The treble peak was a trifle obvious and sounded a little 'detached', perhaps because the extreme HF was not particularly detailed. Elsewhere the balance and dynamics were mildly impressive, with plenty of 'bounce' and an attempt to convey stereo depth. Surface noise was not exaggerated, midrange focus was pretty good, and the general integrity was good.

CONCLUSIONS

Belying its rather nondescript appearance, the *C77* is the sort of model that gives moving magnets a good name. It offers good compatibility and sound quality at a very sensible price. Clearly a Best Buy, the only question mark lies over the treble peak and how it might interact with a given system and pair of ears.

TEST RESULTS

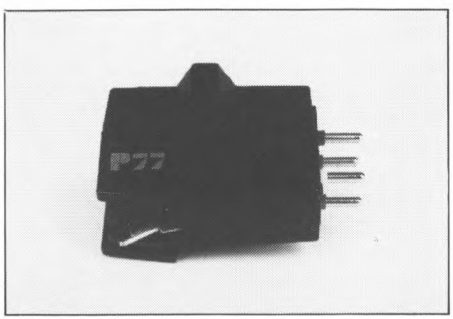
Type, mass	moving magnet 6g
Stylus type	spherical
Stylus inspection result	confirmed, well mounted
Output Level (1kHz, 5cm/s)	3.75mV
Relative output (0dB = 1mV/cm/s)	−1dB
Channel balance	0.85dB
Channel separation (L,R)	28.5, 28.8dB
Tracking ability (L,R)	80,80µm
Frequency response limits 100Hz-5Hz	+1, −2.5dB
Frequency response limits 30Hz-20kHz	+1, −9dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	22, 31, 22dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	28, 24, 22dB
Channel diff. from graph, 100Hz, 1kHz, 10kHz	0.5, 0.5, 1dB
Test tracking weight, loading	1.8g, 300pF
LF resonance frequency, 12.5g arm (vert, lat)	10, 10.3Hz
Estimated compliance (vert, lat)	16, 15cu
Recommended arm effective mass	6-16g
LF resonance rise, 12.5g arm (vert, lat)	14.5, 12dB
Typical selling price	£20

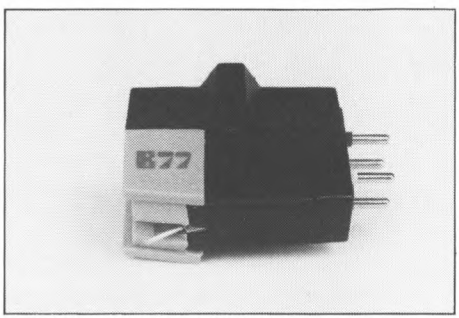
For graph reference see issue No 43

RECOMMENDED

A&R P77Mg/E77Mg

A&R CAMBRIDGE LTD, DENNY END INDUSTRIAL CENTRE, WATERBEACH, CAMBRIDGE CB5 9PB
TEL: (0223) 861550





Popular on the UK market for a number of years, A&R have just introduced alternative versions of their *C*, *E* and *P77*s, the *Mg* suffix denoting a cast magnesium mounting section replacing the standard plastic — shades of the *K9*! This is a £10 price loading; existing '77 users can upgrade the body alone for £23, and standard models will continue to remain available in parallel.

This is a conventional — even slightly old-fashioned — moving magnet design, majoring on such virtues as a strong square body and lugs with plenty of headshell contact, and a well-fitting stylus assembly. Electrical output is quite normal, and changes in input load capacitance are not dramatic: given the option, 400pF is preferred.

Compliances measured higher this year than before, which is rather a pity as the choice of ideally compatible arms is now more restricted, to low and low/medium mass types. The two models were quite similar, the slightly higher *E* suggesting a typical production tolerance. Under the microscope, the *P* had a fine four-faceted 'line' grind on a small nude stone; finish and alignment were both very good. The *E* on the other hand, had a poor quality diasa-shank pseudo-elliptical tip, virtually unpolished and poorly aligned.

Lab Report

Tracking abilities are fine. The *P* gave the better separation measurements, but the spectrograms were very similar, showing slight internal asymmetry. The response graphs were also pretty close, and had an old-fashioned characteristic which gave a quite pronounced dip in the presence band around 7-9kHz, with a quite sharp recovery beyond. Such a departure from neutrality invites censure, but history suggests this balance is often well suited to the mid-priced system such cartridges partner. Channel balance was quite poor.

Sound Quality

Fair consistency between listeners placed the *E* at average and the *P* above average, the latter a pretty fair placement considering the price — and the rather 'laid back' balance didn't do the scoring any favours. The difference between good and poor tip was quite clearly audible in the smoothness (or not) of the top end. Listeners liked the 'scale', richness and good transparency, but focus and dynamics seemed 'softened'

somehow, and the sound seemed less 'bouncy' and lively than recollections of earlier '77s.

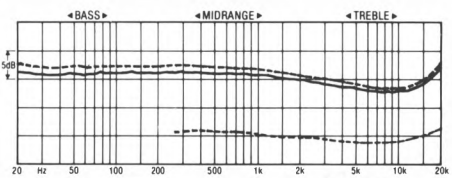
Conclusions

If the metal body has made an improvement, then the generator is showing its age, or the increase in compliance had some influence. Either way, the '77s did not seem as competitive as in earlier years, though the *P77* did enough to merit cautious recommendation.

Test Results

A&R P77 (E77 in brackets where different)

Type, mass	high o/p m-m, 7g
Stylus type	nude (diasa) detachable
Stylus tip geometry	line (pseudo-elliptical)
Stylus finish/alignment	v good/v good (poor/skew)
Output Level (1kHz, 5cm/s)	3.9mV
Relative output (0dB = 1mV/cm/s)	−2dB
Tracking ability (L,R)	>80, >80μm
Distortion 300Hz (lat+9dB, vert+6dB)	−48/−34 (−35)dB
Frequency response 100Hz-5kHz	+1, −2 (−2.2)dB
Frequency response limits 30Hz-20kHz	+3, −2.3 (+2, −2.6)dB
Stereo Separation 100Hz, 3kHz, 10kHz	32, 30, 29 (27, 30, 25)dB
Channel difference 1kHz, 10kHz	1, 0.6, (0.8)dB
Test tracking weight, loading	1.8g, 250-400pF
LF resonance frequency, 11g arm	7.3 (7)Hz
Estimated compliance	24 (26)cu
Recommended arm mass/damping	4-9g (3-8g)/none
LF resonance rise, 11g arm	15 (13)dB
Typical selling price	£57.50 (£47.50)

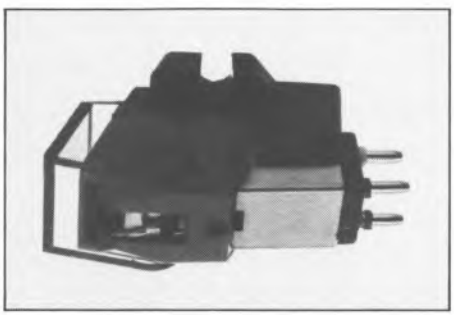


Frequency response (outside grooves). Left solid, right dash. Lower trace with 400pF.

BEST BUY

AUDIO-TECHNICA AT110E

TECHNICA HOUSE, LOCKWOOD CLOSE, LEEDS, LS11 5UU.
TEL: (0532) 771441



This conventional low cost (£17) magnetic cartridge shares bodywork and the LC-OFC (linear crystal) wiring with the *105* and *115E*. The rigid body, mildly compromised by half-circle mounting lugs, accepts a firmly located stylus assembly. It tracks securely enough at a sensible 1.5-2g, though the specified mild-profile elliptical stylus looked suspiciously spherical under the 'scope — a curious juxtaposition with the test *'105*..

Compliance is pretty sensible, suiting a wide range of arms, though better class turntables are to be preferred as there is little damping of the resonance. The highish mass of the cartridge suggests that the lowest mass arms are better avoided.

LAB REPORT

Output level is about average, and although low capacitance is specified, a high capacitance load did flatten the response and extend the bandwidth. Most pre-amps should provide suitable loading, though experimentation with a little extra might pay off in some systems.

Frequency response downtilted quite noticeably until some capacitance was added, when a good overall response to 14kHz was obtained. Channel balance error was a less than impressive 1.1dB, though the match between channels was quite close. Even at the fast writing speed the response traces were pretty smooth, with only a couple of minor 'glitches'.

Separation was very good considering the modest price of this model, only mildly asymmetrical and showing a 5dB improvement at high frequencies over the cheaper *'105*.

SOUND QUALITY

This extra treble was immediately apparent in the listening tests, providing a significantly 'livelier' sound than the *'105*. With high capacitance loading, the cartridge could sound rather brittle and aggressive, so the recommendation for low capacitance should be followed. The sound was quite 'fast', 'firm' and 'bouncy', with a good overall balance, but a mild 'steely' coloration was also described.

CONCLUSIONS

This exceedingly well balanced budget cartridge is a very capable performer, with few grounds for technical criticism, a sound quality that more than stands up to scrutiny, and performance more than able to do justice to better quality turntables. Whether the LC-OFC wire actually is a worthwhile 'magic ingredient' remains a moot point, but the *'110E* is clearly a very competitive package well deserving recommendation.

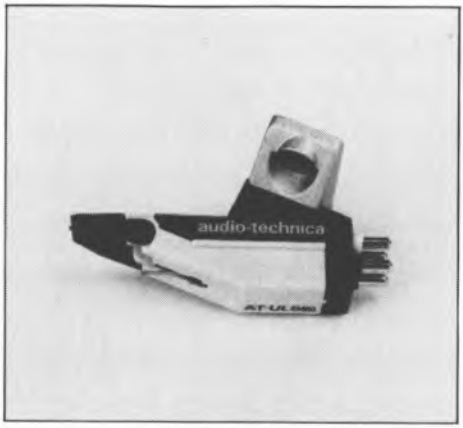
TEST RESULTS

Type, mass	moving mgnet 7.2g
Stylus type	elliptical
Stylus inspection result	spherical!
Output Level (1kHz, 5cm/s)	4.0mV
Relative output (0dB = 1mV/cm/s)	0dB
Channel balance	1.1dB
Channel separation (L,R)	30, 30dB
Tracking ability (L,R)	80, 78μm
Frequency response from graph 100Hz-5kHz	+1.5, −2dB
Frequency response from graph 30Hz-20kHz	+1.5, −7dB
Stereo Separation L on R 80Hz, 3kHz, 10kHz	33, 36, 32dB
Stereo Separation R on L 80Hz, 3kHz, 10kHz	36, 39, 33dB
Test tracking weight, loading	1.8g, 150pF
LF resonance frequency, 13.5g arm (vert, lat)	9, 9Hz
Estimated compliance (vert, lat)	15, 15cu
Recommended arm effective mass	5-16g
LF resonance rise, 13.5g arm (vert, lat)	14, 16dB
Typical selling price	£17

For graph reference see issue No 43

AUDIO TECHNICA AT-UL5

AUDIO TECHNICA (UK) LTD, TECHNICA HOUSE, LOCKWOOD CLOSE, LEEDS LS11 5UU.
·———TEL: (0532) 771441———·



One of a pair of new low output moving-coil models, the *'UL5* (and *'3*) have detachable stylus assemblies and represent a separate series from the similarly new *'FT3*; space has limited our coverage to the *'5*. The plastic moulding containing magnets and connection pins is fixed into a vestigial metal casting for rigid headshell mounting, albeit with a small contact area. The stylus assembly in another high quality moulding, which makes a good push fit onto the main body. The cantilever-mounted moving-coils are asymmetrically placed by design.

The compliance is a little higher than average, so low and medium mass arms are best suited. Electrical output is quite generous, but a moving-coil input is needed. The tip turned out to have a fairly ordinary diasa-shank with pseudo-elliptical grind, decently mounted, finished and aligned.

LAB REPORT

The high compliance confers good tracking abilities even at 1.5g downforce. Separation values were good at low and mid frequencies, but deteriorated quite considerably at high frequencies, while a fair amount of ultrasonic spuriae were also generated. The response showed good channel balance and the normal (1.5dB) presence droop with well controlled recovery following. The main HF resonance was quite high.

SOUND QUALITY

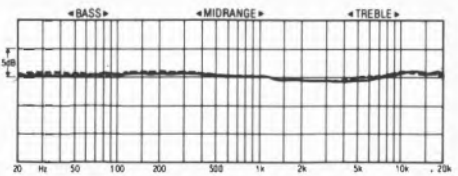
Rating a decent enough 'above average', the sound was still disappointing compared to the similarly priced non-detachable *FT3*. Open, clear and quite lively with some depth and space, bass was a little 'plump', treble a bit coarse and obvious, and dynamics rather bland, with some midrange masking and colour.

CONCLUSIONS

This is by no means a bad performer, but it is comfortably outclassed by its *FT3* stablemate amongst others, and nothing distinguishes it from the crowd.

TEST RESULTS

Type, mass	low o/p m-c, 4.2g
Stylus type	diasa shank, detachable
Stylus tip geometry	good pseudo-elliptical (0.4×0.7)
Stylus finish/alignment	good/f good
Output Level (1kHz, 5cm/s)	0.48mV
Relative output (0dB = 1mV/cm/s)	−20dB
Tracking ability (L,R)	>80, >80μm
Distortion 300Hz (lat + 9dB, vert + 6dB)	−48dB/−37dB
Frequency response 100Hz-5kHz	+1, −1dB
Frequency response limits 30Hz-20kHz	+1, −1dB
Stereo Separation 100Hz, 3kHz, 10kHz	27, 35, 19dB
Channel difference 1kHz, 10kHz	0, 0.1dB
Test tracking weight, loading	1.5g, n/a
LF resonance frequency, 11g arm	7.4Hz
Estimated compliance	28cu
Recommended arm mass/damping	4-10g, none
LF resonance rise, 11g arm	14dB
Typical selling price	£65

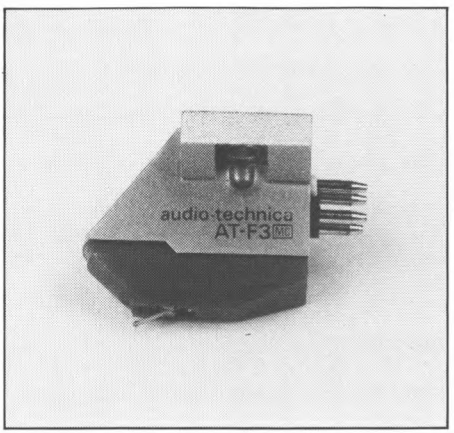


Frequency response (outside grooves). Left solid, right dash.

BEST BUY

AUDIO TECHNICA ATF3

AUDIO TECHNICA (UK) LTD, TECHNICA HOUSE, LOCKWOOD CLOSE, LEEDS LS11 5UU.
TEL: (0532) 771441



This brand new low output moving-coil model (£70) from Audio Technica has no resemblance to earlier models they have marketed. The stylus assembly is fixed in the generator system, which is glued together from high quality, tough plastic mouldings. This is then fixed in a small cast-metal mounting bracket with full circular lugs to enable tight headshell mounting.

Output is on the low side, even by moving-coil standards, so it is prudent to check for pre-amp compatibility before purchasing: high gain and low noise are both required. Compliance is quite moderate, though a little on the high side for some of the heavier arms around. A beautiful tiny naked diamond tip was properly finished and fitted, its true elliptical form accurately aligned.

LAB REPORT

Tracking abilities were fine with scope for additional improvement if need be. Distortion measured very well, but channel separation was average, if reasonably consistent. Substantial ultrasonic spuriae were generated. The response trace showed a channel discrepancy of 0.5-1dB over much, but not all of the band. The presence droop was held to just 1dB while the recovery peaks a little early at 10kHz, which will be inclined to add a little treble 'sting'.

SOUND QUALITY

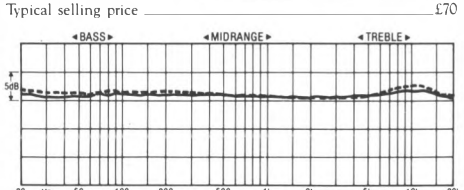
Despite one dissenter, the *ATF3* attained a 'good' rating, which indicates a very fine performance for the price. The anticipated high frequency 'untidiness' received comment, as did a certain lack of bass authority. But the overall sound was big and generous, with a lively pace, good frontal focus and width, and quite good depth and transparency. Appealingly informative, it could also sound a little 'coarse'.

CONCLUSIONS

Combining fine subjective performance with good build and tip quality, one can overlook the slight technical weaknesses and firmly recommend this model, as offering a near ideal balance for the price. Some care should be taken to ensure tonearm and pre-amp compatibility.

TEST RESULTS

Type, mass	low o/p m-c, 5g
Stylus type	nude low mass, fixed
Stylus tip geometry	true elliptical (0.2×0.7)
Stylus finish/alignment	v good/excellent
Output Level (1kHz, 5cm/s)	0.25mV
Relative output (0dB = 1mV/cm/s)	−26dB
Tracking ability (L,R)	>80, >80μm
Distortion 300Hz (lat+9dB, vert+6dB)	−50dB/−36dB
Frequency response 100Hz-5kHz	+0.5, −0.2dB
Frequency response 30Hz-20kHz	+1, −0.3dB
Stereo Separation 100Hz, 3kHz, 10kHz	21, 25, 21dB
Channel difference 1kHz, 10kHz	0.2, 0.8dB
Test tracking weight, loading	1.5g, n/a
LF resonance frequency, 11g arm	8Hz
Estimated compliance	22cu
Recommended arm mass/damping	4-12g, none
LF resonance rise, 11g arm	14dB
Typical selling price	£70

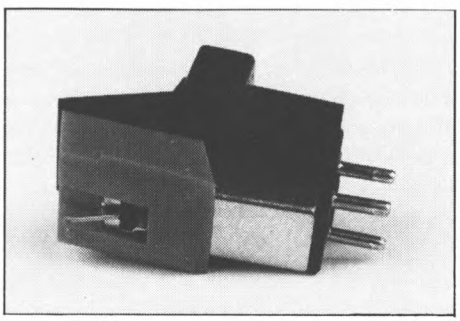


Frequency response (outside grooves). Left solid, right dash.

BEST BUY

AUDIO TECHNICA AT95E

AUDIO TECHNICA (UK) LTD, TECHNICA HOUSE, LOCKWOOD CLOSE, LEEDS, LS11 5UU.
TEL: (0532) 771441



This cartridge is awkwardly not a catgalogue item — it's only sold in bulk — and appears on dealers' shelves at various prices. Sitting just above the £18 Linn *Basik (AT93)* on the *AT* ladder, the *95E* costs £20, or £15, or whatever. Paradoxically, the margin on a £20 '95 is similar to most £40 cartridges, so the dealer doesn't mind which he sells, and the customer is happy to take the half price option.

Cheaply made by robots to fine tolerances, this high output magnetic cartridge has a simple body of reasonable integrity with good stylus assembly fit. The generator is properly located and has just the right compliance to match most popular arms. The cheap shank-mount elliptical stylus is decently finished and well aligned.

LAB REPORT

Tracking abilities were reasonable, and separation quite good. The response is a sort of triple-humped rollercoaster of a ride, from +3dB at 20Hz to −2dB at 15kHz — not exactly neutral or extended, but controlled for all that. High capacitance loading will 'brighten' the treble a little.

SOUND QUALITY

Without direct comparison with *Basik, AT105s* etc, the *95E* sounded pretty good: lively and dynamic, a bit rich and 'heavy', but also quite clear and open. Treble lacked refinement and extension, but the overall balance still deserved an average rating, which is fine for the price.

CONCLUSIONS

Ramming home the message that it may be better to spend a little more on turntable and tonearm and a little less on the cartridge, the *95E* is an ideal 'starter model' that responds well to good players. After all, a cartridge with a rather limited and coarse top end isn't going to stand out until the coarseness is out of the record player top end —and that don't come cheap. A clear Best Buy, with the invitation to haggle on price.

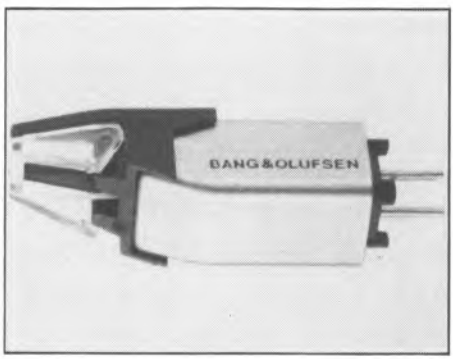
TEST RESULTS

Type, mass	high o/p m-m, 7.2g
Stylus type	shank mount, detachable
Stylus tip geometry	medium res elliptical
Stylus finish/alignment	good−/good+
Output Level (1kHz, 5cm/s)	4.7mV
Relative output (0dB = 1mV/cm/s)	0dB
Tracking ability (L,R)	80, 75μm
Distortion 300Hz (lat+9dB, vert+6dB)	−45dB/−36dB
Frequency response 100Hz-5kHz	+1.5, −1.6dB
Frequency response 30Hz-20kHz	+1.5, −6dB (see text)
Stereo Separation 100Hz, 3kHz, 10kHz	30, 32, 26dB
Channel difference 1kHz, 10kHz	0.2, 0.4dB
Test tracking weight, loading	1.8g, 250pF
LF resonance frequency, 11g arm	8.8Hz
Estimated compliance (vert, lat)	18cu
Recommended arm mass/damping	8-14g, none
LF resonance rise, 11g arm	14dB
Typical selling price	see preamble

Frequency response (outside grooves). Left solid, right dash.

BANG & OLUFSEN MMC1

BANG & OLUFSEN (UK) LTD, EASTBROOK ROAD, GLOUCESTER GL4 7DE.
TEL: (0452) 21591



With the top of the range MMC1, B&O throw all their advanced technology into a miniature cartridge with jewelled cantilever and a tiny diamond tip with exquisite line-contact profile (but a sensible shank long enough to avoid too much dust collection). Regrettably again we have the plug-in adaptor, though the overall mass is still low, and downforce a superlight 1g.

Compliance is pretty sensible, considering it has to accommodate B&O's own ultra-low-mass arms.

LAB REPORT

Output is a little on the low side, but should be sufficient for the great majority of amplifier moving-magnet inputs.

Response and channel balance were exemplary, save a single 900Hz 'glitch' we attribute to the mounting adaptor. That apart the trace was pretty smooth, gently falling 4-5dB across the band with exemplary high frequency control.

Stereo separation was likewise reference-standard stuff, with outstanding figures throughout the band, and no compromise at high frequencies. Groove stability was decent and tracking ability fine, despite the low downforce, though the cartridge as a whole was rather microphonic.

SOUND QUALITY

The extraordinary clarity and detail at high frequencies are sufficient to rate this model in a high grouping, and will be sufficient and convincing reason for many purchasers. But one does notice the treble, inasmuch as it somehow draws attention to itself, while the bass plods along a bit, almost as an afterthought. Focus, midrange dynamics, and stereo imaging were to a good standard.

CONCLUSIONS

Well worth considering for its strengths, the MMC1 also deserves a better adaptor, since the one supplied lacks rigidity. Even as it stands it is a satisfying cartridge, possibly with greater appeal to the classical than rock listener.

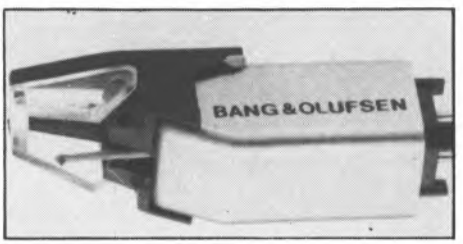
TEST RESULTS

Type, mass	moving magnet, 3.3g
Stylus type	small nude 'line'
Stylus inspection result	fine, tiny, long 'pegged' line contact
Output Level (1kHz, 5cm/s)	.75mV
Relative output (0dB=1mV/cm/s)	−2dB
Channel balance	0.4dB
Channel separation (L,R)	30, 30dB
Tracking ability (L,R)	>80, >80µm
Frequency response limits 100Hz-5kHz	+1, −1.5dB
Frequency response limits 30Hz-20kHz	+1, −4dB
Separation L on R 100Hz, 3kHz, 10kHz	29, 38, 32dB
Separation R on L 100Hz, 3kHz, 10kHz	33, 48, 34dB
Channel diff. 100Hz, 1kHz, 10kHz	0.5, 0.5, 0dB
Test tracking weight, loading	1g, 200pF
LF resonance frequency, 12.5g arm (vert, lat)	9, 8Hz
Estimated compliance (vert, lat)	24, 21cu
Recommended arm effective mass	5-13g
LF resonance rise, 12.5g arm (vert, lat)	13, 12dB
Typical selling price	£93

For graph references see issue No. 43

BANG & OLUFSEN MMC4

BANG & OLUFSEN (UK) LTD, EASTBROOK ROAD, GLOUCESTER GL4 7DE.
TEL: (0452) 21591



Selected to represent the lower end of the B&O range, this cartridge slots neatly into the hierarchy of five models, which share a common adaptor to provide compatibility with B&O's turntables and their super-light arms.

The cartridge itself is a little miracle of engineering miniaturisation, though the adaptor is slightly flexible and the connection only push-fit. The whole weighs a mere 3.3g, and tracks at a low 1.2g, using a tapered aluminium cantilever fitted with a titanium-bonded elliptical tip.

Compliance is to be high enough to match B&O's own arms, yet still low enough to allow a reasonable range of low and medium mass arms to be used.

Lab Report

Output level is rather below average, but this almost certainly only means that users will have the luxury of a wide volume control range! The change in measured response with increased capacitance was very marginal, but the sound was slightly preferred.

Response is most impressive, showing the usual gently falling trace, with a mild recovery to a well-damped resonance at around 10kHz. Channel balance was fine. Much of the class of this cartridge can be gleaned from the remarkably smooth trace even at high writing speed, but the Achilles heel of the adaptor resonance is shown clearly at 900Hz, similar to though less severe (and at a higher frequency) than those encountered with P-mount cartridges, but subjectively significant nonetheless.

Despite the low cost of this model, fine results were obtained for separation, particularly in the midband, bettering 30dB over most of the range. Tracking was impressively secure throughout.

Sound Quality

There is a close family resemblance throughout the B&O's range. All are handicapped by slight softening and blurring at low frequencies, which gives a relaxed rather than 'punchy' presentation, with fine control.

The '4 was picked out for its particular solidity and overall balance, which seemed remarkably 'seamless' for the price. Midrange clarity, dynamics and focus are good, giving fine stereo imaging. The treble is well balanced and controlled, though a touch unrefined. Stability was impressive and surface noise under control.

Conclusions

The general standard attained by the B&Os do much to reinforce their claim that moving magnets can sound as good as moving coils. The mounting bracket problem keeps them from the top class, but its sonic significance will depend on the relative importance the listener attaches to powerful integrated bass.

Test Results

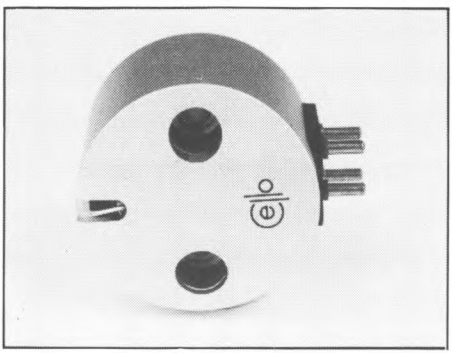
Type, mass	moving magnet 3.3g
Stylus type	elliptical
Stylus inspection result	short squat brazed elliptical, little polish
Output Level (1kHz, 5cm/s)	2.55mV
Relative output (0dB = 1mV/cm/s)	−4dB
Channel balance	0.05dB
Channel separation (L,R)	30, 30dB
Tracking ability (L,R)	80, 80µm
Frequency response limits 100Hz-5Hz	+1, −1.5dB
Frequency response limits 30Hz-20kHz	+1, −3dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	30, 38, 27dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	26, 39, 26dB
Channel diff. from graph, 100Hz, 1kHz, 10kHz	0.5, 1, 0.5dB
Test tracking weight, loading	1.2g, 200pF
LF resonance frequency, 12.5g arm (vert, lat)	9, 9Hz
Estimated compliance (vert, lat)	24, 24cu
Recommended arm effective mass	5-15g
LF resonance rise, 12.5g arm (vert, lat)	15, 12dB
Typical selling price	£23, calibrated £34

For graph references see issue No 43

RECOMMENDED

CELLO CHORALE

AUTOMATION SCIENCES CO, 20 LITTLE GADDESDEN, BERKHAMSTED, HERTS HP4 1PA.
TEL: (044 284) 2786



Cello is a newish company headed up by Mark Levinson, whose products have always been known as extravagancies with a lot of class. Hewn, as it were from a solid aluminium rod, the *Chorale* has maximum instant oooh! and aaah! appeal. It may be a total nightmare to align lateral headshell angle, but who cares? You're not going to take it in and out every week — it's the reviewer who gets the short straw. It's a classic heavyweight, low output moving-coil with immense structural integrity, capable of really rigid headshell mounting. But it also has too much mass for its compliance (or *vice versa*), limiting sensible application to low and medium mass arms. Poking from the underside is a tiny cantilever, cleanly tipped with fine small-splint swept elliptical diamond, slightly misaligned. Output is a few dB below the moving-coil average, so partnering pre-amps need enough gain and sufficiently low noise.

LAB REPORT

The highish compliance confers secure tracking, but may help explain the rather indifferent separation results. The frequency response looks nice and smooth and is very nearly flat as well, the presence depression being a mere 1dB. The channels are closely matched with good control and a slight rise at very high frequencies.

SOUND QUALITY

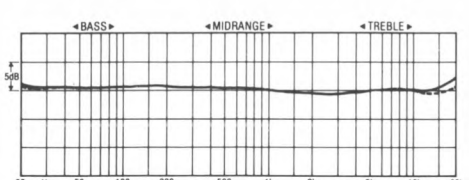
The sound did at least make a serious effort to justify the very high price. Appealing more to some than others, the transparent delicacy of the treble region — string instruments most particularly — were without equal. Detail was of the highest order, though the balance was a touch light and bright. Low frequencies seemed a trifle rich slow and lazy, but with good extension and little coloration.

CONCLUSIONS

The Cello's handicap is its unsuitability to more massive arms, and it is not the ideal all-rounder. But in the right system it is capable of re-defining treble resolution, and deserves the serious consideration of the serious audiophile.

TEST RESULTS

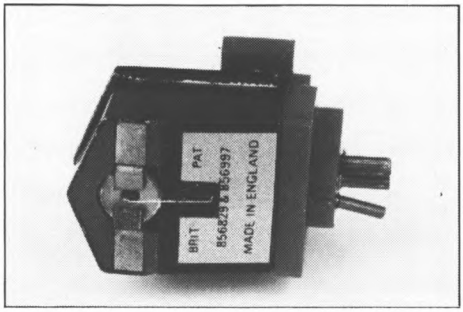
Type, mass	low o/p m-c, 13g
Stylus type	naked, small splint, fixed
Stylus tip geometry finish/alignment	true swept elliptical
Stylus inspection result	clean excellent/slight skew
Output Level (1kHz, 5cm/s)	0.25mV
Relative output (0dB = 1mV/cm/s)	−26dB
Tracking ability (L,R)	>80, >80um
Distortion 300Hz (lat +9dB, vert +6dB	−47dB, −33dB
Frequency response 100Hz-5kHz	+0.6, −0.5dB
Frequency response 30Hz-20kHz	+0.7; −.5dB
Stereo Separation 100kHz, 3kHz, 10kHz	22, 26, 21dB
Channel difference 1kHz, 10kHz	0.2, 0dB
Test tracking weight, loading	1.5g, n/a
LF resonance frequency, (11g arm)	6.5Hz
Estimated compliance (vert, lat)	23cu
Recommended arm mass/damping	4-10g, helpful
LF resonance rise, (11g arm)	14dB
Typical selling price	£690



Frequency response (outside grooves). Left solid, right dash.

DECCA MAROON

PRESENCE AUDIO, EASTLAND HOUSE, PLUMMERS PLAIN, HORSHAM, WEST SUSSEX RH13 6NY.
TEL: (044485) 333



Decca's basic cartridge has changed colour this year, from blue to maroon. It hasn't changed much, and is still utterly different from every other cartridge. The 'cantilever' is nearly vertical, disappearing up inside the body through sensing coils that directly scan cantilever motion at the tip. A tieback filament holds the moving iron generator in place, but the arrangement has a very stiff vertical compliance and virtually no damping.

Arm matching is problematic, to say the least — damped and medium/high mass arms are probably the best compromise. The soft plastic push-in mount looks terrible, but it probably helps soak up the excessive mechanical energy. Electrical output is healthy enough for normal disc inputs. The spherical tip used an indifferent diasa-shank stone of poor polish.

LAB REPORT

Last year's *Blue* had decent treble control, but the *Maroon* went bananas above a 9kHz resonance, with some irregularity elsewhere. Midrange tracking ability was quite good, but subjectively the high frequencies gave some problems. The separation was good at low and mid frequencies, but then decayed gradually towards the HF resonance, which was strong enough to generate substantial ultrasonic harmonics.

SOUND QUALITY

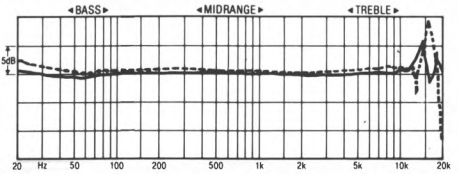
Rated well above average, on a good player the Decca has always shown its unique strengths, against which must be set obvious high frequency weaknesses. The bass lacks a little power and weight, the midband a little depth, but the integration and 'speed' through these regions is superb, solo vocal and acoustic guitar sound remarkably 'tactile'. But when the going gets tough, particularly with massed strings, the *Maroon* impolitely takes a raincheck.

CONCLUSIONS

The familiar combination of Heaven and Hell, handicapped by an indifferent tip, poor top end control, as well as a price increase leaves this year's Decca in the 'worth considering' group. Some won't be able to live without it, others will worry for the HF modulations on their discs.

TEST RESULTS

Type, mass	high o/p moving iron 6.7g
Stylus type	diasa shank, fixed
Stylus tip geometry	spherical 0.6
Stylus finish/alignment	poor polish/good
Output Level (1kHz, 5cm/s)	3.2mV
Relative output (0dB = 1mV/cm/s)	−3dB
Tracking ability (L,R)	>80, >80μm
Distortion 300Hz (lat+9dB, vert+6dB)	−35dB*/−34dB
Frequency response 100Hz-5kHz	+0.5, −0.5dB
Frequency response 30Hz-20kHz	+5, −0.5dB (see graph)
Stereo Separation 100Hz, 3kHz, 10kHz	31, 34, 20dB
Channel difference 1kHz, 10kHz	0.2, 1.5dB
Test tracking weight, loading	2g, n/a
LF resonance frequency, 11g arm	17/7Hz
Estimated compliance	complex 4/27cu
Recommended arm mass/damping	8-16g, worthwhile
LF resonance rise, 11g arm	20-30dB
Typical selling price	£109

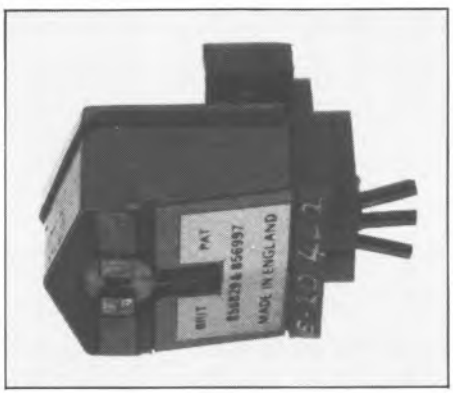


Frequency response (outside grooves). Left solid, right dash.

RECOMMENDED

DECCA SUPER GOLD

PRESENCE AUDIO, EASTLAND HOUSE, PLUMMERS PLAIN, HORSHAM, WEST SUSSEX RRH13 6NY.
TEL: (044 485) 333



Defying comparison with other cartridges, the Decca is a throwback to the days when record companies carried out much of the technical development. Some regard it merely as a curious British anachronism that can't possibly work. But Decca enthusiasts will contend that it can spit contemptuously on any rivals.

The 'moving-iron' generator with no conventional cantilever, is completely undamped and has wildly differing vertical and horizontal compliances which would suggest there isn't an arm on the market which is really suitable; in practice the more substantial tonearms seem to work best, and some form of damping can be a boon. At £248, the *Super Gold* has a high-quality van den Hul stylus.

LAB REPORT

All Deccas possess steep low frequency rise due to the high-Q vertical resonance at around 20Hz; this can add some excess 'weight'. Response from the mid bass up to the lower treble (5kHz) is then remarkably flat, if marred by the mounting bracket decoupling effect at around 350Hz. The main treble resonance around 8kHz is surely the most dominant subjective factor. There was some tracking uncertainty, particularly on heavy bass transients and sometimes at high frequencies.

SOUND QUALITY

Sounding decidedly 'bright' in balance, more perhaps than might be suspected from the measurements, the *Super Gold* could sound a little 'fierce' and tended to emphasise record surface faults and tape hiss. However, treble detail was exceptionally fine where the cheaper models could sound a little coarse.

Traditional virtues of dramatic 'speed' and lack of 'overhang' were fully — even exaggeratedly — on display, while some coloration was evident and stereo imaging seemed precise but somewhat 'up-front', with reduced depth.

CONCLUSIONS

There is probably no cartridge more capable of revealing the excitement and tension of musical performance than the *Super Gold*, though it is kind neither to recording defects nor to record surfaces. Capable of inducing the fiercest and most loyal love/hate relationships in audio, the top Decca is not for the fainthearted. For those who take the trouble to persevere in optimising a system, possibly involving some modification of mounting and body damping, the rewards can be considerable.

TEST RESULTS

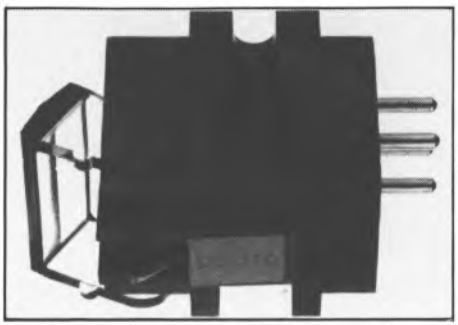
Type, mass	moving iron (eff. magnet) 6.7g
Stylus type	van den Hul
Output Level (1kHz, 5cm/s)	3.6mV
Relative output (0dB = 1mV/cm/s)	−1dB
Channel balance	0.3dB
Channel separation (L,R)	20, 25dB
Tracking ability (L,R)	80, 80µm
Frequency response limits 100Hz-5Hz	+0.5, −0dB
Frequency response limits 30Hz-20kHz	+2.5, −1dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	??dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	27, 25, 21dB
Test tracking weight, loading	1.6g, n.a.pF
LF resonance frequency, 12.5g arm (vert, lat)	17, 6Hz
Estimated compliance (vert, lat)	complex: 4, 30cu
Recommended arm effective mass	complex: 8-20g
LF resonance rise, 12.5g arm (vert, lat)	14, 19dB
Typical selling price	£248

First reviewed: 1983. Rating: Recommended.

BEST BUY

DENON DL110

HAYDEN LABORATORIES LTD, HAYDEN HOUSE, CHILTERN HILL, CHALFONT ST PETER, BUCKS.
TEL: (0753) 888447



Denon were busying away making *'103* moving coil cartridges for Japanese domestic and broadcast customers while throughout the rest of the world only Ortofon stuck doggedly to the m-c principle.

Now we have two very competitively priced high(ish) output models. The £60 *DL110*, finished in an attractive maroon tortoiseshell effect, has a neat rigid four-square body with substantial though only semicircular mounting lugs and a reasonable area of headshell contact. A high quality advanced elliptical tip stylus of low mass was fitted.

Cartridge mass is quite low, so a medium compliance at a sensible 1.8g downforce provides good tracking capabilities in a package which is usefully compatible with a wide range of arms. The quite heavy internal generator damping should help it perform in inadequate turntable systems. Output level is significantly below normal, but most amplifiers will have sufficient reserve gain.

LAB REPORT

The frequency response trace is pretty remarkable by any standards, let alone those of £60 cartridges. Occasional minor uneveness can be detected in the 1-2kHz region, but there is no other ground for criticism apart from noting the normal overall downtilt, held to a respectable 3dB.

Separation results were good too, mildly asymmetric but better than 30dB even at high frequencies, and with reasonable control of ultrasonic spuriae besides.

SOUND QUALITY

The listening panel seemed to be passing through a positive phase when the *'110* was presented and were generally enthusiastic, praising the clarity and dynamics, a generally neutral balance, and fine midrange projection. Minor concern was raised at the quality of the bass, which some felt sounded mildly disassociated and detatched.

The overall reaction seemed to be that this model offers a fine balance of strengths, while noting that it still falls short of the very highest standards.

CONCLUSIONS

To describe a cartridge as lacking character should be praise of a high order. The Denon *110* sailed through our subjective and objective test programme with consummate ease. It deserves firm recommendation as a fine all-rounder which is very likely to perform to a consistently high standard under nearly all circumstances. Provided the lowish output is no problem, our only minor reservation is that other less heavily damped models can sound rather more lively.

TEST RESULTS

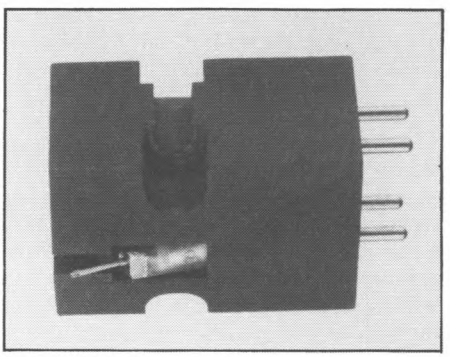
Type, mass	high output moving coil 4.8g
Stylus type	advanced elliptical
Stylus inspection result	small nude stone, well aligned
Output Level (1kHz, 5cm/s)	1.5mV
Relative output (0dB = 1mV/cm/s)	-8dB
Channel balance	0.4dB
Channel separation (L,R)	30, 30dB
Tracking ability (L,R)	80, 78µm
Frequency response limits 100Hz-5Hz	+1.5, -0.5dB
Frequency response limits 30Hz-20kHz	+1.5, -1.5dB
Stereo Separation L on R 80Hz, 3kHz, 10kHz	29, 38, 30dB
Stereo Separation R on L 80Hz, 3kHz, 10kHz	36, 47, 31dB
Test tracking weight, loading	1.8g, n/apF
LF resonance frequency, 12.5g arm (vert, lat)	10, 9Hz
Estimated compliance (vert, lat)	15, 19cu
Recommended arm effective mass	6-16g
LF resonance rise, 13.5g arm (vert, lat)	11, 12dB
Typical selling price	£60

For graph references see issue No 43

RECOMMENDED

DENON DL103

HAYDEN LABORATORIES, HAYDEN HOUSE, CHILTERN HILL, CHALFONT ST PETER, BUCKS.
TEL: (0753) 888447



One of the oldest models still in current production, the *103* is the low output moving-coil model which Denon made originally for NHK, the Japanese equivalent of the BBC, and which definitely made a major contribution towards the revival of the genre.

It is a large but quite solid and heavy cartridge, with large headshell contact area but half-circle retaining lugs. Spherical styli may lack status, but that fitted here was very neat. Compliance is quite low, allowing matching with a usefully comprehensive range of arms.

LAB REPORT

Some high-gain pre-amps (notably certain valve models) should be able to take the *103* directly into moving-magnet inputs, but most users will find it provides plenty of urge for m-c inputs.

Frequency response showed a fairly modest 2dB downtilt through the midrange, and a slight flattening out at 7-8kHz. In fact a straight line could be drawn through the response trace from 20-20kHz with deviations of less than 0.5dB, which is very impressive at this (or any) price level. However, the response was 2dB 'brighter' if taken at the outer grooves, a function of the limited scanning radius of the spherical tip. Channel balance was pretty good, and the response was smooth, with just a tiny 900Hz 'glitch' and some bass unevenness.

Separation generally exceeded 30dB across the bulk of the band, reducing somewhat at the extremes, and 2.5g tracking weight (no problem with the large footprint area of a spherical tip) provides adequate tracking abilities and extraordinary groove stability — it is easy to understand its popularity in broadcast studios.

SOUND QUALITY

Very well received, the strength of the sound is its fine integration and great liveliness, coupled with a firm and powerful bass. Treble can be inconsistent, and generally sounded a little rolled off, while the midrange extended the good clarity established through the bass.

CONCLUSIONS

Spherical styli may be unfashionable, but they have always worked exceedingly well in the *103*. Once again this stalwart shines out from the pack, and furthermore offers fine value for money and general (moving-coil) compatibility.

TEST RESULTS

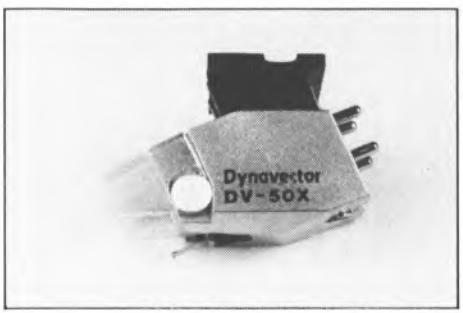
DENON DL103

Type, mass	low output moving coil, 8.5g
Stylus type	spherical
Stylus inspection result	small v. short shank, diagonal set
Output Level (1kHz, 5cm/s)	0.44mV
Relative output (0dB=1mV/cm/s)	−19dB
Channel balance	1.0dB
Channel separation (L,R)	29.7, 28, 24dB
Tracking ability (L,R)	75, 80μm
Frequency response limits 100Hz-5kHz	+1, −1dB
Frequency response limits 30Hz-20kHz	+1.5, −3dB
Separation L on R 100Hz, 3kHz, 10kHz	32, 31, 26dB
Separation R on L 100Hz, 3kHz, 10kHz	25, 32, 26dB
Channel diff. 100Hz, 1kHz, 10kHz	0, 0, 0.5dB
Test tracking weight, loading	2.5g, n.a.
LF resonance frequency, 12.5g arm (vert, lat)	10, 10Hz
Estimated compliance (vert, lat)	13, 13cu
Recommended arm effective mass	6-16g
LF resonance rise, 12.5g arm (vert, lat)	15, 13dB
Typical selling price	£90

For graph references see issue No 43

DYNAVECTOR DV-50X

DYNAVECTOR UK, 117 KINGS ROAD, LONG DITTON, SURBITON KT6 5JE.
TEL: 01-398 8710



Dynavector are longstanding moving-coil specialists, and have a tradition of producing fine high-output, mid-price models like the *'10XIV*, recommended elsewhere, and the plastic-bodied *'50X* fills the same price slot with an only slightly different recipe. Though lightweight, the plastic is a good hard grade, but limited contact area and semicircular fixing lugs suggest that arm/cartridge mechanical coupling was not a major design priority. A probably resonant hinged plastic stylus guard is fitted, and could be removed, but beware the vulnerability of a cantilever that extends a couple of millimeters beyond the front of the main body.

The high output is still 6dB below 'target', so those undertaking shop comparison should be prepared to adjust the volume control, though there is still plenty of signal for conventional moving magnet inputs. Compliance is a little on the high side, so despite the low cartridge mass, low and medium mass arms will work best; internal damping allows one to bend the rules a little here. The stylus was an unimpressively cheap pseudo-elliptical affair, but it was properly mounted and aligned.

LAB REPORT

The measurements look most competent, with adequate tracking margins at a lowish downforce, and exceptional values for separation, albeit with mild asymmetry. The frequency response is smooth and reasonably flat, dropping some 2dB up to the presence region and then starting to lose slight control from around 8kHz, though the treble uneveness remains under pretty close control.

SOUND QUALITY

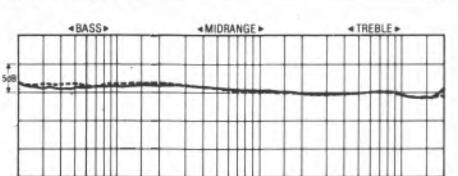
The *'50X* only scored an average rating in the listening tests, which is rather disappointing at its above average price. The sound was considered inoffensive enough, but lacking in dynamics and 'life'. Upfront, detail was good, but the bass was rather 'fat' and 'slow', and the upper bass 'thickened', constraining depth and focus, while the treble lacked 'sparkle'.

CONCLUSIONS

Though promising enough on lab performance, the sound was insufficiently involving to satisfy listeners, and the tip quality was disappointing too. Though competent enough, a recommendation is not appropriate.

TEST RESULTS

Type, mass	high o/p m-c, 4.5g
Stylus type	low cost shank mount, fixed
Stylus tip geometry	pseudo-elliptical
Stylus finish/alignment	good/v good
Output Level (1kHz, 5cm/s)	2.3mV
Relative output (0dB = 1mV/cm/s)	−6dB
Tracking ability (L,R)	79, >80μm
Distortion 300Hz (lat+9dB, vert+6dB)	−44dB/−34dB
Frequency response 100Hz-5kHz	+1, −0.2dB
Frequency response limits 30Hz-20kHz	+1, −1dB
Stereo Separation 100Hz, 3kHz, 10kHz	33, 39, 38dB
Channel difference 1kHz, 10kHz	0, 0dB
Test tracking weight, loading	1.2g, n/a
LF resonance frequency, 11g arm	8.4Hz
Estimated compliance	25cu
Recommended arm mass/damping	6-14g, none
LF resonance rise, 11g arm	13dB
Typical selling price	£60



Frequency response (outside grooves). Left solid, right dash.

RECOMMENDED

DYNAVECTOR DV10X IV

DYNAVECTOR UK, 117 KINGS ROAD, LONG DITTON, SURBITON KT6 5JE.
TEL: 01-398 8710

This lightweight high output moving coil from Japanese specialist Dynavector is the latest in a long series of *10X* models, which are accustomed to high ratings in *Choice*. Though the transparent bodywork is cantilevered from a plastic mounting plate, rigidity is reasonable. The longish cantilever looks a little vulnerable to accidental damage, and the stylus is a fine quality nude elliptical on a rectangular shank.

Compliance is fairly low and pretty well damped, so medium-to-high mass arms are to be preferred. Tracking abilities fell slightly short of the target despite the reasonable 1.7g downforce.

LAB REPORT

Output level is lower than most models intended for moving magnet inputs, but was still high enough to be most unlikely to cause any difficulties.

Frequency response followed the familiar downtilted pattern but only dropped some 3dB across the whole band. The high frequency resonance is quite well controlled, but at a lowish 7-8kHz, while there were also a couple of midrange 'glitches' to cope with at 600 and 800Hz. Channel balance showed some 0.5dB variation at different parts of the main frequency spectrum, but was held quite closely at high frequencies.

Separation figures were good for a cartridge at this price level (or any price level, for that matter), albeit with mild channel asymmetry.

SOUND QUALITY

Bass was felt to be slightly overdamped, with mild upper bass richness combining to give an impression of slightly limited extension. The mild treble peak was audible as a slight 'brightness', and emphasised by 'smearing'. Midrange focusing was very good, and this tended to draw attention away from the limitations at the extremes. Stereo seemed a trifle lacking in depth, but was impressively solid and stable, as was the general behaviour of the cartridge in the groove.

CONCLUSIONS

This is a fine sounding cartridge at a realistic price, with the added convenience of driving moving magnet amplifier inputs directly. Tracking ability is less its *forte* than groove stability, yet damping should be sufficient to ensure successful widespread compatibility, so firm recommendation is clearly indicated.

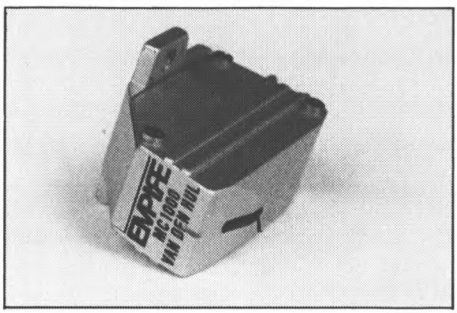
TEST RESULTS

Type, mass	high output moving-coil 4.5g
Stylus type	nude elliptical
Stylus inspection result	good small rectangular section
Output Level (1kHz, 5cm/s)	2.35mV
Relative output (0dB = 1mV/cm/s)	−4dB
Channel balance	0.4dB
Channel separation (L,R)	26.1, 30dB
Tracking ability (L,R)	80, 77μm
Frequency response limits 100Hz-5Hz	+1.5, −1dB
Frequency response limits 30Hz-20kHz	+2, −2dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	23, 32, 23dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	35, 35, 30dB
Channel diff. from graph, 100Hz, 1kHz, 10kHz	0.5, 0.5, 0.5dB
Test tracking weight, loading	1.7g, n.a.
LF resonance frequency, 12.5g arm (vert, lat)	11, 12Hz
Estimated compliance (vert, lat)	12, 10cu
Recommended arm effective mass	8-18g
LF resonance rise, 12.5g arm (vert, lat)	well damped
Typical selling price	£60

For graph references see issue No 43

EMPIRE MC1000

AUTOMATION SCIENCES CO, 20 LITTLE GADDESDEN, BERKHAMSTED, HERTS HF4 1PA.
·———TEL: (044 284) 2786———·



This is the cartridge van den Hul designed for Empire to manufacture in Switzerland and market under its banner. We tried to cover it a couple of years ago, but an early sample didn't survive the post, while last year there was some concern over sample consistency. The '*1000* has a screwed metal case, with full circular threaded mounting 'ears' — strip the thread, and you can use a conventional nut and bolt — plus a reasonable headshell mounting area.

The mechanical parameters are suited to low and medium mass arms, internal damping helping widen compatibility. The stylus was found to be a vdH line contact nude stone, but of average quality and with an excess of adhesive. Finish and alignment were reasonably good, but could have been improved.

LAB REPORT

Despite above average compliance, the tracking margins were not generous. Separation was very good, though the supplementary spectrogram (not published) indicated the treble resonance at a quite low frequency, though under quite good control, and a fair amount of ultrasonic output was also recorded. The response trace has a 2dB presence droop and close output control thereafter, but high frequency control doesn't match the vdH models. Channel balance remained close throughout.

SOUND QUALITY

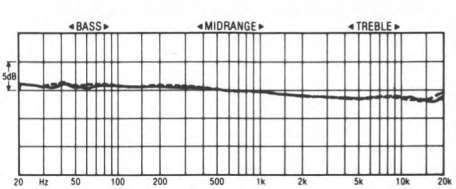
The Empire scored a good overall rating, albeit with some dissent amongst the listeners. Its potentialities were recognised, along with an attractively 'bouncy' liveliness. The midrange was neutral with quite good focus, but the inherent transparency revealed a degree of 'grain' and coarseness in the presence and treble. A powerful, tuneful bass gives good atmosphere and communication.

CONCLUSIONS

The MC1000 does succeed in providing van den Hul sound on the cheap, but the price isn't that cheap and the sound doesn't have the class of its cousins. It is a rational choice which is well worth considering, but enthusiasm not logic sells high end cartridges, and somehow the Empire has a little trouble generating it.

TEST RESULTS

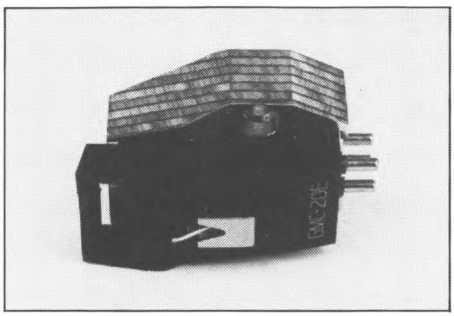
Type, mass	low o/p m-c, 7.5g
Stylus type	naked, fixed
Stylus tip geometry	vdH line contact
Stylus finish/alignment	gluey, f good/good
Output level (1kHz, 5cm/s)	0.43mV
Relative output (0dB = 1mV/cm/s)	−22dB
Tracking ability (L,R)	>65, >73μm
Distortion 300Hz (lat+9dB, vert+6dB)	−46dB/−34dB
Frequency response 100Hz-5kHz	+1, −1dB
Frequency response limits 30Hz-20kHz	+1, −1dB
Stereo Separation 100Hz, 3kHz, 10kHz	29, 34, 25dB
Channel difference 1kHz, 10kHz	0.1, 0.1dB
Test tracking weight, loading	1.6g, n/a
LF resonance frequency, 11.5g arm	7.7Hz
Estimated compliance	20cu
Recommended arm mass/damping	5-10g, none
LF resonance rise, 11g arm	12dB
Typical selling price	£310



Frequency response (outside grooves). Left solid, right dash.

GLANZ GMC20E

PRESENCE AUDIO, EASTLAND HOUSE, PLUMMERS PLAIN, HORSHAM, WEST SUSSEX RH13 6NY.
TEL: (044485) 333



This is a fairly expensive (£129) low output moving-coil which has the (dubious) distinction of a detachable stylus assembly. It bears an uncanny resemblance to a Japanese-sourced Empire tested last year (see summaries), but is clearly a more expensive version. The body had strong circular metal mounting lugs, but mechanical integrity is inevitably compromised by the plug-in plastic mouldings that comprise the removable assembly — even though a good all round fit is achieved. The coils are asymmetrically placed on the cantilever by design.

Compliance is unusually high by today's standards, so only the lowest mass arms are really suitable, and just now that doesn't allow for many sensible alternatives, so compatibility could be a major problem, exacerbated by the very light internal generator damping . Arm damping will almost certainly be worthwhile. Helping to justify the price, a fine quality tip was properly fitted and aligned. Moving-coil inputs are mandatory, but no problems are envisaged.

LAB REPORT

Tracking was adequate, but without all that much in hand. Separation measured well, but the spectrogram revealed a suppressed resonance at around 8kHz. Frequency response is very flat, staying within a single dB window throughout. However, the trace also shows repeated mild mechanical perturbations, and a significant 1dB difference between the channels. Extreme high frequencies were well balanced but a little rough.

SOUND QUALITY

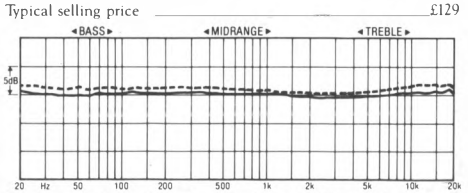
This cartridge only rated average on the listening tests, though it is only fair to note that our standard 11g arm is on the massy side for ideal compatibility. Listeners' responses varied somewhat, but criticism was commonly made of significant coarseness and unsubtlety, a general lack of dynamics, plus added brightness at the top end, exaggerating tape and surface noise. Bass was sloppy, and perspectives phasey.

CONCLUSIONS

While it can be argued that this cartridge might not have had its best shot, the compatibility problem will be no less serious in the marketplace. A decent tip and reasonable measurements alone cannot justify the asking price.

TEST RESULTS

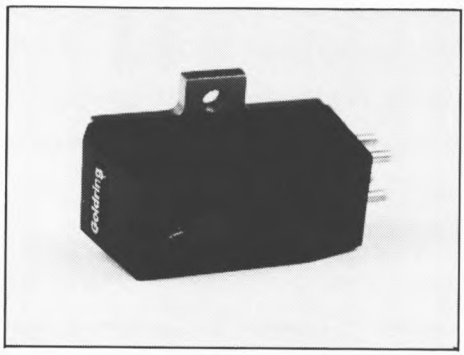
Type, mass	low o/p m-c, 6.2gg
Stylus type	nude, detachable
Stylus tip geometry	swept elliptical
Stylus finish/alignment	superb/v good
Output Level (1kHz, 5cm/s)	0.48mV
Relative output (0dB = 1mV/cm/s)	−20dB
Tracking ability (L,R)	75, 74μm
Distortion 300Hz (lat+9dB, vert+6dB)	−46dB/−34dB
Frequency response 100Hz-5kHz	+0.5, −0.2dB
Frequency response 30Hz-20kHz	+0.7, −0.2dB
Stereo Separation 100Hz, 3kHz, 10kHz	28, 31, 24dB
Channel difference 1kHz, 10kHz	1, 1.2dB
Test tracking weight, loading	1.8g, n/a
LF resonance frequency, 11g arm	4.8Hz
Estimated compliance (vert, lat)	47cu
Recommended arm mass/damping	3-6g, helpful
LF resonance rise, 11g arm	20dB
Typical selling price	£129



Frequency response (outside grooves). Left solid, right dash.

GOLDRING GERARD LOUIS

GOLDRING LTD, UNIT 8, GREYFRIARS ROAD, MORETON HALL INDUSTRIAL ESTATE,
BURY ST. EDMUNDS IP32 7DX. TEL: (0284) 701101



This *de luxe* 'Signature' Electro variation is beautifully, almost traditionally, finished with a 'gold' backplate and ebony body — something of a Gerard Louis *Quinze* in fact, mercifully without the curlicues. It has a lower than usual moving-coil output, so a low noise, high gain pre-amp may be preferred. Massively built on a substantial backplate, good structural and mounting integrity should be ensured, though the internal wire layout seemed a trifle untidy.

High mass and low compliance suggests that medium and high mass arms will provide the best match, both in terms of vibration and low frequency resonance. A decent quality naked van den Hul diamond was well finished but less well installed, with some excess adhesive, and poor alignment centring.

LAB REPORT

Despite the generous downforce, low compliance and internal damping give tracking margins that are not generous, but will be sufficient for most purposes in a decent player. The frequency response is smooth and flat, up a little at very low frequencies with the lowish compliance, and dipping a modest 1.5dB in the presence region. Channel balance is generally very close, but with a mild loss of control at around 12kHz, coincident with the minimum separation and presumably a mild treble resonance. Separation was decent, but unexceptional considering the price, while other results were fine.

SOUND QUALITY

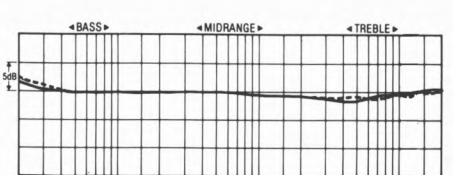
The *GL* made it into the good category, but only just, which is not particularly impressive considering the unit's high price. Spacious and weighty, it was rather 'up front' and unsubtle, tending to sound a little 'loud'. Imagery lost some depth and the midrange had some 'phasey' coloration, while the treble was also unexceptional.

CONCLUSIONS

Attractive enough on the outside, the insides turned out to be rather ordinary — competent enough but with insufficient performance and build quality to justify a £400 price tag.

TEST RESULTS

Type, mass	low o/p m-c, 9.5g
Stylus type	naked vdH, fixed
Stylus tip geometry	excellent line contact, gluey
Stylus finish/alignment	good/fair
Output Level (1kHz, 5cm/s)	0.2mV
Relative output (0dB = 1mV/cm/s)	−27dB
Tracking ability (L,R)	70, 65μm
Distortion 300Hz (lat+9dB, vert+6dB)	−46dB/−36dB
Frequency response 100Hz-5kHz	+0.8, −0.5dB
Frequency response 30Hz-20kHz	+1, −0.5dB
Stereo Separation 100Hz, 3kHz, 10kHz	27, 30, 23dB
Channel difference 1kHz, 10kHz	—, 0, 1.4dB
Test tracking weight, loading	2g, n/a
LF resonance frequency, 11g arm	9.3Hz
Estimated compliance	11cu
Recommended arm mass/damping	10-18g, none
LF resonance rise, 11g arm	13dB
Typical selling price	£399

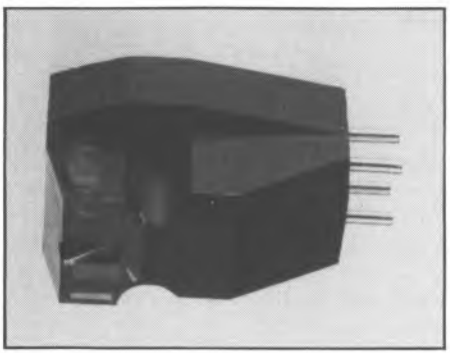


Frequency response (outside grooves). Left solid, right dash.

RECOMMENDED

GOLDRING EPIC

GOLDRING PRODUCTS LTD, UNIT 8, GREY FRIAR'S RD, MORETON HALL IND EST, BURY ST EDMUNDS IP32 7DX. TEL: (0284) 701101



This well established budget cartridge from Goldring attracted much interest and favourable comment from its introduction. The body is rather large, though it can be mounted tightly with good contact area.

The stylus assembly made a fine tight fit, and the specified elliptical tip was confirmed and neatly mounted. Compliance is moderate and well-damped, so arms of up to 16g effective mass looks a safe enough bet. The downforce of 2g helps to give reasonable tracking performance.

LAB REPORT

Plenty of output for the least sensitive amplifiers, plus a response which shows little change in shape with added capacitance will ensure no compatibility problems here. In fact the rather 'dim' response was improved a couple of dB by an extra 250pF without any untoward side effects, so adding a little extra capacitance may be beneficial.

The response trend is determinedly downtilted at high frequencies, falling some 6dB between 1kHz and 20kHz, which is not too promising. But it does follow a smooth and even trend, the final HF region is under fine control, and the curve itself is pretty smooth, with only one minor (750Hz) 'glitch'.

Channel balance was acceptable enough for the price, and separation likewise, at least showing good balance and evenness if not at a particularly exalted level. Tracking abilities are adequate, and groove stability pretty good.

SOUND QUALITY

Dominated by the dulled response, the *Epic* tended to sound bass heavy but was quite impressive in terms of integration and focus, and was quite liked as a result on the listening tests. One hesitates to call it lively, but 'punchy' is not a bad adjective. Dynamics and coloration were pretty decent throughout, and stereo imaging showed some depth, albeit with some congestion.

CONCLUSIONS

This unpretentious cartridge is rather too dull in balance for the standard of ancillary equipment we used during listening, but the tight high frequency control is not ill-suited to the budget equipment it is likely to partner. The generally decent performance indicates cautious recommendation in the right system context.

TEST RESULTS

Type, mass	moving magnet 6.5g
Stylus type	elliptical
Stylus inspection result	neat simple elliptical
Output Level (1kHz, 5cm/s)	3. 8mV
Relative output (0dB = 1mV/cm/s)	0dB
Channel balance	0.3dB
Channel separation (L,R)	28.6, 25.7dB
Tracking ability (L,R)	70, 69μm
Frequency response limits 100Hz-5Hz	+1, −3dB
Frequency response limits 30Hz-20kHz	+1.5, −6/7dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	21, 27, 29dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	18, 23, 25dB
Channel diff. from graph, 100Hz, 1kHz, 10kHz	0.5, 0.5, 1dB
Test tracking weight, loading	1.8g, 200pF
LF resonance frequency, 12.5g arm (vert, lat)	10, 10Hz
Estimated compliance (vert, lat)	13, 13cu
Recommended arm effective mass	6-14g
LF resonance rise, 12.5g arm (vert, lat)	11, 11dB
Typical selling price	£17.50

For graph references see issue No 43

GRACE F9E II

RUSS ANDREWS TURNTABLE ACCESSORIES, EDGE BANK HOUSE, SKELSMERGH, KENDAL, CUMBRIA LA8 9AS. TEL: (053 983) 247

With a history that seems to stretch back into the mists of time, the *F9E* has become something of a yardstick for high-quality moving-magnet designs, providing a sound competitive with m-c models in a device which offers good tracking abilities at low downforce. Recent refinement justifies the *II* suffix, with visible change to the fluorescent stylus assembly moulding.

The manufacturer's family ties with the Supex people can be seen in a similar concern for good mechanical body rigidity with substantial fixing lugs. The new stylus assembly makes a fairly good fit, but was not exceptional in this respect, and in fact led to some inconsistency when measuring compliance.

Compliance is specified at a sensible 20cu. Assisted by fairly strong internal damping, the *F9E II* once again tracked well at a fairly low downforce of 1.2g. Electrical output is ample, and channel balance fair. The advanced elliptical tip had a slightly asymmetric shank.

LAB REPORT

Changing the load capacitance altered the treble response by a fairly substantial 3dB, so attention should be paid to this in a system context. With low capacitance, an almost ruler-flat response, downtilted 4dB, from 200Hz to 20kHz, is punctuated by a broad 2dB peak at 11kHz; higher loading increases the peak by 1dB and rolls off the higher frequencies.

Separation was excellent, particularly through the lower midrange with dB values consistently in the '40s, and with well-suppressed ultrasonics.

SOUND QUALITY

Curiously, during 'hands-on' listening, the sound was actually preferred with the additional capacitance. The traditional highly regarded virtures of the '*9E* were again in evidence, combining a slightly 'weighty' balance with an impressively 'lively' presentation.

The majority of comments positively described this as an interesting solid-sounding cartridge. But there were a couple of dissenters, and a general criticism of some 'fizz'.

CONCLUSIONS

While the latest version of the *F9E* can be said to deliver the sonic goods satisfactorily, the variable compliance of our sample could well explain why the *II* was not regarded as any significant improvement over its predecessor. It remains a fine enough example of moving-magnet technology to be worth considering.

TEST RESULTS

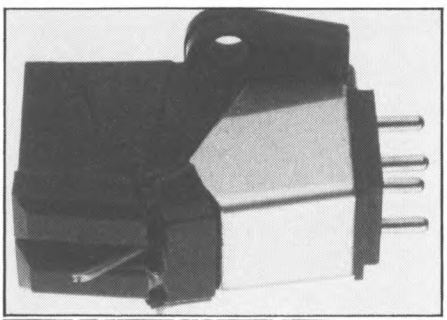
Type, mass	moving magnet, 6g
Stylus type	advanced elliptical
Stylus inspection result	tiny, slightly asymmetric advanced elliptical
Output Level (1kHz, 5cm/s)	4mV
Relative output (0dB = 1mV/cm/s)	-1dB
Channel balance	0.6dB
Channel separation (L,R)	30, 30dB
Tracking ability (L,R)	<80, <80µm
Frequency response limits 100Hz-5kHz	+1, -1.5dB
Frequency response limits 30Hz-20kHz	+1, -3dB
Separation L on R 80Hz, 3kHz, 10kHz	31, 39, 27dB
Separation R on L 80Hz, 3kHz, 10kHz	36, 39, 28dB
Test tracking weight, loading	1.2g, 200pF
LF resonance frequency, 13.5g arm (vert, lat)	5, 5Hz
Estimated compliance (vert, lat)	see text
Recommended arm effective mass	5-10g
LF resonance rise, 13.5g arm (vert, lat)	11, 13dB
Typical selling price	£176

For graph references see issue No. 43

BEST BUY

GRADO MT

MOTH MARKETING, 47 ARMSTRONG CLOSE, WILSTEAD, BEDFORD.
TEL: (0234) 741152



Like all Grado models, this is a simple design of unprepossessing appearance, sensibly constructed to couple well with the tonearm mechanically. The mounting lugs are a little flimsy and should not be over-tightened, but they at least provide circular contact with the bolts.

The stylus assembly fit is remarkably tight, with additional mastic-type damping.

A fairly stiff compliance means that medium and heavy mass arms are to be preferred, while the lack of any cantilever damping (a characteristic Grado trait) implies that tonearm damping could be beneficial if available, and that poorer quality turntables should be avoided. Tracking abilities should be adequate, but in an indifferent player could be caught out on the more difficult material (opera, choral etc).

Output is fine for conventional moving magnet inputs, but the design of the generator means Grados, though entirely unaffected by input capcitance loading, may be somewhat susceptible to hum pickup in the 'wrong' system (glass turntable platters, for example).

LAB REPORT

Frequency response was certainly a little dramatic, suggesting a cartridge stronger on character than neutrality. Dropping a full 3dB through the midrange from 200Hz to 5kHz, there is evidence of slight recovery and then a sharp rise to a +2dB peak at 18kHz.

Separation showed good channel matching and impressive evenness, despite absolute values which were below average. Ultrasonic output was higher than usual, corroborating the high frequency response problem.

SOUND QUALITY

The frequency characteristic proved a major element in the subjective reaction, though 'listening through' the effect revealed a sound of rare quality considering the low price.

The balance was rich and slightly 'heavy', marred by some softness in bass definition and some sibilant and surface noise exaggeration. Inherent good clarity and 'speed', along with the balance, helped to convey impressive scale with good vocal projection and ambient detail.

CONCLUSIONS

Despite the odd frequency balance, this Grado produced sufficient of the sound quality goods to indicate recommendation at its very reasonable price. Other aspects of technical performance were decent enough in any case.

However, significant reservations remain regarding the suitability of such a lightly-damped model in the budget turntables it is likely to partner. A fine potential performer, it needs, more than most, to be checked out in the prospective system.

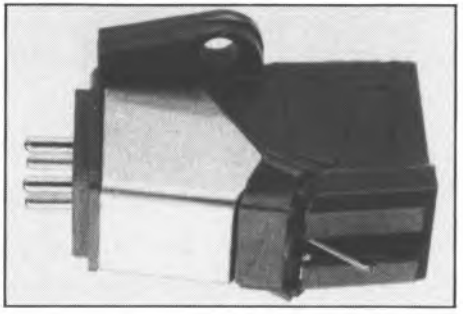
TEST RESULTS

Type, mass	moving magnet 5.5g
Stylus type	not specified
Stylus inspection result	mild elliptical
Output Level (1kHz, 5cm/s)	3.5mV
Relative output (0dB = 1mV/cm/s)	−1dB
Channel balance	0.6dB
Channel separation (L,R)	24, 25dB
Tracking ability (L,R)	80, 66μm
Frequency response from graph 100Hz-5Hz	+1.5, −1.5dB
Frequency response from graph 30Hz-20kHz	+2, −3dB
Stereo Separation L on R 80Hz, 3kHz, 10kHz	26, 31, 29dB
Stereo Separation R on L 80Hz, 3kHz, 10kHz	32, 34, 31dB
Test tracking weight, loading	1.5g, n/apF
LF resonance frequency, (13.5g arm) (vert, lat)	11, 11Hz
Estimated compliance (vert, lat)	12, 12cu
Recommended arm effective mass	8-18g
LF resonance rise, (13.5g arm) (vert, lat)	18, 21dB
Typical selling price	£20

For graph references see issue No. 43

GRADO M3

MOTH MARKETING, 47 ARMSTRONG CLOSE, WILSTEAD, BEDFORD.
TEL: (0234) 741152



Grado cartridges are unusual in several ways, the most obvious being the almost total lack of low frequency damping, which is not so much of a bad thing *per se*, but which does mean that the accompanying turntable needs to be pretty decent. The body is a rather soft blue plastic, and we frankly didn't dare try the recommended three-point mounting spacer for fear of tearing off the lugs, which showed signs of straining when tightened. Stylus was a nicely shaped and mounted special elliptical.

The compliance is beautifully chosen for the test arm, and perfectly symmetrical, so a fair range of arm effective masses should be useable despite the high resonance rise.

LAB REPORT

Frequency response sorted out the cheaper *T* and the M3 quite comfortably, while at the same time showing some significant strengths in both. They were identical from 100Hz to 6kHz, showing impressive channel balance but a gently curving downtilt of 4dB. Whereas the *T* then recovered substantially, showing some channel divergence above 12kHz, the M3 flattened and then turned down again at 9kHz, smoothly following the original trend under exceptional control. The trace as a whole was devoid of other identifiable resonances.

Separation measurements were fairly unspectacular, if reasonably consistent, and showed quite good control of ultrasonic spuriae. Tracking posed no problems, stability was quite impressive despite the 1.5g tracking weight, and surface noise stayed under good control.

SOUND QUALITY

Liked in particular for its lively openess, the M3 was a bit of a lightweight when it comes to bass 'slam', but managed to sound remarkably uncongested throughout most of the band.

The midrange showed reasonable focus and stereo was quite promising. while the balance as a whole sounded a touch 'bright' and 'cold', somewhat lacking in richness and mid bass power. Some treble brightness was audible, but the combination of control and detail was good for the price.

CONCLUSIONS

A decent sounding cartridge for the price, not to mention some impressive results in the technical testing, ensures it is well worth considering, and the suggestion that other models in the Master series deserve checking out according to the depth of your pocket. However, it is not a cartridge to use with an inadequate turntable; Grados have a habit of sounding only as good as their players.

TEST RESULTS

Type, mass	moving magnet 5.5g
Stylus type	elliptical
Stylus inspection result	confirmed small & neat
Output Level (1kHz, 5cm/s)	3.4mV
Relative output (0dB = 1mV/cm/s)	−1.5dB
Channel balance	0dB
Channel separation (L,R)	23.6, 21.8dB
Tracking ability (L,R)	80, 80μm
Frequency response limits 100Hz-5Hz	+2, −2dB
Frequency response limits 30Hz-20kHz	+2, −2/3dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	25, 23, 22dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	33, 32, 25dB
Channel diff. from graph, 100Hz, 1kHz, 10kHz	0, 0, 0dB
Test tracking weight, loading	1.5g, n/apF
LF resonance frequency, 12.5g arm (vert, lat)	10, 10Hz
Estimated compliance (vert, lat)	16, 16cu
Recommended arm effective mass	6-14g*
LF resonance rise, 12.5g arm (vert, lat)	18, 17dB
Typical selling price	£43

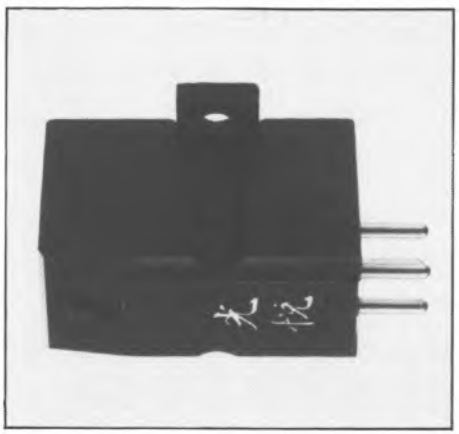
**with slight damping if available*

For graph references see issue No. 43

RECOMMENDED

KOETSU BLACK K

ABSOLUTE SOUNDS, 42 PARKSIDE, LONDON SW19.
TEL: 01-947 5047



A refinement of the well-established Koetsu *Black*, this latest *K* version features a number of detail changes, including the addition of some tasteful gilt to the otherwise featureless body.

Mechanically it appears to be very similar, with a lightly-damped compliance suited to medium and high mass arms. Some additional tonearm damping might be to advantage if available.

Electrical output needs normal moving-coil boost but no more. Though an inherently good quality stylus was fitted, polish was a little lacking and glue rather too much in evidence. Tracking margins were not generous despite the sensible 1.8g tracking weight, and this model should be approached with caution by lovers of grand opera and choral music.

LAB REPORT

An inherently flat and smooth response downtilted a modest 2dB across the band, and held between fine overall ±1dB limits. However there were occasional 'glitches' and a mild lack of control at high frequencies was also indicated.

Separation was truly outstanding, maintaining a symmetrical 45dB-plus, right from 250Hz to 5kHz, albeit with slight spurious ultrasonic output.

SOUND QUALITY

In our initial 'hands on' work, it was obvious that the *Black K* was a significant sonic improvement over its predecessor, retaining the Koetsu character but with a 'lighter', 'faster' sound overall.

However, in the 'blind' presentation the panel were somewhat less convinced. While praising the impressive 'scale' and dynamics, there was criticism of some bass muddling and excess, and some high treble 'tizz'. Though scoring well enough, it was not quite as highly rated as might have been expected. Overall it has a romantic and spacious presentation which has undoubted appeal.

CONCLUSIONS

The *Black K* has certainly done enough technically and subjectively to retain recommendation, enhancing the reputation of its illustrious and successful predecessor. However, it is not a sound to everyone's taste, and the panel showed sufficient misgivings to warn that it should be auditioned before purchase. A good turntable and arm are mandatory.

TEST RESULTS

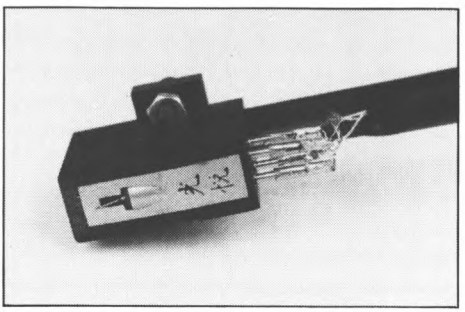
Type, mass	low output moving coil, 9.5g
Stylus type	not specified
Stylus inspection result	super elliptical, indifferent polish
Output Level (1kHz, 5cm/s)	0.36mV
Relative output (0dB = 1mV/cm/s)	−21dB
Channel balance	0.2dB
Channel separation (L,R)	30, 30dB
Tracking ability (L,R)	62, 65μm
Frequency response limits 100Hz-5kHz	+1, −0.5dB
Frequency response limits 30Hz-20kHz	+1 −1dB
Separation L on R 80Hz, 3kHz, 10kHz	34, 44, 37dB
Separation R on L 80Hz, 3kHz, 10kHz	37, 45, 38dB
Test tracking weight, loading	1.8g, n.a.
LF resonance frequency, 13.5g arm (vert, lat)	10, 10Hz
Estimated compliance (vert, lat)	13, 13cu
Recommended arm effective mass	6-10g
LF resonance rise, 13.5g arm (vert, lat)	15, 17dB
Typical selling price	£550

For graph references see issue No. 43

RECOMMENDED

KOETSU RED

ABSOLUTE SOUNDS, 42 PARKSIDE, LONDON SW19.
TEL: 01-947 5047



Last tried two years ago, this famous and respected cartridge has apparently been refined, so a catch-up was overdue. Furthermore it now transpires that the last review sample may have been a 'well-knackered demonstrator', to coin a manufacturer's cliche. Resembling an expensive *Mah Jong* tile in a beautifully finished rosewood and gilt, the heavy metal foundation makes firm, generous headshell contact. Compliance remains very low, slightly asymmetric and lightly damped, so medium and heavy arm masses will match best. Electrical output is strictly moving-coil, and the stylus a small, naked 'fine-line', beautifully finished and well mounted and aligned.

LAB REPORT

Even with a generous 2g downforce, the low compliance has made tracking a little marginal. The separation figures were pretty good, though deteriorating significantly towards higher frequencies; the spectrogram also indicated exceptional upper bass separation, but also a fair amount of ultrasonic 'hash'. The responses were decent enough, but channel balance should have been better. The presence drooped around 1.5dB, but the well controlled HF resonance was more pronounced than before.

SOUND QUALITY

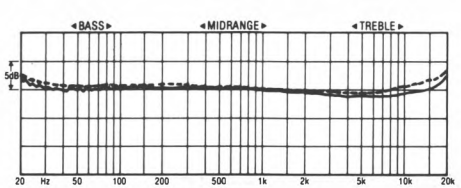
The current *Red* sounds 'livelier' than two years earlier (when it was considered laid back to the point of falling over), brighter and more forward, even slightly larger than life; stereo staging and focus are near immaculate — or at any rate thoroughly impressive. Resolution and depth are both good, particularly through the bass, while the treble remains a trifle obvious.

CONCLUSIONS

Almost larger than life, and considered now to have added vivacity, the *Red* is just as seductive as ever. Some aspects of lab performance still show some room for improvement, but it remains one of the key yardsticks by which others are judged, and as such well deserves recommendation. Potential purchasers should insist on a home trial — but anyone who takes it into their home will be reluctant to take it out again.

TEST RESULTS

Type, mass	low o/p m-c, 10.5g
Stylus type	naked low mass, fixed
Stylus tip geometry	fine line elliptical
Stylus finish/alignment	excellent/very good
Output level (1kHz, 5cm/s)	0.38mV
Relative output (0dB = 1mV/cm/s)	−22dB
Tracking ability (L,R)	70, 66μm
Distortion 300Hz (lat+9dB, vert+6dB)	−50dB/−32dB
Frequency response 100Hz-5kHz	+0.5, −1dB
Frequency response 30Hz-20kHz	+2, −1dB
Stereo Separation 100Hz, 3kHz, 10kHz	29, 30, 21dB
Channel difference 1kHz, 10kHz	0.2, 1dB
Test tracking weight, loading	2g, n/a
LF resonance frequency, 11g arm	12Hz
Estimated compliance	7.5cu
Recommended arm mass/damping	10-25g, might help
LF resonance rise, 11g arm	15dB
Typical selling price	£835

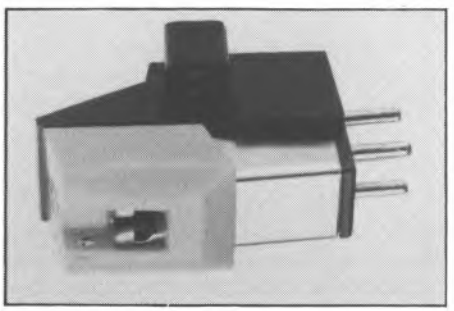


Frequency response (outside grooves). Left solid, right dash.

BEST BUY

LINN BASIK

LINN PRODUCTS LTD, 257 DRAKEMIRE DRIVE, CASTLEMILK, GLASGOW G45 9SZ.
TEL: 041-634 0371



Conceived originally by Linn as a giveaway with the arm of the same name, to drive home the company's view that the turntable and arm are infinitely more important than the cartridge, the current model *Basik* is now available as a separate £18 item, a price which leaves generous margins for all concerned. It is made in Japan by Audio Technica and based on the *AT93*, but seems to have acquired something of a cult reputation for itself as a 'giant killer'.

This simple moving magnet design has good mechanical properties in terms of body rigidity and stylus fit, though the stylus itself was rather heavily glued. Compliance is on the high side of medium, which means that arms should be on the low side of medium mass, a category which just about accommodates Linn's own designs!

LAB REPORT

Output is quite sufficient in level, and although fairly tolerant of capacitance, there was little doubt that it sounded best when well-loaded.

Frequency response actually measured best with low capacitance, where it was very good indeed, holding ±1dB from 20Hz-16kHz; increased capacitance emphasised the 10kHz peak a touch and curtailed the bandwidth slightly. Channel balance was poor in terms of absolute error. The high writing speed trace was a little untidy, confirming the slight unevenness on the original chart.

Separation was distinctly uninspiring, lurking around the 20dB mark, due we suspect to the lively highish vertical compliance. Tracking, on the other hand, was pretty good.

SOUND QUALITY

Reflecting its low cost in terms of general brashness and unsubtlety, the *Basik* nevertheless did a decent job in conveying detail and dynamics through most of the range, though surface noise tended to be exaggerated and the sound could occasionally be described as 'fierce'. Definitely preferred on rock rather than classical music, this cartridge tried hard to give a good impression of overall integrity. Groove stability was reasonable.

CONCLUSIONS

No cartridge better deserves the epithet 'cheap and cheerful', yet the *Basik* goes much further in delivering the goods than its well-padded price level might indicate. It is one of the brightest-sounding amongst the better low cost cartridges, which will either be a blessing or a curse to the prospective purchaser, according to system and taste.

TEST RESULTS

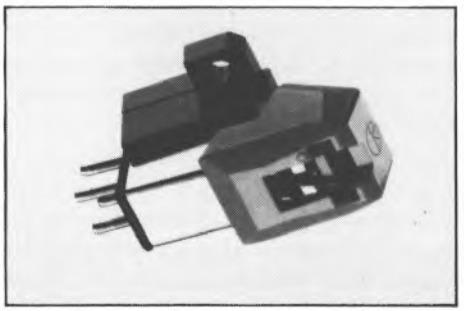
Type, mass	moving magnet 5g
Stylus type	spherical?
Stylus inspection result	rather heavy glueing, small
Output Level (1kHz, 5cm/s)	3.38mV
Relative output (0dB = 1mV/cm/s)	−1.5dB
Channel balance	0.98dB
Channel separation (L,R)	28.1, 28.5dB
Tracking ability (L,R)	80, 80μm
Frequency response limits 100Hz-5Hz	+1, −1dB
Frequency response limits 30Hz-20kHz	+1.5, −3.5dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	20, 23, 19dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	20, 19, 16dB
Channel diff. from graph, 100Hz, 1kHz, 10kHz	1.5, 1.5, 1.5dB
Test tracking weight, loading	2g, 300pF
LF resonance frequency, 12.5g arm (vert, lat)	8.8, 8.6Hz
Estimated compliance (vert, lat)	25, 26cu
Recommended arm effective mass	6-14g
LF resonance rise, 12.5g arm (vert, lat)	15.6, 11.2dB
Typical selling price	£18

For graph references see issue No 43

BEST BUY

LINN K9

LINN PRODUCTS LTD, 257 DRAKEMIRE DRIVE, CASTLEMILK, GLASGOW G45 9SZ.
TEL: 041-634 0371



Linn have 'tweaked' the *K9*'s tail for 1987, stiffening compliance slightly. We have run it through the listening, checked the data, and updated the review. *K9* takes the cheap 'n' cheerful *Basik* as a starting point, beefs up the bodywork with a metal casting, improves the stylus assembly fit still further, and slaps on a Vital stylus with the clear intention of transforming something that nobody would describe as a sow's ear into the proverbial silk purse.

The mechanical improvements seem to be well founded, with plenty of headshell contact area, and inspection confirmed the presence of an advanced elliptical Vital tip. Compliance indicates that low- or medium-mass arms will match well.

Electrical output suits normal moving magnet inputs, though capacitance loading will affect the frequency response. Tracking abilities were more than adequate at the sensible 1.8g downforce.

LAB REPORT

With low capacitance loading the response showed a gentle 2dB downtilt between 200Hz and 6kHz, followed by a broad slight recovery and eventual rolloff. At the recommended and subjectively preferred higher loading the treble trough was reduced but a broad treble peak appeared, +1.5dB 10-13kHz.

While the frequency response was quite impressive, the separation betrayed the humble origins of the generator system. Not that the values were particularly poor, just that they were inferior to many others, with significant channel asymmetry.

SOUND QUALITY

Auditioned on neutral ground (ie outside a Linn-based system), *K9* still confidently delivered the goods. Rating 'above average' (one dissenter short of 'good'), it delivered a strong, powerful sound, a little lacking in subtlety and depth, but crisp and well defined. Lacking some space, 'air' and transparency, it could sound a bit relentless, but had good 'speed' and timing, and a fairly sweet, slightly bright treble.

CONCLUSIONS

K9 continues to provide a finely balanced, energetic sound in a moving magnet context, giving strong competition for many moving coils. Good lab performance, high output and good arm compatibility ensure a continuing Best Buy rating.

TEST RESULTS

Type, mass	moving magnet 7.2g
Stylus type	'vital' elliptical
Stylus inspection result	high quality vital confirmed
Output Level (1kHz, 5cm/s)	3.3mV
Relative output (0dB = 1mV/cm/s)	−1dB
Channel balance	0.4dB
Channel separation (L,R)	23, 30dB
Tracking ability (L,R)	80, 80µm
Frequency response from graph 100Hz-5Hz	+1, −1.5dB
Frequency response from graph 30Hz-20kHz	+1, −4dB
Stereo Separation L on R 80Hz, 3kHz, 10kHz	36, 34, 30dB
Stereo Separation R on L 80Hz, 3kHz, 10kHz	23, 27, 22dB
Response limits ref computer mean, 1kHz-15kHz	+3, −0.5dB
Response limits ref computer mean, 1kHz-20kHz	+3, −0.5dB
Test tracking weight, loading	1.8g, 200pF
LF resonance frequency, 13.5g arm (vert, lat)	9, 8Hz
Estimated compliance (vert, lat)	16, 20cu
Recommended arm effective mass	6-15g
LF resonance rise, 13.5g arm (vert, lat)	12, 17dB
Typical selling price	£60

For graph references see issue No 43

RECOMMENDED

LINN KARMA & ASAKA

LINN PRODUCTS LTD, 257 DRAKEMIRE DRIVE, CASTLEMILK, GLASGOW G45 9SZ.
TEL: 041-634 0371

Karma's body is a small strong alloy casting. The (short) aluminium alloy cantilever carries a swept elliptical (Vital) tip, which was a tiny well-aligned rectangular section nude stone.

Compliance is low, symmetrical and with very little damping, so medium-to-high mass arms are the rational choice, with the *Ittok* making an admirable match. Downforce is 1.7g, which gave adequate tracking abilities but left little in hand.

LAB REPORT

Undoubtedly a low output model, the *Karma* still has sufficient for any decent m-c input.

Frequency response was smooth but with a fairly large 3dB downtilt, running from 100Hz to 5kHz, then a small, controlled 1dB peak at 10kHz, and a small 'glitch' at 14kHz. Channel balance was very close with fine control at high frequencies. At high writing speed, there was a solitary 'glitch' at 1.2kHz. Separation figures were amongst the best.

SOUND QUALITY

With the best will in the world, the author is going to find it impossible to remain entirely dispassionate about the model he has purchased and been using over a long period.

The *Karma* sound is essentially very weighty, powerful and extended in the bass, and slightly bright and brittle in the mid treble. Integration and control are major strengths, yet there is none of the congestion that often accompanies more heavily damped models — Karma is very 'fast' in the manner of the Decca (though not to the same degree), yet extends this subjective speed over a much wider band-width. Focus, dynamics and projection in the midband are exceptional, but the sound is a little 'clinical' lacking the warmth, romance and depth of smoother sounding high-end models. Yet because of the fine integration, what seems to be less apparent detail translates into more coherent information.

CONCLUSIONS

Capable of superb results in the right system context, *Karma* sets high standards for bandwidth integration, and is uncoloured and fast to boot. But by coupling such a bandwidth of high mechanical energy to the tonearm, it also sets new standards for interface problems. While it may be strongly recommended for use in Linn-based systems, there must be a similarly strong note of caution against more general applications, where results will be less predictable.

LINN ASAKA

Replacing Linn's longstanding and successful *Asak*, this £249 model incorporates the rigid metal bodywork from the more expensive *Karma* without any real price increase over its predecessor. *Asaka's* silver finish contrasts with *Karma's* jet black, but there are few other apparent differences.

Basic measurements were impressively consistent, with fine separation, tracking ability that was adequate (improving with higher room

temperatures), and a slightly 'bright' response, particularly at 15kHz on one channel.

A crucial question for Linn cartridge fanciers must be whether *Asaka* offers *Karma* performance on the cheap — but this it does not. It is an *Asak* at heart, and lacks the remarkable low frequency 'speed' and integration of the *Karma*.

Nevertheless, it is a fine-sounding cartridge, capable of great dynamic contrast, bounce and 'life', if erring a little on the aggressive side. In the right system it may be confidently recommended, but cannot help falling within the no man's land between the 'good but cheap' models and top performers like its big brother.

Test Results

LINN KARMA

Type, mass	low output moving coil, 6.2g
Stylus type	Vital superelliptical
Stylus inspection result	confirmed, fine small stone, accurately set
Output Level (1kHz, 5cm/s)	0.2mV
Relative output (0dB=1mV/cm/s)	−26dB
Channel balance	0.25dB
Channel separation (L,R)	30, 30dB
Tracking ability (L,R)	80, 76μm
Frequency response limits 100Hz-5Hz	+2, −1dB
Frequency response limits 30Hz-20kHz	+2, −2dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	30, 33, 35dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	32, 37, 33dB
Channel diff. from graph, 100Hz, 1kHz, 10kHz	0, 0, 0.5dB
Test tracking weight, loading	1.7g, n.a.
LF resonance frequency, 12.5g arm (vert, lat)	11.5, 11.5Hz
Estimated compliance (vert, lat)	12, 12cu
Recommended arm effective mass	9-18g
LF resonance rise, 12.5g arm (vert, lat)	15.5, 14.5dB
Typical selling price	£399

LINN ASAKA

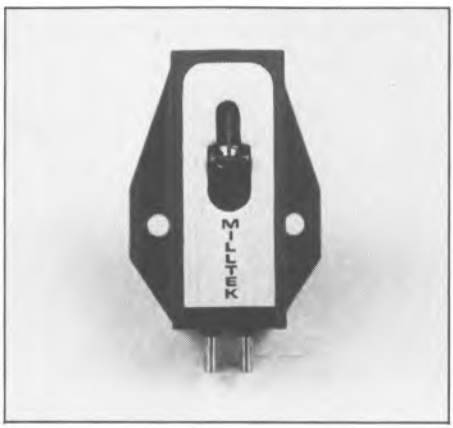
Type, mass	low output moving coil, 6.2g
Output Level (1kHz, 5cm/s)	0.17mV
Channel balance	0dB
Channel separation (L,R)	30, 30dB
Tracking ability (L,R)	66, 58μm
Frequency response limits 1kHz-15kHz	+1.5, −2.5dB
Frequency response limits 1kHz-20kHz	+2.5, −2.5dB
Test tracking weight, loading	1.6g, n.a.
LF resonance frequency, 13.5g arm (vert, lat)	11, 11Hz
Estimated compliance (vert, lat)	12, 12cu
Recommended arm effective mass	9-18g
LF resonance rise, 13.5g arm (vert, lat)	16, 16.5dB
Typical selling price	£249

First reviewed: Karma, 1985; Asaka, 1986; (Asak 1980, retested 1982, 1984). Rating: Recommended.

RECOMMENDED

MILLTEK AURORA

PRESENCE AUDIO, EASTLAND HOUSE, PLUMMERS PLAIN, HORSHAM, WEST SUSSEX RH13 6NY.
TEL: (044485) 333



This £200 high output moving-coil cartridge is apparently connected with Kiseki, and handled by the same UK importer. It has an attractive shiny green aluminium body which is large but reasonably light, and structurally very rigid, with a large headshell mounting area. Though it has sufficient output for nearly all conventional moving magnet inputs, the volume will need to be set a little higher than usual, or when making comparisons.

Compliance is quite stiff, so the very lowest mass arms should be avoided, and most of the heavyweights should work well, perhaps aided by moderate damping. Stylus inspection was encouraging, the low mass naked diamond tip having been well aligned and polished, albeit with a little excess glue.

LAB REPORT

Despite the lowish compliance, tracking ability was quite competent, assisted by the highish downforce. Separation was excellent, showing fine symmetry and good control of the HF resonance. The frequency response showed the usual 'droop', a highish 2.5dB in this instance, and then some channel imbalance in the final octave, but with good control nonetheless.

SOUND QUALITY

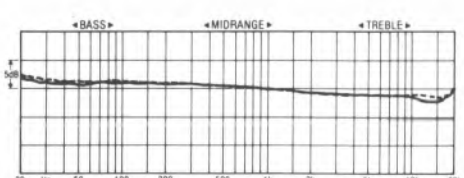
Though less than the best, the *Milltek* comfortably rated good, with all the appealing hallmarks of a classic big 'n' beefy moving-coil. The sound was fairly neutral, clear, open and atmospheric, with a wide subjective bandwidth that got a little untidy towards the extremes. Dynamics and bass were slightly softened, resolution pretty good, while an overall feeling of relaxed ease was noted.

CONCLUSIONS

Beautiful build quality, fine lab performance, good compatibility, not to mention a good sound as well must warrant recommendation for this fine and well balanced cartridge.

TEST RESULTS

Type, mass	higher o/p m-c, 7.5g
Stylus type	naked, fixed
Stylus tip geometry	true swept elliptical
Stylus finish/alignment	excellent/v good
Output Level (1kHz, 5cm/s)	2.6mV
Relative output (0dB = 1mV/cm/s)	−5.6dB
Tracking ability (L,R)	>80, 73µm
Distortion 300Hz (lat+9dB, vert+6dB)	−46dB/−37dB
Frequency response 100Hz-5kHz	+1, −1.2dB
Frequency response 30Hz-20kHz	+1.5, −2.8dB
Stereo Separation 100Hz, 3kHz, 10kHz	28, 37, 27dB
Channel difference 1kHz, 10kHz	0, 0.9dB
Test tracking weight, loading	2.1g, n/a
LF resonance frequency, 11g arm	10Hz
Estimated compliance	12cu
Recommended arm mass/damping	8-16g, none
LF resonance rise, 11g arm	14dB
Typical selling price	£198



Frequency response (outside grooves). Left solid, right dash.

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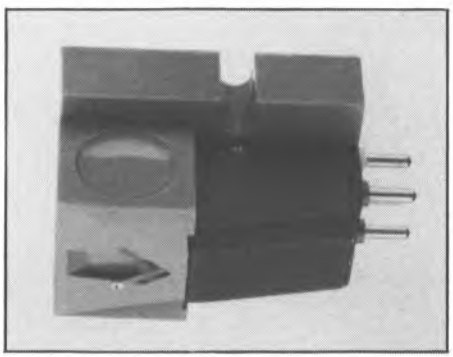
NAGAOKA MP10

PATH GROUP PLC, 1 BERENS ROAD, LONDON NW10 5DY.
TEL: 01-969 2514



Very much the 'baby' of the Nagaoka moving magnet range, the *MP10* shares the same impressive rigid body structure, albeit an unattractive dull red plastic moulding, as the models higher up the range. Humbly sporting a spherical tip, which was actually quite small and neatly mounted, a substantial 2.3g downforce ensures good tracking ability and groove stability.

Compliance is sensible, nicely symmetrical, so although the *MP10* is probably best served by low mass arms, medium mass models are almost as suitable.

LAB REPORT

Substantial enough in output for any moving magnet input, Nagaoka specify low capacitance loading, which should be particularly respected in this instance, as the treble rolloff is already quite severe, and is only made worse by increasing capacitance.

Frequency response shows a pronounced downtilt commencing at 300Hz, increasing in slope a little around 2kHz until levelling out some 5dB down at 13kHz, then finally rolling off at 17kHz. Despite the inaccuracy of this response in absolute terms, the lack of sudden change throughout the band is praiseworthy. Furthermore, channel balance stayed closely within 0.5dB, and 'glitches' were merely minor unevenesses, predominantly below 1kHz.

Separation figures rivalled many cartridges costing many times the price, even showing respectable control at high frequencies.

SOUND QUALITY

Despite the treble rolloff, which in the manner of spherical styli becomes more severe towards the end of a disc side (our response was taken at roughly the middle of a side), the *MP10* was very well liked for the 'seamlessness' and control of its sound, which showed remarkably good integration for such a low cost design. High frequencies did sound 'shut in', and depth was curtailed, but the bass and mid were satisfyingly energetic, 'bouncy' and 'punchy'.

CONCLUSIONS

Spherical tip apart, the *MP10* is clearly substantially well balanced. Moreover, the slightly 'dim' balance could well prove to be an ideal partner to the less-than-tidy tonearms, amplifiers and loudspeaker which its price suggests will be frequent partners.

TEST RESULTS

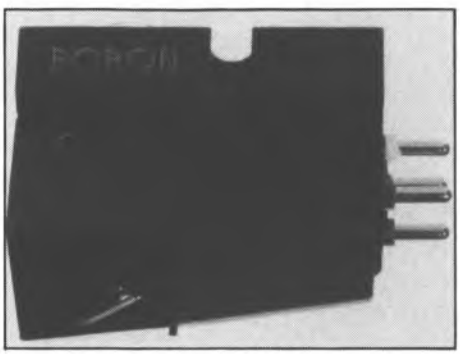
Type, mass	moving magnet 6.8g
Stylus type	spherical
Stylus inspection result	small and neat
Output Level (1kHz, 5cm/s)	3.75mV
Relative output (0dB = 1mV/cm/s)	0.9dB
Channel balance	0.54dB
Channel separation (L,R)	28.9, 30dB
Tracking ability (L,R)	80, 80µm
Frequency response limits 100Hz-5Hz	+1, −3dB
Frequency response limits 30Hz-20kHz	+1.5, −7dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	27, 29, 24dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	32, 30, 25dB
Channel diff. from graph, 100Hz, 1kHz, 10kHz	0.5, 0, 0dB
Test tracking weight, loading	2.3g, 100pF
LF resonance frequency, 12.5g arm (vert, lat)	9, 8.7Hz
Estimated compliance (vert, lat)	17, 18cu
Recommended arm effective mass	5-13g
LF resonance rise, 12.5g arm (vert, lat)	11.3, 12.3dB
Typical selling price	£17

For graph references see issue No 43

BEST BUY

NAGAOKA MP11 BORON

PATH GROUP PLC, 1 BERENS ROAD, LONDON NW10 5DY.
TEL: 01-969 2514



The *MP11* has been a particular favourite in Nagaoka's range of moving magnet models for some years, though in the past our tests have favoured the *MP10*. However, Nagaoka now have a *Boron* version, featuring a cantilever made from this exotic material. This large cartridge is also on the heavy side, but has a fairly well-fitting stylus assembly and a good body shape which can be fixed firmly enough in the headshell despite semicircular lugs.

Our original preference for the *MP10* was due to the *'11's* undesirably high compliance. The *Boron* comes in with a much more sensible compliance, closer to the *'10* than the *'11* yet high enough to ensure good tracking performance at the sensible 2g tracking weight. Nevertheless low and medium mass arms will match best, and decent quality turntables should be used as internal damping is modest.

Electrical output is fine for any normal input, though capacitance variations do have an influence on the response. Channel balance was a reasonable 0.6dB.

LAB REPORT

Both responses were good by any standards. With the recommended low capacitance a gentle 2dB downtilt from 200Hz to 10kHz was followed by a 2-3dB peak at 18kHz. With higher capacitance the response held within ±0.5dB to 12kHz, rolling off thereafter. It is something of a moot point as to which of the two is to be preferred.

Separation was reasonable enough, though decidedly asymmetric between the channels.

SOUND QUALITY

Subjectively, the *MP11 Boron* was in fact preferred with additional capacitance, sounding a little 'spitty' with low loading.

Reactions varied somewhat, but were generally very favourable considering the modest price. A major strength was the overall balance, which was 'weighty' and 'powerful', conveying a good sense of scale and space. Low level resolution and dynamics attracted some mild criticism, however, as did some 'thickening' in the bass and midrange.

CONCLUSIONS

While this could not be described as a particularly exciting cartridge, it auditioned well and the technical performance was also entirely adequate. It is certainly good enough to respond to good quality ancillaries, and definitely merits a 'Best Buy' rating.

TEST RESULTS

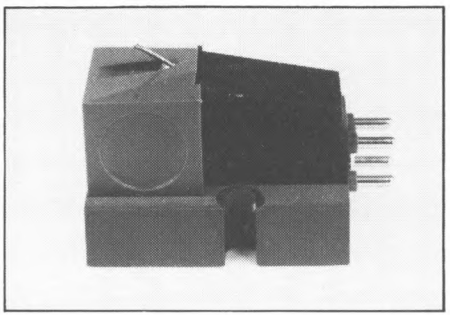
Type, mass	moving magnet 6.8g
Stylus type	elliptical
Stylus inspection result	mild elliptical
Output Level (1kHz, 5cm/s)	4mV
Relative output (0dB = 1mV/cm/s)	0dB
Channel balance	0.6dB
Channel separation (L,R)	30, 23dB
Tracking ability (L,R)	80, 80µm
Frequency response from graph 100Hz-5Hz	+0.5, −1dB
Frequency response from graph 30Hz-20kHz	+0.5, −1.5dB
Stereo Separation L on R 80Hz, 3kHz, 10kHz	37, 45, 32dB
Stereo Separation R on L 80Hz, 3kHz, 10kHz	30, 31, 20dB
Test tracking weight, loading	2g, 100pF
LF resonance frequency, 13.5g arm (vert, lat)	8, 8Hz
Estimated compliance (vert, lat)	20, 20cu
Recommended arm effective mass	5-13g
LF resonance rise, 13.5g arm (vert, lat)	15, 15dB
Typical selling price	£38

For graph references see issue No 43

RECOMMENDED

NAGAOKA MP11 GOLD

THREE MARKETING LTD, 1 BERENS ROAD, LONDON NW10 5DY.
TEL: 01-969 2514



This new variation upon a familiar Nagaoka theme capitalises on the formidable reputations of the standard *MP11* and last year's *Boron* (cantilevered) derivative. There's no evidence of a solid gold cantilever fortunately, merely a rather large and unappealing sludge-grey/brown body, albeit sensibly designed for good rigidity, good headshell contact and stylus fit, despite semicircular mounting lugs.

Historically *Choice* preferred the *MP10* and *Boron* to the standard *'11* because of the latter's high compliance, but the *Gold* seems to be letting it rise, 27cu restricting arm choice to low mass models only. Substantial internal damping does at least help matters here. And despite the prestige implied by its title, the *Gold* turned out to have a very ordinary diamond, a shank-mounted pseudo-elliptical of indifferent polish. Output level is bang on the moving magnet target.

LAB REPORT

The high compliance ensures good tracking abilities, but may have contributed to the indifferent separation figures. There was significant asymmetry here, and a suggestion that the first treble irregularity occurred below 10kHz, but the response trace confirmed good control. The response itself is reasonably flat, losing 1.5dB up to 8kHz and then peaking at 16kHz, with some extreme top irregularity. Channel balance is quite close, but there was some overall uneveness throughout the trace.

SOUND QUALITY

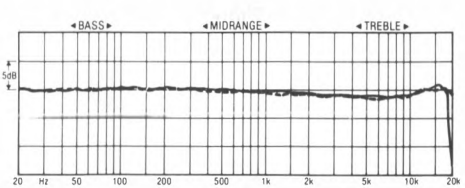
So far, not so good, but the *Gold* then proceeded to turn in as strong a listening test performance as the *Boron* had a year earlier, scoring above average at a distinctly average price. Fairly mild criticisms were directed at most areas, but the overall package seemed to balance well subjectively, and rock came over well. The sound tended towards the bland, and dynamics were muted with low level information and depth curtailed, but the sound generally remained clear, open and even.

CONCLUSIONS

The disappointing stylus and unexceptional measured performance is offset by the decent listening results. But the highish compliance has come back, so the cheaper *Boron* remains much the most sensible of the *MP11s*.

TEST RESULTS

Type, mass	high o/p m-m 6.8g
Stylus type	shank mount, detachable
Stylus tip geometry	pseudo-elliptical
Stylus finish/alignment	fair/v good
Output Level (1kHz, 5cm/s)	5mV
Relative output (0dB = 1mV/cm/s)	0dB
Tracking ability (L,R)	>80, >80µm
Distortion 300Hz (lat+9dB, vert+6dB)	−44dB/−34dB
Frequency response 100Hz-5kHz	+0.2, −0.2dB
Frequency response 30Hz-20kHz	+1.2, −0.2dB
Stereo Separation 100Hz, 3kHz, 10kHz	22, 25, 20dB
Channel difference 1kHz, 10kHz	0.1, 0.1dB
Test tracking weight, loading	1.7g, 200pF
LF resonance frequency, 11g arm	7.3Hz
Estimated compliance	27cu
Recommended arm mass/damping	3-8g, none
LF resonance rise, 11g arm	10.5dB
Typical selling price	£45



Frequency response (outside grooves). Left solid, right dash.

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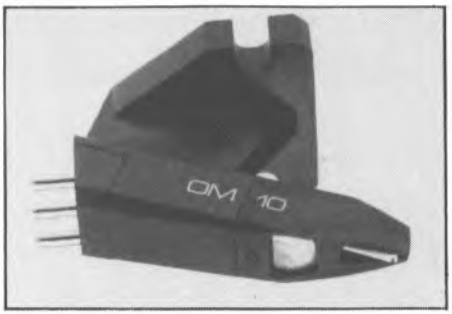
BEST BUY

ORTOFON OM10

ORTOFON UK LTD, DENMARK HOUSE, TAVISTOCK INDUSTRIAL ESTATE, RUSCOMBE, TWYFORD, BERKS RG10 9NJ. TEL: (0734) 343621



This cartridge is often supplied with the popular Dual 505 budget turntable, and is also available as a separate item. The OM designation refers to an optional mass facility, because the 5g cartridge mass contains 2.5g of ballast, which may be removed if the tonearm is capable of balancing such a low mass.

Experiencing this difficulty ourselves, we elected to retain the ballast, but this option, theoretically at least, should allow a wider range of arm masses to be accommodated.

However, it can be argued that the provision of mass as mere ballast must compromise structural rigidity, and certainly the body mounting was rather skeletal, though the stylus assembly made a good fit. Compliance was moderate enough to suit a wide range of arms, the heavier ones benefitting from ballast removal.

LAB REPORT

With enough output to drive any amplifier, this model is designed to work into a highish capacitance to achieve the manufacturer's intended results at the high frequency resonance. Where pre-amp input loading is low, adaptors may be used in the signal line.

Frequency response looks most impressive, dropping quite smoothly 3dB between 100Hz and 7kHz, then rallying to 19kHz. Adding capacitance to the manufacturer's recommendation reduces the treble droop to 1dB at 3kHz, and the response starts rolling gently at 10kHz. Channel balance was found to be quite close, but with a broad 0.5dB error 100-600Hz which cannot be corrected and may be audible. There is also evidence of quite pronounced 'glitches' in response at 500Hz and 1.2kHz, with some general uneveness at high frequencies.

Separation figures were pretty good, albeit asymmetric to a marked degree between channels and with significant sample variation, while tracking abilities were fine.

SOUND QUALITY

Nice but noisy (referring to record surfaces) is a snapshot comment on the *OM10* sound. High frequencies were audibly down compared with the more expensive *OMs* but were nevertheless clean and well controlled.

The midrange was nicely integrated and open-sounding, while the bass did show a degree of overhang.

CONCLUSIONS

Clearly one of the leading 'cheapies', the *OM10* gives a decent overall performance, albeit with some sample variation, not to mention a fine level of sound quality for the price.

TEST RESULTS

Type, mass	moving magnet 5g*
Stylus type	'E'
Stylus inspection result	neatly mounted simple elliptical
Output Level (1kHz, 5cm/s)	3.6mV
Relative output (0dB = 1mV/cm/s)	−1dB
Channel balance	0.23dB
Channel separation (L,R)	23.6, 21.6dB
Tracking ability (L,R)	80, 80μm
Frequency response limits 100Hz-5Hz	+1, −1dB
Frequency response limits 30Hz-20kHz	+1, −5dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	30, 45, 39dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	22, 24, 25dB
Channel diff. from graph, 100Hz, 1kHz, 10kHz	0.5, 0.5, 0.5dB
Test tracking weight, loading	1.5g, 400pF
LF resonance frequency, 12.5g arm (vert, lat)	9, 7.6Hz
Estimated compliance (vert, lat)	19, 24cu
Recommended arm effective mass	5-15g**
LF resonance rise, 12.5g arm (vert, lat)	7, 11.7dB
Typical selling price	£19

**includes 2.5g ballast*

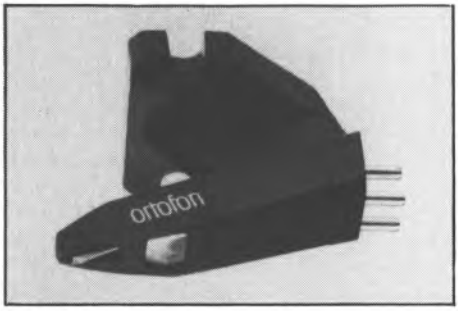
***if arm can be re-balanced with ballast removed*

For graph references see issue No 43

RECOMMENDED

ORTOFON OM20

ORTOFON UK LTD, DENMARK HOUSE, TAVISTOCK INDUSTRIAL ESTATE, RUSCOMBE, TWYFORD, BERKS RG10 9NJ. TEL: (0734) 343621



This is the £35 middle model in Ortofon's stylish 'optional mass' range of moving magnet cartridges. It is a 2.5g cartridge with 2.5g of removable ballast, the latter necessary more to enable conventional arm counterbalances to work than for any other reason, as it contributes nothing to the structural rigidity. Stylus fit is quite good.

Even fully laden, the *OM20* can match a fair range of arm effective masses, though high mass examples will benefit from ballast removal. Tracking weight is a low 1.25g, but tracking ability was still good.

Lab Report

Substantial output avoids any likelihood of amplifier sensitivity mismatch. Ortofon usually specify high capacitance loading, but there was no mention in the instruction leaflet on this occasion. In fact the subjective difference was quite slight, and the measured change not that great either.

Frequency response was very flat with capacitance loading, falling within a 1dB 'window' from 30Hz to 15kHz, while without capacitance the high frequency extension was marginally increased, at the expense of an overall 2dB 'window'. Channel balance was a little disappointing, and 'glitches', relating to the mounting we suspect, are visible either side of 1kHz. The trace as a whole was a little uneven at high frequencies, but not severely so.

Separation figures were reasonable enough, and were well maintained at high frequencies, though they were somewhat asymmetric and uneven throughout the band.

Sound Quality

Generally very well balanced tonally, if a touch 'thin' and 'bright', the *OM20* succeeds handsomely as an all-rounder despite a certain lack of excitement. Focus, depth and dynamics were well below the best, but the general level of competance and control were very convincing, with good lateral stereo.

Conclusions

Definitely deserving recommendation, this turned out to be our favourite amongst Ortofon's moving magnet cartridges. While it may not produce one of the most dynamic sounds around, it offers impressive compatibility mechanically and sonically with the fairly modest equipment which one would expect it to partner, and generally delivers the goods in a well-balanced manner.

Test Results

Type, mass	moving magnet 5g*
Stylus type	'E'
Stylus inspection result	mild elliptical, decent quality
Output Level (1kHz, 5cm/s)	3.6mV
Relative output (0dB = 1mV/cm/s)	-1dB
Channel balance	0.2 1dB
Channel separation (L,R)	23.6, 21.6dB
Tracking ability (L,R)	80, 80µm
Frequency response limits 100Hz-5Hz	+1, -0dB
Frequency response limits 30Hz-20kHz	+1.5, -0dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	30, 26, 25dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	35, 36, 28dB
Channel diff. from graph, 100Hz, 1kHz, 10kHz	1, 1, 1.5dB
Test tracking weight, loading	1.25g, 400pF
LF resonance frequency, 12.5g arm (vert, lat)	9, 7.6Hz
Estimated compliance (vert, lat)	21, 25cu
Recommended arm effective mass	5-16g**
LF resonance rise, 12.5g arm (vert, lat)	7, 11.7dB
Typical selling price	£40

**includes 2.5g ballast*

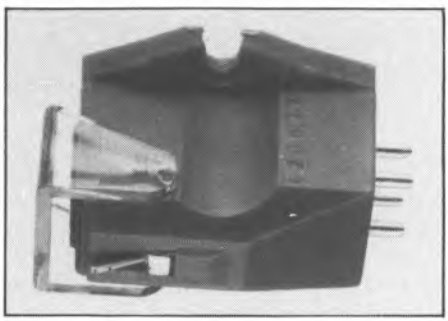
***if arm balances with ballast removed*

For graph references see issue No 43

BEST BUY

ORTOFON MC10 SUPER

ORTOFON UK LTD, DENMARK HOUSE, TAVISTOCK INDUSTRIAL ESTATE, RUSCOMBE, TWYFORD, BERKS RG10 9NJ. TEL: (0734) 343621



Ortofon deserve considerable respect for their singlehanded bearing of the moving coil torch through the dark years of moving magnet domination.

The *MC10 Super* set out to change all that, providing a fully competitive and comparable £50 model. There are still a few of the old oddities around it's true to say, including an unusually 'deep' body requiring different arm height adjustment from most other models, the silly hinged stylus guard, and semicircular mounting lugs which are prone to distortion. Stylus was an accurately shaped and aligned small nude elliptical.

Compliance is impressively symmetrical, lightly damped, and very sensibly chosen for low- and medium-mass arms. Although the tracking reserve is not great, it will still be sufficient for most cases.

LAB REPORT

Output level is close to ideal for normal amplifier moving coil inputs, and the clever trick is that Ortofon have done this while retaining the sonically superior low impedance coils.

Frequency response shows a fairly pronounced midrange downtilt amounting to some 3dB between 200Hz and 7kHz, whereupon there was a mild and slightly uneven recovery. Channel balance was pretty good throughout. The overall trace showed areas of vague uneveness, but no distinct resonances. Separation figures were rather average, though quite well balanced and notably well maintained at high frequencies.

SOUND QUALITY

What a delightfully sweet-sounding cartridge this is. There is a touch of the 'boom'n'tizz' which indicates a little loss of control at the frequency extremes, but even these balance each other nicely, while the midrange sounds delightfully clear, open and uncongested, with decent stereo, depth, dynamics and focus, and a pleasantly 'airy' sound. It has much of the delicacy of far more expensive designs, if lacking quite the same degree of control, sophistication and smoothness.

CONCLUSIONS

Ortofon's extensive experience has somehow managed to come up with a beautifully judged package, which combines the full open, dynamic qualities of moving coils without resort to overdamping or undue lack of control. The balance errs a trifle on the latter side, but it is hard to envisage a better overall combination of the various parameters within the cost constraints.

TEST RESULTS

Type, mass	low output moving-coil 7.2g
Stylus type	'E'
Stylus inspection result	fine small nude elliptical
Output Level (1kHz, 5cm/s)	0.32mV
Relative output (0dB = 1mV/cm/s)	−22dB
Channel balance	0.1dB
Channel separation (L,R)	30, 30dB
Tracking ability (L,R)	75, 74μm
Frequency response limits 100Hz-5Hz	+1.5, −1dB
Frequency response limits 30Hz-20kHz	+1.5, −2dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	22, 26, 20dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	24, 28, 21dB
Channel diff. from graph, 100Hz, 1kHz, 10kHz	0.5, 0.5, 0.5dB
Test tracking weight, loading	1.5g, n.a.
LF resonance frequency, 12.5g arm (vert, lat)	9, 9Hz
Estimated compliance (vert, lat)	15, 15cu
Recommended arm effective mass	5-15g
LF resonance rise, 12.5g arm (vert, lat)	14, 12dB
typical selling price	£59

For graph references see issue No 43

RECOMMENDED

ORTOFON MC20 SUPER

ORTOFON (UK) LTD, DENMARK HOUSE, TAVISTOCK INDUSTRIAL ESTATE, RUNSCOMBE, TWYFORD, BERKS RG10 9NJ. TEL: (0734) 343621

Ortofon, with some justification, regard the gold-finished *'20 Super* as a bargain-priced exotic, and certainly the rigid all-metal body construction is normally associated with higher priced models. Solid integral circular fixing lugs and a good headshell contact area should ensure rigid mounting in high quality tonearms.

Stylus is specified as a van den Hul I. Despite the generous 1.8g tracking weight, the tracking ability is adequate rather than impressive. Measurement showed channel balance and separation were likewise good rather than spectacular, while the response was impressively smooth, flat and extended. The output level is adequate for all normal moving-coil amplifier inputs.

The generator mechanism is impressively symmetrical in vertical and horizontal compliance and in terms of the lightish damping. A lower effective mass than the 13.5g test arm would probably provide the best match; ideally under 10g is to be preferred, though up to 15g effective mass may be used.

SOUND QUALITY

Sound quality was very inviting, tending towards politeness rather than excitement. Attractive, clear and open sounding, the balance tended towards the 'dry' and 'thin'. Treble was very detailed, if perhaps a little obvious, and while the bass sounded well extended and firm, it was a little lacking in 'slam' and 'punch'. Stereo imaging was delightful, spacious and 'airy' with good soundfield integration. The cartridge showed very tidy control of unwanted resonances, but was felt to lack a little energy in the bass and lower mid regions, and did not sound as 'quick' as some designs.

CONCLUSIONS

Overall, the *MC20 Super* is a competitive and well balanced package which certainly merits recommendation on the basis of fine sound quality and wide compatibility at a reasonable price. In many ways its performance can approach much more expensive exotic models, though the total package does fall a little short of the best.

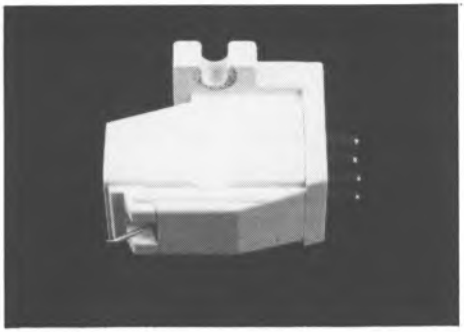
TEST RESULTS

Type, mass	low output moving coil, 9g
Output Level (1kHz, 5cm/s)	0.2mV
Channel balance	-0.5dB
Channel separation (L, R)	30, 28.6dB
Tracking ability (L,R)	68, 63μm
Frequency response limits 1kHz-15kHz	+0.5, −1.5db
Test tracking weight, loading	1.8g, n.a.pF
LF resonance frequency, 13.5g arm (vert, lat)	9, 9Hz
Estimated compliance (vert, lat)	16, 16cu
Recommended arm effective mass	6-15g
LF resonance rise, 13.5g arm (vert, lat)	15, 15dB
Typical selling price	£165

First reviewed: The Collection 1986

ORTOFON X1/X3

ORTOFON (UK) LTD, DENMARK HOUSE, TAVISTOCK INDUSTRIAL ESTATE, RUSCOMBE, TWYFORD,
BERKS RG10 9NJ. TEL: (0734) 343621



Representing Ortofon's first real attempt to produce popularly priced, high output moving-coil models for direct connection to a standard moving magnet input, the *X3* and *X1* are twins, distinguished by the blue and off-white of their respective plastic bodies and the quality of their diamond tips. They are very lightweight, but the reinforced plastic used seems very strong. However, headshell contact area is not great and semicircular fixing lugs do not encourage excessive tightening of the fixing screws.

The similar compliances conveniently match a broad range of available arms, but the output level is significantly below a normal high output cartridge — in practice this will usually be an advantage, allowing the full range of the volume control to be used, but there may be isolated instances where the pre-amp has insufficient gain or too much noise. Despite their mid-market position, neither diamond was exceptional. The £45 *X1* had a very ordinary shank-mount pseudo-elliptical tip of nearly spherical contact and unbalanced grind, indifferently finished and mounted. The £69 *X3* tip showed better polish and alignment with a diasa shank, but was again poorly shaped, tending to a spherical rather than the intended line contact.

Lab Report

Despite the moderate compliance, the substantial 2g downforce conferred good tracking abilities. Separation figures were fairly ordinary, the spectrograms (not shown) indicating that the *'3* had slightly better control in the treble region, while the *'1* had a healthy but unwanted ultrasonic component. The frequency responses of either channel of either cartridge were almost identical. (By inference, channel balance was good.) There was some mild uneveness, plus the usual dip of about 1.5dB in the presence region, but the high frequency lift started down around 8kHz and could have been better controlled thereafter.

Sound Quality

On the border between average and above average, there was some disagreement between the panelists, and in fact the cheaper *X1* scored consistently slightly higher marks. Neither was particularly well received, both being criticised for lacking bass power and definition and compounding the situation with a 'zitty' top end. Competent but uninvolving, strong but unsubtle, the X3's better tip gave somewhat improved treble qualities, but the whole also managed to sound a little less lively than the *X1*.

Conclusions

On balance this new X-series must be regarded as a disappointment. Ortofon have made a valiant attempt to produce a fully compatible

high output design, but the generator system seems to be less well behaved than the low output, similarly priced and highly successful *MC10* Super. At £45/£69 mere competence is no longer sufficient, and better tip quality is expected too.

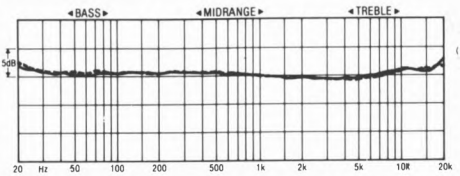
Test Results

Ortofon X1

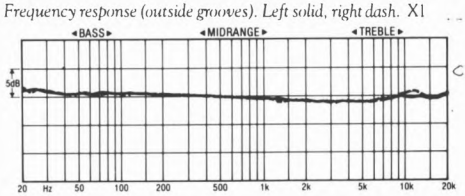
Type, mass	high o/p m-c, 4g
Stylus type	shank mount, fixed
Stylus tip geometry	pseudo-elliptical (see text)
Stylus finish/alignment	fair/good
Output Level (1kHz, 5cm/s)	2mV
Relative output (0dB = 1mV/cm/s)	−8dB
Tracking ability (L,R)	>80, >80μm
Distortion 300Hz (lat+9dB, vert+6dB)	−45dB/−35dB
Frequency response limits 100Hz-5Hz	+1, −0.5dB
Frequency response limits 30Hz-20kHz	+1.3, −0.5dB
Stereo Separation 100Hz, 3kHz, 10kHz	26, 33, 24dB
Channel difference 1kHz, 10kHz	0, 0.3dB
Test tracking weight, loading	2g, n/a
LF resonance frequency, 11g arm	9.8Hz
Estimated compliance	15cu
Recommended arm mass/damping	6-15g, none
LF resonance rise, 11g arm	13dB
Typical selling price	£45

Ortofon X3

Type, mass	high o/p m-c, 4g
Stylus type	diasa shank, fixed
Stylus tip geometry	poorly shaped semi-line
Stylus finish/alignment	fair/slightly skew
Output Level (1kHz, 5cm/s)	2mV
Relative output (0dB = 1mV/cm/s)	−8dB
Tracking ability (L,R)	>80, >80μm
Distortion 300Hz (lat+9dB, vert+6dB)	−44dB/−33dB
Frequency response 100Hz-5kHz	+1, −0.5dB
Frequency response 30Hz-20kHz	+1.4, −0.5dB
Stereo Separation 100Hz, 3kHz, 10kHz	28, 29, 26dB
Channel difference 1kHz, 10kHz	−, 0, 0.8dB
Test tracking weight, loading	2g, n/a
LF resonance frequency, 11g arm	9.5Hz
Estimated compliance	17cu
Recommended arm mass/damping	5-15g, none
LF resonance rise, 11g arm	14dB
Typical selling price	£45, £69



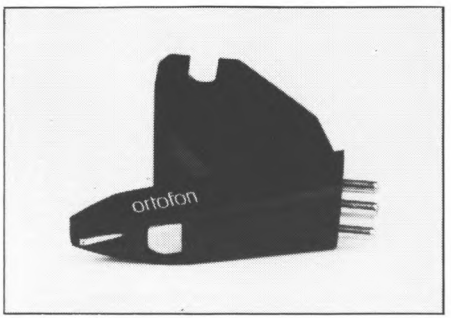
Frequency response (outside grooves). Left solid, right dash. X1



Frequency response (outside grooves). Left solid, right dash. X3

ORTOFON OM40

ORTOFON (UK) LTD, DENMARK HOUSE, TAVISTOCK INDUSTRIAL ESTATE, RUSCOMBE, TWYFORD, · ———BERKS RG10 9NJ. TEL: (0734) 343621——— ·



The *OM40* represents a natural extension at the top of Ortofon's optional mass range, wherein 2g or so of ballast may be removed so as to reduce the system effective mass by that much. In practice, most arms expect 4-10g cartridge masses, so few can take advantage of this facility. Concentrating the mass in mounting plate ballast rather than distributing it evenly does compromise structural integrity somewhat; midband body resonances have been detected in cheaper, less compliant *OMs*.

The diamond tip was a real quality item, comprising a low mass naked stone, well balanced, shaped and finished, cleanly fitted, and properly aligned.

Lab Report

High capacities give fine tracking margins, but restricts arm compatibility significantly, to below 9g effective mass with the weight on board, 11g if it can be removed. Electrical output matches moving magnet input sensitivities, but high capacitance (400pF) loading is recommended, and also gives the flatter response. The curve follows the usual pattern of a gentle falloff with rising frequency, and then recovery to a high frequency resonance; in the case of the *OM40* the moving mass is clearly low, and the bandwith impressively extended as a result. Separation figures were good enough, but the spectrogram (not shown) showed a broad deep symmetry between channels through the mid-band, and confirmed the extended mechanical bandwith.

Sound Quality

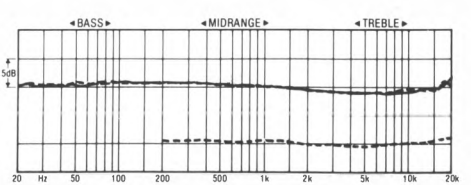
Some panel dissension resulted in an overall rating only just above average, but these are characteristics which should win many friends. Control was excellent throughout, with never a hint of approaching tracking limits. The sound was fairly open with good stereo, a little 'small' sounding but quite 'bouncy' nonetheless. However, it lacked a little in terms of power, sparkle and dynamics, somehow sounding coldly polite overall.

Conclusions

Revealing highly competent engineering throughout, the high compliance will restrict sensible applications somewhat, but the secure tracking and decent quality sound are major strengths.

Test Results

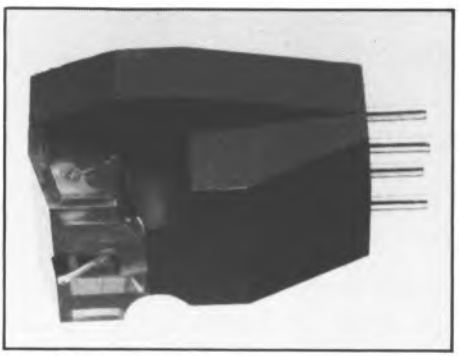
Type, mass	high o/p m-m, 4.5g (see text)
Stylus type	naked/detachable
Stylus tip geometry	fine line contact
Stylus finish/alignment	excellent/v good
Output Level (1kHz, 5cm/s)	3.9mV
Relative output (0dB = 1mV/cm/s)	−2dB
Tracking ability (L,R)	>80, >80μm
Distortion 300Hz (lat+9dB, vert+6dB)	−50dB/−37dB
Frequency response 100Hz-5kHz	+0.8, −1.2dB
Frequency response limits 30Hz-20kHz	+2, −1.2dB (see text)
Stereo Separation 100Hz, 3kHz, 10kHz	28, 33, 28dB
Channel difference 1kHz, 10kHz	0, 0.2dB
Test tracking weight, loading	1.5g, 400pF
LF resonance frequency, 11g arm	6.3Hz
Estimated compliance	33cu
Recommended arm mass/damping	3-8g, could help
LF resonance rise, 11g arm	16dB
Typical selling price	£69



Frequency responses (lower trace 400pF)

RATA RP20

RUSS ANDREWS TURNTABLE ACCESSORIES, EDGEBANK HOUSE, SKELSMERGH, CUMBRIA LA89AS.
TEL: (053 983) 247



The RATA *RP20* is built for Russ Andrews by Goldring, and in fact shares a common body with the Goldring *Epic*. The body design is inherently good, allowing tight mounting with a good contact area. Internal wiring differs from that of the *Epic*, as does the elliptical tip, which has a rather sharper profile. However, the inherent shape is good, if bulky. Stylus fit is pretty secure.

Compliance matches a sensible range of low- and medium-mass arms, but damping is light, so the heavier arms are better avoided.

LAB REPORT

The healthy output will drive amplifiers most efficiently. Claimed to be independent of loading capacitance, our sample still showed both measured and audible improvement when using high capacitance.

The response trace shows the treble flattening out at around 5kHz and then building up to a substantial peak on one channel, though the other channel is very impressively controlled. A slight 800Hz 'glitch' is visible, though the trace is nice and steady otherwise. Tracking abilities and groove stability seemed reasonable.

SOUND QUALITY

Marred by the distinctly audible treble peak on one channel (5dB difference between channels!), the sound was otherwise very promising for the price with good integration and low frequency solidity, and a clear dynamic midrange with the beginnings of fine stereo imaging. The 'sparkle' was a bit strong at the top of course, and tended to upset the imaging rather, but hopefully this is merely a sample problem.

CONCLUSIONS

Despite the treble problems of our sample, and now that body strength is improved, this model clearly merits recommendation. It offers an inherently rather better balanced sound than the *Epic* which justifies the slightly higher cost.

TEST RESULTS

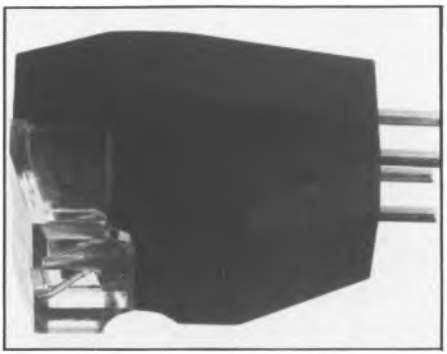
Type, mass	moving magnet 7.6g
Stylus type	simple elliptical
Stylus inspection result	confirmed neat mounting
Output Level (1kHz, 5cm/s)	3.55mV
Relative output (0dB = 1mV/cm/s)	−1dB
Channel balance	0.9dB
Channel separation (L,R)	28, 26.6dB
Tracking ability (L,R)	80, 80μm
Frequency response limits 100Hz-5Hz	+1, −2.5dB
Frequency response limits 30Hz-20kHz	+1, −3dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	26, 41, 27dB
Stereo Separation R on L 100Hz, 1kHz, 10kHz	19, 24, 27dB
Channel diff. from graph, 100Hz, 1kHz, 10kHz	1, 1, 0dB
Test tracking weight, loading	1.8g, 250pF
LF resonance frequency, 12.5g arm (vert, lat)	9, 9Hz
Estimated compliance (vert, lat)	15, 15cu
Recommended arm effective mass	6-14g
LF resonance rise, 12.5g arm (vert, lat)	15, 14dB
Typical selling price	£20

For graph references see issue No 43

RECOMMENDED

RATA RP40

RUSS ANDREWS TURNTABLE ACCESSORIES, EDGEBANK HOUSE, SKELSMERGH, CUMBRIA LA8 9AS.
TEL: (053 983) 247



The RATA cartridges are based on the budget moving magnet Goldring *Epic* mouldings, with rather better cantilever and styli, and some changes to the internal generator. The '40 is the middle of three models, eponymously priced.

Rather bulky and heavy, the body has full circular lugs and a generous mounting area for proper mechanical coupling to the headshell; the plastic is now strengthened, after our problem with cracking and crumbling on early samples. Stylus assembly fit is excellently tight.

Mechanically, it suits low and medium mass arms. Compliance is somewhat asymmetrical, and lightly damped. Tracking abilities were good, and channel balance close.

LAB REPORT

Frequency responses looked far from promising, falling a full 3.5dB to the 8kHz trough, then rising 5-6dB to an ultrasonic 19kHz peak. The addition of capacitance has little effect with this generator, reducing the trough depth a dB or so. The high quality mechanical design is reflected in the smooth traces with just a single 'glitch'.

Further evidence of this may be seen in the fine separation performance, which was also smooth, unusually well extended, and almost perfectly symmetrical, with values between 33 and 40dB steadily improving to unusually high frequencies.

SOUND QUALITY

The *RP40* was quite well received despite the recognised oddities of its response characteristic. Balance was determinedly 'heavy', yet with a slight 'edge' at high frequencies. Focus was quite good, and stereo spread excellent, with an impressive sense of scale. Good midrange and treble detail and decent dynamic resolution were also noted, as the '40 did a good job of sorting out the layers and complexity of the mix.

CONCLUSIONS

Behind the far from neutral balance, there is a fine cartridge doing its best, showing fine cantilever control at high frequences, with good stereo and detail as a result. Whether the balance is desirable or tolerable will depend to a degree upon the other bits of a system, but if this aspect works out, the *RP40* is an impressive contender, meriting cautious recommendation.

TEST RESULTS

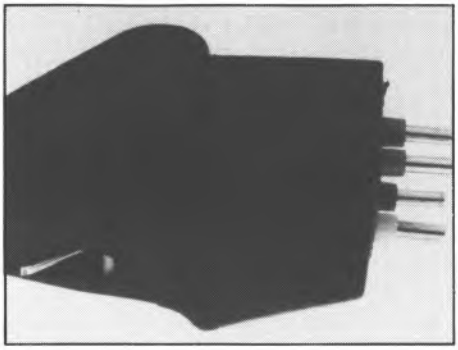
Type, mass	moving magnet 7.1g
Stylus type	elliptical
Stylus inspection result	good quality elliptical
Output Level (1kHz, 5cm/s)	3.7mV
Relative output (0dB = 1mV/cm/s)	−1dB
Channel balance	0.3dB
Channel separation (L,R)	28, 29dB
Tracking ability (L,R)	80, 80μm
Frequency response from graph, 100Hz-5Hz	+1, −2dB
Frequency response from graph, 30Hz-20kHz	+3, −3dB
Stereo Separation L on R 80Hz, 3kHz, 10kHz	34, 39, 39dB
Stereo Separation R on L 80Hz, 3kHz, 10kHz	33, 37, 40dB
Test tracking weight, loading	1.5g, 400pF
LF resonance frequency, (13.5g arm) (vert, lat)	10, 8Hz
Estimated compliance (vert, lat)	14, 20cu
Recommended arm effective mass	6-15g
LF resonance rise, (13.5g arm) (vert, lat)	12, 14dB
Typical selling price	£40

For graph references see issue No 43

RECOMMENDED

REGA RB100

REGA RESEARCH LTD, 119 PARK STREET, WESTCLIFF-ON-SEA, ESSEX SS0 7PD.
TEL: (0702) 333071



Plain and simple, this £38 moving magnet model is unusual in having a fixed stylus; in some senses it is built like a moving coil. The body has proper fixing lugs and decent headshell contact area, so the mechanical integrity of the whole is potentially superior to conventional m-m types.

Compliance on our sample was on the high side, suitable really only for low to medium mass arms, including Rega's own. Internal damping is fairly light, so nasty cheap turntables should be avoided. Some asymmetry was noted in the vertical and horizontal planes.

Electrical output is a little below average, though sufficient to drive any normal amplifier, but anyone attempting shop comparisons will need to advance the volume to avoid a misleading result.

LAB REPORT

Frequency response followed the unashamed downtilt favoured by a number of successful UK cartridges. Here the droop was a substantial 5dB from 200Hz to 10kHz, ameliorated by only a single dB with higher capacitance loading. Recovery to the treble resonance was a mild 2dB, at 18kHz. Despite the odd shape the trace was very smooth, showing fine control and channel balance even at high frequencies. An outstanding spectrum of separation was further evidence of excellent cantilever control; the bass started at 35dB and improved to a remarkable 40dB at 10kHz.

SOUND QUALITY

The Rega proved the hardest cartridge in the report to tie down subjectively. Our initial 'hands on' experience suggested that the *RB100* could hold its own with m-c models several times its price. But a later try-out in a different system and with two different samples raised a few doubts; then the 'blind' test results showed contradictory results between panelists and different tracks of the programme. The *RB100* may be unusually system-dependent; the balance is duller than average, and acceptability would seem to depend on how this combines with other components and the musical balances of different discs. At worst, a pleasantly 'laid back' and spacious balance becomes tiresomely dull.

CONCLUSIONS

A contrary design in some respects, the *RB100* has a remarkable mechanical performance for its price, with a balance that is as far from average — and 'neutrality' — as it is possible to be. In the right system context it is a potential 'Best Buy', but the wrong combination could be an absolute disaster. It merits recommendation, but with a stern 'try before you buy' warning.

TEST RESULTS

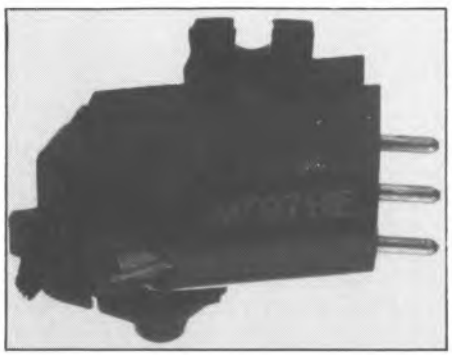
Type, mass	(fixed) moving magnet 5.9g
Stylus type	not specified
Stylus inspection result	good quality elliptical
Output Level (1kHz, 5cm/s)	2.8mV
Relative output (0dB = 1mV/cm/s)	−3dB
Channel balance	0.5dB
Channel separation (L,R)	25, 30dB
Tracking ability (L,R)	80, 80μm
Frequency response from graph 100Hz-5Hz	+1, −3dB
Frequency response from graph 30Hz-20kHz	+1, −4dB
Stereo Separation L on R 80Hz, 3kHz, 10kHz	36, 45, 40dB
Stereo Separation R on L 80Hz, 3kHz, 10kHz	35, 37, 39dB
Test tracking weight, loading	1.8g, 150pF
LF resonance frequency, 13.5g arm (vert, lat)	8, 6Hz
Estimated compliance (vert, lat)	20, 35cu
Recommended arm effective mass	5-12g
LF resonance rise, 13.5g arm (vert, lat)	13, 15dB
Typical selling price	£38

For graph references see issue No 43

RECOMMENDED

SHURE M97HE

HW INTERNATIONAL LTD, 3-5 EDEN GROVE, LONDON N7 8EQ.
TEL: 01-607 2717



Shure revived four favourite designs of the past for their 'Encore' series, and on the basis of work carried out in previous editions, the '97*HE* looked to be the 'one most likely to'.

This £40 moving magnet model features Shure's stabiliser/brush, which dampens the vertical low frequency resonance completely. The additional stability ensures that the '97*HE* will work stably in virtually any context, even in high mass arms, while the highish compliance provides adequate tracking abilities at the rather low 1g downforce.

Shure's 'Hyperelliptic' stylus profile (hence *HE*) is a form of swept ellipse. Excessive glue on our sample made it difficult to assess alignment or quality.

LAB REPORT

Response shows substantial variation with capacitance loading above 1kHz. The Shure recommendation of 250pF is about midway between the values we measured, and would appear a good compromise. The traces are quite smooth, with slight ripple but no 'glitches', and the 3dB discrepancy at very high frequencies is the only cause for mild complaint.

Separation was very good, giving high but asymmetric readings in the midband, which were well maintained into bass and treble.

SOUND QUALITY

Though regarded as inherently more tidy than exciting, the '97*HE* acquitted itself very respectably on the 'politeness' of the sound and neutrality of the balance, though focus, dynamics and the resolution of low level detail were a little weak. Some of the 'liveliness' of other presentations was missed, but stereo perspectives were clear and stable, and coloration, bar a touch of hardness, was low.

CONCLUSIONS

Though there remain reservations about the mechanical construction, the cantilever engineering is to a high standard, and the '97*HE* delivers a very respectable technical and sonic performance at a realistic price. The stabiliser undoubtedly works, acting as a safety net to help the cartridge get the most out of high mass arms. Though it won't turn a sow's ear of a turntable into a silk purse, it will at least keep going and produce a respectable result.

TEST RESULTS

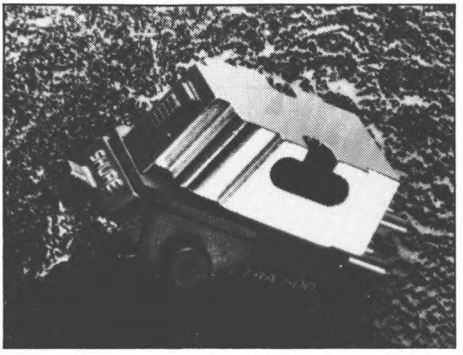
Type, mass	moving magnet 6.6g
Stylus type	nude hyperelliptical
Stylus inspection result	tip obscured by glue
Output Level (1kHz, 5cm/s)	4mV
Relative output (0dB = 1mV/cm/s)	0dB
Channel balance	0.4dB
Channel separation (L,R)	30, 30dB
Tracking ability (L,R)	80, 72μm
Frequency response from graph, 100Hz-5Hz	+1, −1.5dB
Frequency response from graph 30Hz-20kHz	+1, −3dB
Stereo Separation L on R 80Hz, 3kHz, 10kHz	32, 42, 36dB
Stereo Separation R on L 80Hz, 3kHz, 10kHz	38, 51, 37dB
Test tracking weight, loading	1g*, 250pF
LF resonance frequency, 13.5g arm (vert, lat)	9*, 6Hz
Estimated compliance (vert, lat)	16, 35cu
Recommended arm effective mass	5-15g
LF resonance rise, 13.5g arm (vert, lat)	10*, 16dB
Typical selling price	£40

*excluding stabiliser, see text

For graph references see issue No 43

SHURE ULTRA 500

HW INTERNATIONAL LTD. 3-5 EDEN GROVE, LONDON N7 8EQ.
·———TEL: 01-607 2717———·



The *Ultra 500* bristles with specific engineering features, including the telescopic beryllium tube cantilever, the 'ridged' stylus profile, advanced laminated magnetic generator structure, and a Dynamic Stabiliser.

One major departure for Shure is the comparatively heavy metal body which is engineered to give a firm headshell fit. However, the lugs might have finished the job by completing the circle. And there is inherent flexibility in any detachable stylus assembly, despite careful engineering.

LAB REPORT

Results were generally good, and impressively consistent whether or not the stabiliser was used. However, despite careful installation alignment, separation only just bettered 25dB on one channel (1kHz), though it exceeded 30dB on the other.

Tracking ability comfortably exceeded our measurement limit, though the horizontal compliance is a little on the high side for medium mass arms. The response seemed impressively flat.

SOUND QUALITY

In the auditioning system context, the *Ultra 500* probably started at a slight disadvantage, but acquitted itself very respectably, the tracking security giving audible benefits. The stereo image seemed a little narrower than with expensive moving-coil models, the soundstage more closely confined to the loudspeaker enclosures.

Overall balance was attractively 'lively', a little forward perhaps, but well-focused. Treble showed fine control, with no 'splash' and very little 'smear', if not perhaps as 'fast' as some. Low frequencies were uncoloured and quite well extended, though there did seem some lack of 'weight' and a reduced sense of scale in the total presentation.

CONCLUSIONS

There is no doubting the accomplishments of what could well be the finest moving-magnet cartridge around. Whether they are sufficient to justify the high asking price is harder to judge. For those for whom tracking ability and control are major priorities, the *Ultra 500* is well worth considering.

TEST RESULTS

Type, mass	moving magnet, 9.3g
Output Level (1kHz, 5cm/s)	3mV
Channel balance	0dB
Channel separation (L,R)	25.6, 30dB
Tracking ability (L,R)	80, 80μm
Frequency response limits 1kHz-15kHz	+1, −1.5dB
Frequency response limits 1kHz-20kHz	+1, −1.5dB
Test tracking weight, loading	1.7g (total), 250pF
LF resonance frequency, 12.5g arm (vert, lat)	9*, 7Hz
Estimated compliance (vert, lat)	20, 27cu
Recommended arm effective mass	6-14g
LF resonance rise, 12.5g arm (vert, lat)	15*, 16dB
Typical selling price	£452

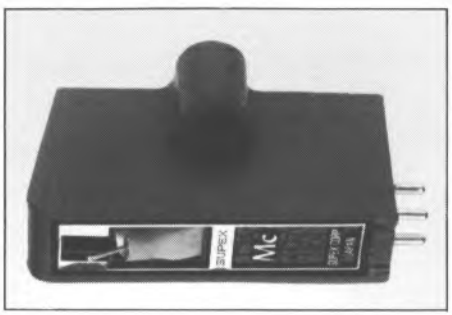
**This resonance removed when stabiliser is used.*

First reviewed: The Collection 1986

RECOMMENDED

SUPEX SD900 IV AND SD901 IV

RUSS ANDREWS TURNTABLE ACCESSORIES, EDGE BANK HOUSE, SKELSMERGH, KENDAL, CUMBRIA, LA8 9AS. TEL: (053 983) 247



Very much old favourites, the Supex *900* and *901* are now in the MkIV versions. The former low output and the latter high output are moving-coil models.

LAB REPORT

The *900*'s frequency response kept within fairly close limits, though a 2.5dB downtilt starts at around 200Hz and bottoms out at 5kHz. A mild 1dB recovery is centred upon 10kHz, with a slightly uneven but well balanced continuation beyond. The *901* was very similar though a little brighter and with a more pronounced peak in the treble region. The downtilt was held to around 2dB, and the recovery at 9kHz made up the same amount. Channel balance was outstanding throughout, even above the treble peak.

SOUND QUALITY

Earlier *900* versions have sailed through listening panel tests often enough and we were surprised that the new *900 IV* was not better received. Criticisms on this occasion were of a tendency to dullness and slowness, with some bass softening. On the other hand, the *901* received plaudits like 'exudes authenticity'. A degree of 'boom 'n' tizz' was criticised, but there was praise for mid and treble detail, for space and ambience, and the ability to maintain resolution well down into the mix. Not everyone was completely convinced, and there was felt to be some room for improvement in the bass, which showed mild tracking problems and was a little 'sluggish', but on balance the *901* gave a fine overall performance.

CONCLUSIONS

The Supex *900* is an inherently fine cartridge, but despite the recent update it does seem to be beginning to show its age. The *901* delivered sufficient objective and subjective performance to justify its price tag, and the (fairly) high output allows it to provide high quality moving-coil performance for systems without m-c gain where a separate step-up would be an intrusion.

TEST RESULTS

SUPEX SD900 IV

Type, mass	low output moving coil, 8.3g
Stylus type	vital elliptical
Stylus inspection result	fine super ellipse
Output Level (1kHz, 5cm/s)	0.19mV
Relative output (0dB = 1mV/cm/s)	2.2dB
Channel balance	0.1dB
Channel separation (L,R)	29, 29dB
Tracking ability (L,R)	80, 72μm
Frequency response limits 100Hz-5Hz	+2, −1.5dB
Frequency response limits 30Hz-20kHz	+2, −2dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	45, 750, 750dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	750, 47, 750dB
Test tracking weight, loading	2g, n.a.pF
LF resonance frequency, 12.5g arm (vert, lat)	10, 10Hz
Estimated compliance (vert, lat)	12, 12cu
Recommended arm effective mass	10-18g
LF resonance rise, 12.5g arm (vert, lat)	14, 15dB
Typical selling price	£286

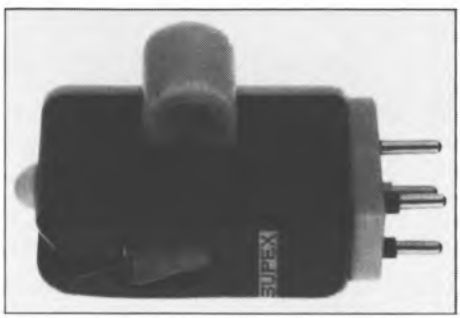
SUPEX SD901 IV

Type, mass	high(ish) output moving coil, 9.1g
Stylus type	vital advanced elliptical
Stylus inspection result	quality vital, marred by glue
Channel separation (L,R)	30, 24dB
Tracking ability (L,R)	60, 75μm
Frequency response limits 100Hz-5Hz	+1.5, −1dB
Frequency response limits 30Hz-20kHz	+1.5, −2dB
Stereo Separation L on R 100Hz, 3kHz, 10kHz	30, 51, 39dB
Stereo Separation R on L 100Hz, 3kHz, 10kHz	36, 50, 33dB
Test tracking weight, loading	2g, n.a.pF
LF resonance frequency, 12.5g arm (vert, lat)	9, 9Hz
Estimated compliance (vert, lat)	14, 14cu
Recommended arm effective mass	0-10g
LF resonance rise, 12.5g arm (vert, lat)	18, 18dB
Typical selling price	£286, £302

For graph references see issue No. 43

SUPEX SDX2000

RUSS ANDREW'S TURNTABLE ACCESSORIES, EDGE BANK HOUSE, SKELSMERGH, KENDAL, CUMBRIA LA8 9AS. TEL: (053 983) 247



Latest moving-coils from Supex are the high-and low-output *SDX2000* models. Fine mechanical construction with solid lugs and a good contact area ensure secure mounting. Stylus is the usual high quality Vital, again rather over-glued in this instance.

Compliance is quite low, but so is the mass, so a fairly wide range of arms may be used, with preference for strong rigid types. Tracking is a little marginal for some tastes in music, and considering the sensible 1.8g downforce.

LAB REPORT

The low-output *2000*'s frequency response is very flat and quite smooth, showing a less exaggerated downtilt and recovery, with very good control and channel balance up to ultrasonic frequencies. The high-output response was almost identical, but with each of the other's flaws slightly exaggerated. In addition there were a number of response 'glitches', perhaps due to the greater number of internal wire turns. Though inevitably not quite up to the low-output's standard, it is a fine result nonetheless. Separation was fine.

SOUND QUALITY

Reception to the *2000* was rather mixed, though generally positive. The sound was described as rather on the bright side, notably 'quick' at mid and high frequencies, yet with a heavy slightly 'sluggish' bass, which somehow seemed to lack the expected tension and power. The soundstage was big and open, with good detail and without exaggeration of surface noise. In all it sounded lively, but not entirely integrated across the spectrum.

For some reason the reaction of the listening panel to the high-output *2000* was the more positive. Treble balance was quite neutral in relation to CD (though sonically substantially preferred). Which means it is a touch on the bright side, but with additional weight and richness at the bottom end. The treble sounded sweet and fast, the midrange coherent and detailed, surface noise was controlled, but bass definition was thought not quite right.

CONCLUSIONS

Distinguished from the 'low' version by the uniqueness of a high-output option within the context of a top up-to-date moving-coil design, the *2000* 'high' merits consideration. It doesn't match the best of the low-output designs sonically, and there may be some conventional inputs which need a little more urge than it can provide. But it is a pukka modern m-c, 'faster' than the *901*, and therefore has its own unique niche.

TEST RESULTS

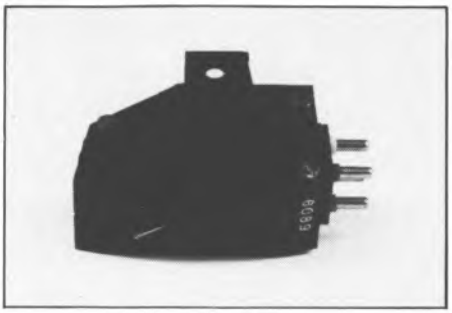
Type, mass	high output moving coil, 4.8g
Stylus type	vital line contact
Stylus inspection result	Fair quality vital, rather gluey
Output Level (1kHz, 5cm/s)	1.1mV
Relative output (0dB = 1mV/cm/s)	−10dB
Channel balance	0.4dB
Channel separation (L,R)	30, 30dB
Tracking ability (L,R)	79, 66μm
Frequency response limits 100Hz-5kHz	+1, −0.5db
Frequency response limits 30Hz-20kHz	+1, −0.5db
Stereo Separation L on R 80Hz, 3kHz, 10kHz	34, 52, 33dB
Stereo Separation R on L 80Hz, 3kHz, 10kHz	36, 48, 33dB
Response limits ref computer mean, 1kHz-15kHz	+2, −0dB
Response limits ref computer mean, 1kHz-20kHz	+5, −0dB
Test tracking weight, loading	1.8g, n.a.
LF resonance frequency, 13.5g arm (vert, lat)	10, 9Hz
Estimated compliance (vert, lat)	14, 18cu
Recommended arm effective mass	6-16g
LF resonance rise, 13.5g arm (vert, lat)	13, 14dB
Typical selling price	£582, £527

For graph references see issue No. 43

RECOMMENDED

VAN DEN HUL MC ONE/MC10

AUTOMATION SCIENCES CO, 20 LITTLE GADDESDEN, BERKHAMSTED, HERTS, HP4 1PA.
TEL: (044 284) 2786



The arrival of the original MC*10* a year ago was a particular ray of sunshine in a none too exciting batch of new cartridges. It cost a packet, and was a mite temperamental, but pushed some of the limits just that little bit further than its rivals. Now the '*10* has been uprated to a (slightly) higher output, and it has been joined by an even tighter specified model based on the same body, designated MC *One*. Both share the same body (with the Empire MC*1000* besides), so the reviews of the two vdH's are combined. And there is talk of a £1,200 *Grasshopper* skeleton model to come (for *The Collection?*) — which should make light work of your precious thorn needles!

Dutchman A. J. van den Hul has had a major influence on stylus and cartridge design (not to mention cable research), the cartridges bearing his name arising out of work done with Empire in Europe a few years ago. The cartridge body is screwed metal, with small circular tapped fixing lugs (which could still use nuts if you strip the thread). Mechanical integrity is pretty sound, and headshell fixing should be tight and secure, with a reasonable contact area.

Mechanically the generators were similar but not identical. Both are well damped internally, and the '*10* was the more compliant, though both will prefer low or medium mass arms. The shorter coils inside the *One* are reflected in a mite less output, but both have plenty for a normal moving-coil input. Inevitably, and mercifully, both were fitted with high quality tips — though ironically our *One* sample had a ridged stylus profile. We understand that normal production will carry the expected top vdH tip.

LAB REPORT

Tracking margins were adequate, but with little in hand, and even a little marginal on the '*10*. The frequency responses are smooth and fairly flat, the *One* dipping 2dB instead of the '*10*'s 1.5dB in the presence band. The *One* is both smoother and slightly better extended at high frequencies. Separation actually measured slightly better on the cheaper '*10*, but this was probably also partly due to asymmetry, and neither gave exceptional results.

SOUND QUALITY

Both cartridges rated very good on listening, but the preference for the *One* was quite distinct. The '*10* is a fine, neutral, balanced performer, with a transparent midrange, fine depth and focus, firm extended bass but a slight treble 'sheen'. The *One* extended all the positive qualities of the '*10*, adding greater authority, weight and scale. The transparency extended further up into the treble, and the overall sound was significantly livelier and more dynamic. Focus was sharper, yet fine control and neutrality was retained.

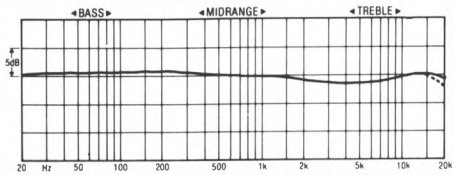
Conclusions

These two cartridges are both very expensive, yet both justify firm recommendation for the high quality sound and performance for those seeking sound of the very highest quality. The *One* sounds so clearly better than the *'10* that the latter now slips into its shadow: frankly, if you have £600 to blow on a cartridge, you'd be crazy not to spend £200 more. And we await with eager anticipation the prospects of a *Grasshopper* skipping around our grooves!

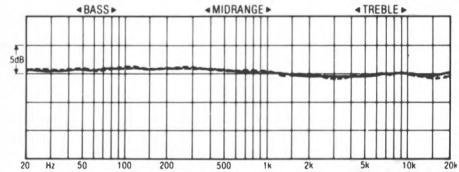
Test Results

(MC10 in brackets)

Type, mass	low o/p m-c 7.5g
Stylus type	naked, fixed
Stylus tip geometry	vdH line contact
Stylus finish/alignment	excellent (good)
Output Level (1kHz, 5cm/s)	0.43 (0.45)mV
Relative output (0dB = 1mV/cm/s)	−22.5 (−19.5)dB
Tracking ability (L,R)	80, 75 (71, 68)µm
Distortion 300Hz (lat+9dB, vert+6dB)	−48/−33 (−54/−35)dB
Frequency response limits 100Hz-5Hz	+1, −0.4dB (−0.5)dB
Frequency response limits 30Hz-20kHz	+1, −0.4 (−0.5)dB
Stereo Separation 100Hz, 3kHz, 10kHz	27, 32, 23 (29, 32, 28)dB
Channel difference 1kHz, 10kHz,	0, 0.1 (0.1, 0.05)dB
Test tracking weight, loading	1.6 (1.5)g, n/a
LF resonance frequency, 11g arm	8 (7.3)Hz
Estimated compliance	18 (24)cu
Recommended arm mass/damping	6-12 (5-10)g, none
LF resonance rise, 11g arm	13dB
Typical selling price	£799, £599



Frequency response (outside grooves). Left solid, right dash. (MC One)



Frequency response (outside groove). Left solid, right dash (MC 10).

DEALER GUIDE

DEALER GUIDE

SUMMARY REVIEWS: CARTRIDGES

This book includes as many complete test reports as possible. Many other cartridges were tested for earlier editions but space no longer allows us to print these in full: they are summarised here.

Every model here has been subject to lab measurement and listening tests; these brief reviews cover the main test findings and give system matching guidance as well as comparative ratings on sound quality. All cartridges are moving — or induced — magnet types of normal output unless otherwise described; moving-coil types described as 'high output' will usually be suitable for use with standard ('mm') phono amplifier inputs. Figures in brackets at the end of each review are: Cartridge mass in grams; vertical compliance in 'compliance units'; and test tracking weights in grams.

ADC TRX1 (£80)

Differing in construction from the Phase range, the *TRX 1* has a nude Vital II superelliptical tip and tapered titanium cantilever. A screw locks the stylus assembly to the alloy body. Response showed some uptilt above 7kHz, the sound was bright and 'tinkly', with a slightly softened 'rich' bass and hence a tendency to the classic hi-fi 'boom 'n' tizz' role. Exciting, if a little fierce at times, the relentlessness of the upper treble may in fact endear it to certain tastes and systems. (6.5g, 18cu, 1.2g).

ADC TRX II (£120)

With a tapered beryllium cantilever, the *TRX II* has a Vital III tip, and higher compliance than the 'I. The treble rise was less pronounced but still noticeable, with such comments as 'fiercely exciting'. Midrange focus and dynamics were liked, but bass was a trifle 'plummy'. Though competent enough, this seemed insufficient to justify the highish cost. (6.5g, 30cu, 1.2g).

Audionote IO2vdH (£750 + c£300 transformer)

As unusual as its extravagant price might suggest, the silver-wired *IO2* is a very heavy moving-coil design of very low output, probably necessitating one of the special optional transformers. The body is superbly rigid, while the generator shows some asymmetry and heavy vertical damping. High quality medium-to-high mass arms should be used. Tracking abilities were a little limited but the sound was eminently listenable, with exceptional and relaxing midrange detail and 'space'. Definitely one variation on the current state of the cartridge art, the *IO2* is capable of delivering the goods in the right system context. (18g, 6/14cu, 2g).

Audio Technica AT105 (£13)

This budget magnetic cartridge is similar in most respects to the *110E* (see full review), including LC-OFC wiring. Mechanical construction is sound, with good tonearm (6-16g) and amplifier compatibility. Low frequencies sounded fine while the treble was a little 'shut in'; overall performance was very good for the price. (7.2g, 13/15cu, 2g).

Audio Technica AT 115E (£27)

Similar to the *110E* (see full review), the *115E* is mechanically sensible, with good amplifier and tonearm (5-16g) compatibility. Sound quality was clear and detailed but on the 'heavy' side, and the performance overall seemed somewhat behind the *110E*. (7.2g, 15cu, 1.5g).

Audio Technica AT320XEII (£50)

This recommended high output moving-coil model has a detachable stylus assembly. It sounds better than it looks, having an impressively refined generator, giving a decent 'laid back' sound quality and suits arm masses 6-18g.

Audio Technica AT140ML (£96)

High priced amongst moving magnet models, the ML refers to a ridged contact stylus. Headshell fixing was disappointing but the detachable stylus assembly made a good fit. Highish compliance indicates low-to-medium mass arms (6-12g) are to be preferred, as is a low capacitance amplifier input. Lab tests showed a significant in-band treble resonance, which dominated the sonic descriptions. This was qualitatively quite liked, but is still too much of an aberration for the elevated price of a generally undistinguished model. (6.5g, 25/20cu, 1.25g).

Audio Technica AT33ML (£227)

This bulky low-output moving-coil cartridge has

a garish gilt finish, gold-plated beryllium cantilever and ridged stylus. Mechanically sound, low/medium compliance suits a broad range of tonearms (6-15g), while electrical output is more than sufficient for any moving-coil amplifier input. Technically competent, the sound was strong on excitement and energy, but lacking a little control and discipline in the extreme bass and treble. Overall this is a high quality cartridge, priced a little on the high side. (6.8g, 16cu, 1.5g).

B&O MMC5 (£17, calibrated £19)

Cheapest of the B&O series, the '5 is specified as being less compliant than the other B&O models, though we consistently found the same resonant frequency (therefore the same compliance) throughout; compliance is necessarily high, to suit the ultra-low mass B&O arms. The elliptical stylus, on a straight aluminium cantilever, has slightly greater tip mass than the more expensive models, and tracking weight range is higher. Frequency response showed a smooth treble region, slightly depressed by 1-2dB. Well controlled, the sound had good focus and energy, but was somewhat lacking in bass. (3.3g, 24cu, 1.5g).

B&O MMC3 (£33, calibrated £47)

The '3 has a nude elliptical stylus on a tapered aluminium cantilever; measured results were virtually the same as other models in the range. Sound quality was a little 'laid back', the treble unobtrusively dropping away, midrange pleasantly enhanced and bass controlled if a little 'soft'. A respectable performer for the price, it remains better suited to B&O rather than universal application. (3.5g, 24cu, 1.2g).

B&O MMC2 (£46, calibrated £68)

Sharing the sapphire-tube cantilever of the *MMC1*, the *MMC2* differs mainly in having a larger (0.12mm/0.1mm) stylus shank. Response and sound quality continued the family resemblance, with soft but controlled bass, low coloration, sweet treble and subjectively good dynamics. Well-engineered, the '2 offers only a modest improvement over the cheaper models, performance again apparently limited by the mechanical compromise of the plug-in adaptor. (3.3g, 24cu, 1.2g).

Denon DL160 (£70)

Very closely related to the *DL110* (see full review), the *DL160* is coloured blue and has a smaller tip. Lab tests found the two models almost indistinguishable, and listening showed a slight preference for the cheaper *'110*. Overall, the *DL160* is a thoroughly competent high output moving-coil model. (4.8g, 18cu, 1.6g).

Dynavector DV23RS (£150)

With Dynavector's famous ruby cantilever, this low-output (0.21mV) moving-coil has quite low compliance, with different but quite highly-damped lateral and vertical LF resonances. Rigid arms in the range 8-18g should be best, though virtually any arm would be usable. Response was very flat. Sound quality was not particularly favoured, described as somehow 'shut in', lacking energy and sparkle but with some HF edginess. (5.3g, 16cu, 1.5g).

Empire MC-5M(£89)

This is a Glanz-sourced low output m-c model with detachable stylus assembly. It sounds 'bouncy' and 'lively', almost in the manner of Deccas, with similar tendencies towards aggression. It suits arms in the 6-15g range, and merits recommendation.

Glanz MFG 110EX (£22)

This modestly priced recommended moving magnet model gave reasonable lab results and rated an impressive 'average' in 1985 listening tests. It sets no new records, but is a solid balanced performer. Arm mass range 6-16g.

Goldring 1010 (£30)

Mechanically this Goldring model appears quite sound, with wide tonearm compatibility (8-16g) but some generator asymmetry. The response was flat and extended with low capacitance loading, but showed a broad 2dB treble peak with higher loading. Listening test results were disappointingly negative for a design which 'looks right' in many respects. (6g, 14/20cu, 1.8g).

Goldring 1020 (£45)

Almost identical to the *1010*, the *1020* features a van den Hul Type II stylus tip, and turned in a very similar overall performance — right down to the disappointing results on audition. (6g, 14/20cu, 1.8g).

Goldring 1040 (£70)

This top model in Goldring's 1000 series has the often much more expensive luxury of a van den Hul Type I tip, and this was reflected in the improvements in high frequency extension and control. Again the promising recipe turned out a disappointment in the listening tests, however. (6g, 14/20cu, 1.8g).

Goldring Electro II (£82)
This medium price high output moving-coil model has a high mass due to the substantial, rigid metal mounting plate which gives good headshell contact. Lowish asymmetric compliance suggests medium-to-high mass arms (8-16g) while a lower than usual output might fall short of the requirements of less sensitive amplifiers (though this is unlikely). The response showed a determined downtilt with some high frequency uneveness, while the sound was considered decent enough but not exceptional. (9g, 7/13cu, 1.8g).

Goldring Electro 11LZ Boron (£120)
With boron cantilever and van den Hul stylus, the *11LZ* is a low-output (0.19mV) moving-coil design. Our sample showed very low vertical compliance, with lateral compliance much higher; medium to heavy arms are to be preferred though it is difficult to avoid one or other of the (quite well damped) resonances occurring too high or low for comfort. The sound was well balanced but lacked low-frequency authority, midrange focus and 'punch'. In all, a decent enough cartridge, but any improvement over the cheaper *11* was not thought sufficient to justify the higher price. (9g, 5cu, 1.8g).

Grado M1 (£125)
This high priced moving magnet model is visually virtually indistinguishable from the cheaper Grado models (see full reviews), albeit showing better high frequency control. Hum-prone applications should be avoided, the lack of damping places a premium on turntable performance, and medium-to-highish mass arms (8-16g) are to be preferred. Unaffected by different amplifier loading, the good sound was a bit rich and heavy, with some treble 'tizz'. (5.5g, 12/17cu, 1.5g).

Highphonic HCA3 (£280)
This beautifully finished low output moving-coil model comes from a spin-off company founded by ex-Denon engineers, and is built on a rigid alloy base. High compliance confers exceptional tracking abilities but restricts application to lower mass arms (5-12g), while very low output might be insufficient for some moving-coil amplifier inputs. Fine technical performance was reflected in an uncoloured sound with very sweet treble, but some 'brightness'. (6.6g, 20/38cu, 1.1g).

Kiseki Purpleheart Sapphire (£595)
Exquisitely finished to match its extravagant price tag, the Purpleheart Sapphire is a low output moving-coil model of good mechanical integrity. Compliance is on the high side, so low-to-medium mass arms are the best bet, but heavy internal damping should take care of any mismatch problems. However, this damping plus the high internal impedance have also probably combined to 'slow down' the sound a little, though it was still liked for its sweetness, spaciousness and lively presentation, and may be well suited to a particular application where the damping is beneficial. (7.5g, 18cu, 2.25g).

Mission 773HC (£150)
Built to Mission specification by Dynavector in Japan, this successful moving-coil design has undergone several changes during its long lifetime; originally a 'high output type', its present output of around 0.22mV definitely needs an 'mc' amplifier input. Medium mass arms are best suited, but the cartridge is flexible in this respect. With a substantially flat frequency response, the *773* showed good dynamics, lowish coloration, good focus, delicacy, and 'air'. Perhaps not rivalling the very top designs in 'life' and transparency, it was thought sufficiently well balanced and competitively priced to merit recommendation. (8.2g, 14cu, 0.22mV).

Monster Alpha 2 (£479)
This fine Japan-sourced low output moving-coil cartridge has a 'ridged' stylus and sound mechanical construction, with a highish compliance suited to low-to-medium mass arms (6-14g). Technical and sonic performance both achieved high standards, though not perhaps sufficient to justify the very high price. (6.5g, 17/27cu, 1.75g).

NAD 9100 (£12)
Built by ADC, the *9100* offers a modest specification and spherical stylus. Frequency response was fairly well extended and a touch brighter than usual; subjectively, it was bright and 'bouncy', if a little relentless at the top end. Rather 'fizzy' and aggressive, dynamic if rather coarse in the treble, it scored a 'Best Buy' rating. (5.8g, 12cu, 2g).

NAD 9200 (£26)
Another NAD variation by ADC, the *9200* has a low-cost diasa-type elliptical stylus. Compliance sensibly matches arms in the 6-19g range. Frequency response showed an even but

determinedly dim treble; listening tests gave rather negative results, the sound described as unexciting, lacking body and a little coarse, listeners tending to prefer the *9100*. An undistinguished contender. (5.8g, 18cu, 1.2g).

Ortofon OM5E (£14)

The cheapest model in Ortofon's *OM* series has much in common with its more expensive variants (see full reviews). Despite evidence of technical competance and wide arm compatibility, the sound was not well rated, and the extra cost of the *OM10* was felt well worthwhile. (2.5/5g, 18cu. 1.8g).

Ortofon VMS5E II (£14)

Despite its low price, the *VMS5* still has an elliptical stylus. The moderate compliance suits arms 8-18g, while tracking is good. Sound quality showed some 'swing' and 'pace', but was also thought rather untidy, though fair enough for the price. (5g, 16cu, 2g).

Ortofon VMS10E II (£21)

With a simple elliptical stylus (designated 'E'), the *VMS10* suits arms from 6-16g, though the measured tracking performance was not particularly good. Frequency response showed a 200Hz-7kHz droop which was not completely eliminated by the recommended 400pF capacitance loading (this can be achieved in most cases by adding Ortofon's neat little *CAP210* device which clips between the cartridge pins). Described as rather ordinary, the sound was slightly 'bright' and 'obvious' in the treble, due rather to coarsening of detail than to any response imbalance; some recent similarly-priced models, including Ortofons, fared rather better. (5g, 18cu, 2g).

Ortofon VMS20E II (£35)

One of the most popular cartridges ever, the *VMS20* has an unspecified elliptical tip, tracking at a low 1g with a highish compliance. Arms of effective mass 5-10g are suitable. Frequency response was smooth, while sound quality was described as generally 'laid-back', rather more 'tinkly' and less stable than the *'10*. (5g, 35cu, 1g).

Ortofon VMS30E II (£52)

Top model in the VMS series, the *'30* has a 'fine line' stylus and fairly high compliance, suiting arms of 5-13g effective mass. Frequency response loaded with 400pF showed a gentle downtilt; with low capacitance, the 18kHz peak reached 3.5dB above the 8kHz level. Subjectively, the *VMS30* proved a capable relaxed performer with fine stable stereo, yet it lacked the ability to generate excitement. Bass tended to be rather 'plummy' and dynamic discrimination weak. The over-damped, rather lifeless VMS sound now shows its age in modern high-performance players; nevertheless, there are still turntables which benefit from such good control of potential bass problems. (5g, 20cu, 1.3g).

Ortofon MC2000 (£450, transformer £400 extra)

This prestige model has a body of solid aluminium and can be very firmly mounted. The expensive silver-wired transformer is needed to step up its exceptionally low output (−40dB) to match normal inputs. Response was remarkably flat, and separation well maintained at HF. On listening, low overall coloration tended to highlight the suppressed 10kHz resonance; treble detail was described as 'etched','up-front', and inclined to be 'fierce' and 'aggressive'. The sound also seemed slightly 'cold' and 'clinical' overall, with some lack of 'bounce' in the lower mid. A strong performer, there are few grounds on which to fault this model, except the extra expense of the transformer; the remarkable damping means almost universal arm compatibility, while the problem of system matching is primarily one of accommodating the *MC2000*'s slight 'glare'. (11g, 24cu, 1.5g).

RATA RP70 (£70)

This top RATA model is visually identical with the cheaper *'20* and *'40* (see full reviews), but fitted with a high quality Vital stylus. Mechanical construction is good, compliance suits a sensible range of arms (6-14g), and performance is generally sound, albeit with a downtilted response which reflects in the subjective balance. Cleaner and sweeter than the *'40*, it also sounded heavier and less lively, the overall rating being similar. (7.1g, 14/20cu, 1.5g).

Shure M92E (£15)

Now rated 'worth considering', due to the inherent limitations of the universal/P-mount adaptor, this model still merits recommendation for *T4P* applications. Though lacking depth, the overall sound balance was good, though treble was not its *forte*. Arm mass range 10-15g.

Shure ME75ED (£22)

Shure's *M75ED II* was almost 'the' hi-fi cartridge for cost-conscious enthusiasts in the mid 1970s,

though by 1977 the competition was catching up and that year's *Choice* review was not very favourable. Revived as an 'Encore' model, and tested in the 1984 edition, the *'75ED* showed a 'splashy' sound quality due to its HF resonance, which gives a bright-sounding extreme top end above a 'laid-back' presence band. Bass was reasonably coherent if somewhat softened. Although competent, it shows its age sonically. (6.4g, 11cu, 1.25g).

Shure M99E (£24)

Resembling the cheaper *'92E*, the *M99E* has higher compliance and will best suit arms of 5-10g effective mass, though the strong damping will minimise any mismatch. Response was consistent, with a 2dB mid/treble suckout. Sound quality was clean and controlled with 'crisp' low frequencies, but not particularly exciting. (7.4g, 15cu, 1.25g).

Shure M104E (£29)

This is a T4P or 'P-mount' plug-in design; conventional two-bolt mounting is via a structurally poor adaptor, which caused a glitch in the frequency response at around 200Hz. It sounded quite lively and 'punchy', though lacking real weight. Bass was quite articulate, mid a trifle recessed, stereo depth flattened; overall, not a substantial improvement on the *M92E*. (7.4g, 15cu, 1.25g).

Shure M105E (£45)

Moving up the range, this P-mount-adaptable model features Shure's damper/brush, is fitted with an elliptical stylus and tracks at 1.25g. Quite high compliance figures indicate low mass arms (6-12g) but the damper effectively negates the vertical resonance while damping the horizontal one, so precise arm matching becomes less essential. Frequency response showed a gentle treble downtilt reaching −3dB at 15-18kHz, and higher load capacitance helped lift output here. Sound quality was not all that well received, a slightly 'spitty' sound lacking deep bass and dynamic contrast, but with stability and good control. This cartridge can be used in virtually any system, where it will perform unobtrusively and innocuously, with a balance that will suit many component combinations admirably. (7.4g, 22cu, 1.25g).

Shure M110HE (£55)

With 'Hyperelliptical' stylus tip, less damping and higher compliance than the cheaper Shures, this P-mount/adaptable model suits 5-15g arms. Frequency response showed a depressed treble above 12kHz; sound quality was thought eminently presentable but unexciting, with smooth, clear high frequencies but some boom and loss of definition in the bass. (7.4g, 20cu, 1.25g).

Shure M111HE (£67)

Similar to the *M110HE*, the *M111HE* is again quite compliant, but effects on arm-cartridge stability are minimised by the 'Dynamic Stabiliser' damper/brush. Sound quality was not, in our view, sufficiently good to justify the price.

Shure ML120HE (£95)

Resembling the *'140HE*, this model has slightly lower compliance but still has a nude 'HE' tip. The sound was quite well liked, clear, detailed and dynamic, if a little uncertain at low frequencies and with slightly 'exposed' treble; well balanced, but bettered by the *'140*.

Shure ML140HE (£120)

This advanced moving magnet design has sensible compliance plus an optional built in damper permitting any arm to be used. Frequency response was very smooth, downtilting with low capacitance loading and flat to 10kHz at higher loading. Sound quality was well liked, if slightly 'bright' subjectively, and the overall performance seemed very well balanced. (4.5g, 15/16cu, 1g).

Shure V15 VMR (£140)

Latest in the long *V15* series, this Shure model pioneered the 'ridged' line contact stylus. Lab results were close to those of the *M140HE*; on listening tests, depth seemed a trifle compressed, the powerful bass was a little 'plummy' and the treble has a slight 'lispy' quality. Despite a fine midrange quality, the overall effect was a lack of 'energy', and slightly 'shut in' sound. In most respects the newer *ML140HE* was preferred. (6.6g, 24cu, 1g).

Supex SM100E (£92)

A conventional-looking moving magnet design,

arms 6-15g are suitable. Stylus is a simple elliptical, of indifferent polish on our 1984 sample. The sound is lively and well integrated, but marred by the HF resonance peak 'tinkle', quite audible on a full range system. This aside, it delivers as much musical information as many moving coils, the bass in particular having an attractive 'bounce', if limited extension. Rather idiosyncratic, it remains worth considering. (7g, 17cu, 1.5g).

Talisman A (£242)

This aluminium-cantilevered Talisman is a low output moving-coil of good mechanical integrity and sensible compliance for matching a broad range of arms. Frequency response was smooth and extended, the sound balance was on the 'heavy' side, with a touch of 'tizz', and the overall performance good, but not exceptional for the price. (6.3g, 18cu, 2g).

Talisman S (£314)

A low output m-c very similar to the A in many ways, the S is distinguished by textured gold finish, a sapphire cantilever, and a frequency response that was noticeably 'bright' at high frequencies. However, despite the excess the treble quality was well liked, and the cartridge considered sweet and easy to listen to. (6.3g, 18/15cu, 2g).

Talisman Alchemist IIIS (£449)

This model uses 'focused field' techniques to produce high output from a moving-coil generator system otherwise similar to that of the S, as are the sapphire cantilever and line-contact tip. A dramatically rising treble (+2dB at 10kHz, +4dB at 15kHz, +8dB at 20kHz on our 1984 sample) gave a brightness which dominated the subjective results and served to emphasise the cartridge's ability to portray treble detail and clarity. The bass lacked 'muscle' and weight, though the midrange was clear and detailed. This cartridge has some notable strengths, but in our view too anomalous a balance to justify recommendation. (6.7g, 23cu, 2g).

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CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS

Viewed as a whole, this is a very positive time for vinyl record playing components; Compact Disc notwithstanding, sales seem very buoyant. CD seems to have attracted new attention to the hi-fi market as a whole, and many customers are discovering that today's record players can give dramatic improvements from their existing record collection, for about the cost of a CD player and a dozen silver discs. Indeed the improvements in record players have forced a substantial reappraisal of our standards for recommendation, so a number of older designs have been downrated slightly in this edition.

Though turntables and tonearms seem to be going places fast, cartridges have remained fairly static. Testing about 20 new models, the usual 20 per cent or so stand out from the crowd, and a number of these are revisions, upgrades and retests. Having tested around 200 cartridges now, only the select few are retained as full reviews, but basic details on a number of others — including recommended models — can be found amongst the summary reviews.

The clearest trend is the continuing steady move towards moving-coil cartridges, which are now dominant above about £70, and increasingly strong down to around £40 or less. It is distressing to continue finding indifferent quality diamond tips sprinkled liberally amongst cartridges costing between £20 and £120, with several prominent manufacturers responsible. The few pence extra required to specify and fit a properly aligned stone of decent quality indicates a regrettable cynicism amongst some producers who ought to know better.

This year's new crop is not a large enough sample to be fully representative, but it is faintly disturbing that compliance values tend to be creeping up slowly. Our mild unease is reinforced by the impression that tonearm effective masses are creeping up too, and it would be a great pity if the delicate compatibility balance of popular arms and cartridges were to become compromised.

The cost of a good sounding arm has come slicing down with the laudable decision by Rega to make an *RB250* variant available as a separate item (*Moth Arm*) or to several turntable manufacturers for OEM fitting. Three such have already taken advantage of this with varying degrees of success while others are also sourcing decent quality fixed head arms from the Far East or ploughing their own successful furrows.

Good quality silver wiring is being increasingly used in reasonably priced tonearms, in the *Datum S* and *Kuzma* both costing under £300. Standards of constructional rigidity and bearing integrity continue to improve, though examples could be used to illustrate that there is no room for complacency.

For the first time we have confronted the issue of the very expensive air-bearing tonearms which are starting to appear on these shores in small numbers. And from our limited sample they seem to work rather well, though they do bring a number of practical problems in their wake. They do seem to be qualitatively 'different' from conventional pivot/lever tonearms. Whereas they clearly offer superior stereo imagery, focus and depth, and often lower coloration, they also seem to lack a little 'slam' and 'weight', perhaps because of their necessarily compromised effective mass.

Turntables have seen the most dramatic changes and improvements. A trio of excellent integrated players have appeared at around £300, delivering a level of quality that demands Best Buy recognition, even though we have previously restricted this to lower price components. And we also have a powerful group of four very competent players down around the £200 mark, plus a few noteworthy cheapies.

Then we have the same situation at around £500 (without arm), where the revised *Pink Triangle* and new Roksan *Xerxes* provide stern competition — in the form of genuine alternative approaches — to established designs such as Linn's *Sondek LP12*. ▶

Now you won't be disappointed with the second best.

The LINN AXIS
turntable fitted with
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The LINN SONDEK LP12 has been in production for 14 years and is widely regarded as the best way to play records. The new LINN AXIS is not, however, a compromise but a new, more affordable alternative.

The AXIS is a two-speed electronically-controlled budget turntable and is not sensitive to mounting tables or surface placement. A three point suspension system gives the unit shock isolation and provides an independent floating suspension for the one piece arm and platter board. A two-part die-cast aluminium platter is supported by a single-point bearing, a version of the famous patented SONDEK bearing.

Supplied with the established BASIK LVX arm (cartridge extra) with black plinth and grey top board, the AXIS offers advanced features you won't find in any other turntable at any price.

LINN PRODUCTS

Of course, the LP12 remains the reference, but we know you won't be disappointed with the second best.

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159 Chase Side Enfield
Middlesex EN2 0PW
01 367 3132

AT Labs
442/4 Cranbrook Rd. Gants Hill
Ilford Essex IG2 6LL

Audio T
190 West End Lane
London NW6 1SQ
01 794 7848

The major key to these welcome alternatives is a developing awareness and understanding of arm termination. Tonearms have improved dramatically over the past five or so years — as have some cartridges — and in so doing are now transmitting much more cartridge/stylus vibration along the arm tube, through the bearings, and on into the arm mount/subchassis/plinth or whatever.

The means of terminating this arm vibration is now a key characteristic which distinguishes the finest turntables. Until recently the traditional subchassis has reigned supreme at the upper end of the market, while Rega and others have provided the alternative full-size plinth termination amongst a range of lower cost players. Now the Logic *Tempo* and Linn *Axis* provide 'suspended plinth' termination to contrast with the Manticore *Mantra's* traditional subchassis. And the *Xerxes* provides a similar platform termination compared with Linn's composite wood/metal and Pink's Aerolam subchassis.

And with a steady trickle of equally competent, exotically priced and styled alternatives, there has never been a greater range of high quality choice. The customer and hence the marketplace are both beneficiaries.

System Price

Below £150

Cheapest recommendation is the **Technics SL-BD22** (£80); performance and sound is rather rudimentary, but build quality is good. The first Best Buy comes in with the **NAD 5120**, at its new low price (£90), justified by its sound quality but neither by build quality nor arm bearing friction. The **Technics SL-DD33** (£100) provides the other side of this coin, while the more expensive **Technics SL-QD33** (£130) merits recommendation. The **B&Q RX2** (£135) is also worth considering.

Realistically representing the starting point for 'real hi-fi', the **Rega Planar 2** is a £125 Best Buy with fine arm and decent termination. Improvements here and elsewhere, coupled with the rising DM has resulted in downrating the **Dual 505-2** (£120) to a recommended model, alongside the **Dual 505 De Luxe** (£140), though both are good, convenient starter units.

Below £250

Running up towards £200 we encounter several models that merit Best Buy rating, starting with the **Thorens TD166** (£169) the **Acoustic Research EB101** (£199), **Ariston RD60** (£200) and **Systemdek IIX/II (£200/215)** — all good suspended motors with fairly good arms, not forgetting the **Rega Planar 3** (£188) — a reasonable plinth-type motor with an exceptional arm. Another Best Buy, the £60 **Moth Arm,** could interestingly partner the *Systemdek IIX* or **Logic Tempo** motors to make up additional Best Buy players.

Recommended players include the **Rotel RP850** (£180), a solid plinth system with good quality arm, the nicely balanced and finished **QED 232/232EN** (£149/£199), and the full subchassis **Thorens TD316** (£199). Several models are also well worth considering: the multi-speed **Dual 5000** (£200), the **SEE Revolver** (with Mission *774LC* or Linn *LVX* arms) (£123-£220), and the **Mission 775LCT** (£200).

Below £350

Three new models bring Best Buy value to this higher price group for the first time: the **Linn Axis** (£300), **Manticore Mantra** (£300) and various **Logic Tempos** with **Datum II** or **Datum S** tonearms (£239/£299, £339/399) all offer well balanced alternatives, each with its own individual flavour.

A compatible group of Best Buy arms lurk around £100, specifically the **Alphason Opal** (£95), the **Linn LV Plus** (£129), the Logic *Datum II* (£119), and the **Rega RB300** (£90), waiting to be fitted to £150-£250 motor units. There are not many of these, the Logic Tempo and Systemdek IIX being the obvious partners.

Recommended motor units include the **Acoustic Research Legend** (£199), **Heybrook TT2** (£259), and **Thorens TD321** (£229), while the **Ariston RD40QAC** motor (£250) is also worth considering. Recommended tonearms include the **Mission 774LC** (£90) **Linn Basik LVX** (£116), and **SME Series III** (£147), plus new entries **Alphason Delta** (£154) and **Sumiko LMT** (£128).

Recommended players include the AR **Legend/***Linn LVX* (£260), while the **Michell Synchro** (£300) and remote/automatic **B&O TX2** (£249) are both worth considering (not to

mention their breath of fresh air styling).

Over £350

Above this price point we will confine our endorsement to recommendations, including other alternatives which are worth considering. Amongst obvious 'packages' are the **Linn LP12/LV Plus** and **LP12/Ittok LVII**, though by and large this is 'Separates Country.'

Trying to work up through typical system prices, suitable recommended motor units might start with the aforementioned Heybrook *TT2* and Logic *Tempo Electronic*, while the **Elite Rock** (£300+) and **Ariston RD90** (£300, and £400 with arm) are both worth considering. In addition to the £100-£150 tonearms mentioned before may be added the recommended **Alphason Xenon** (£196), **Logic Datum S** (£230) and **Kuzma** (£250).

The central core of motor units compete at around £500, with the Linn *LP12* (£450), **Pink Triangle PT Too** (£500), **Roksan Xerxes** (£545) and **Systemdek IV** (£448) providing a fascinating contrast, while progressively higher prices bring in the **Source** (£990), **Oracle Delphi** (£1400), **Zarathustra Soliloquy** (£1995) and **AudioLabor Konstant** (£2560); the **Michell Gyrodec** (£595) is also worth considering.

Accompanying tonearms are even more varied, and can be taken from the £100 group upwards according to pocket and taste. The more expensive recommendations include the **Linn Ittok LVII** (£399), **Alphason HR100S/HR100SMCS** (£335/£385), the **Well Tempered Arm** (£545), **Helius Orion** (£490-£575), **Eminent Technology** (£950), **SME Series V** (£1,138), and **Airtangent (£1,350). The Zeta** 2 (£459-£549), **Mission Mechanic** (£600) and **Souther Triquartz** (£850). are also worth considering.

Cartridges Up To £20

The **Audio Technica** derived Best Buys include the **AT110 LC-OFC** (£17), **AT95E** (£15-£20), **Linn Basik** (£18), contrasting with the **Grado MT** (£20), **A&R C77** (£20), and **Ortoton OM10** (£19).

Recommended 'cheapies' include the **Goldring Epic** (£17), **Nagaoka MP10** (£17) and **RATA RP20** (£20).

Under £60

The two Best Buys are the high output m-m **Nagaoka MP11 Boron** (£38), and low output m-c **Ortofon MC10** Super (£59).

Recommended models include the **B&O MMC4** (£23), **RATA RP40** (£40), **Audio Technica AT3200XEII** (£50), **Glanz MFG-110EX** (£24), **Shure M97HE,** (£40), **Rega RB100** (£38), **Ortofon OM20** (£40), and **A&R P77** (£45). Also worth considering are the **A&R E77** (£36) and **Grado M3** (£43).

Under £150

Joining the Linn **K9** (£60) as a Best Buy is the lively and informative **Audio Technica ATF3** (£70) and the high-output **Denon DL110** (£60). Recommendations include the **Dynavector 10X** (£60), **Empire MC-5M** (£89), Denon **103** (£90), and **Ortofon MC20 Super** (£165). Also worth considering are the **Decca Maroon** (£109), B&O **MMC1** (£93), and **Shure ML140HE** (£120), plus the newly reviewed **Audio Technica ATUL5** (£65), **Ortofon X3 (£69) and OM40** (£69).

Above £150

These must be auditioned before purchase, as a mistake could prove costly! They are all different, and will interact in their own way with a high end system. A brand new high output moving-coil recommendation, the £198 **Milltek Aurora,** joins the long established **Supex 901IV** (£302) and the **Decca Super Gold** (£248). Low output recommendations include the Linn **Asaka** (£249) and **Karma** (£399), the **van den Hul MC10** (£599), and **Koetsu Black K** (£550). At the very expensive end we have the **Cello Chorale** (£690), **van den Hul MC One** (£799) and **Koetsu Red** (£835). High output models worth considering are the **Supex SD2000** (£582), **Grace F9E II** (£176), **Shure Ultra 500** (£452), plus the low output **Supex 900IV** (£287), **Kiseki Purpleheart Sapphire** (£595) and **Monster Alpha 2** (£479).

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Choosing a good hi-fi dealer is the most vital step in acquiring the system that is right for you. This uique directory gives full information on dealers in your area.

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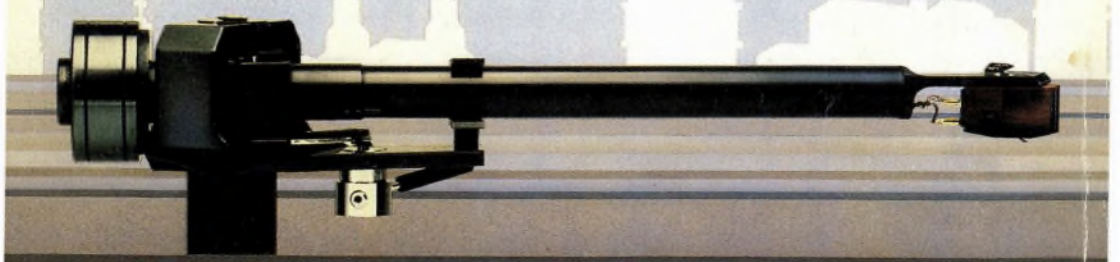

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