

hi fi

for pleasure

PLUS
**Buyer's
Guide**

PUTTING ON THE STYLI

Review Bonanza

- 15 pickup cartridges
- 3 cassette decks
- 3 top tuners
- 2 tuner-amplifiers
- 2 loudspeakers
- 1 pickup arm
- 1 amplifier
- 5 accessories
- plus cassette tape

Video recording— licence shambles

Upgrading made easy



CLASH OF THE CARTRIDGES

During the last couple of years we have seen the revival of the moving coil cartridge and have been informed that we need to pay about £100 to obtain the special sonic qualities which it is purported to offer.

When the moving coil first made its reappearance, most customers were obviously unwilling to spend a fortune on a cartridge, as they doubted whether the apparent improvements were worth the expense.

Chris Rogers and team set magnetics against moving coils in this month's multiple review

This reaction is understandable, but now the situation has changed.

Manufacturers of top-line moving magnet cartridges are informing us that it is necessary to make similar investments to reap the benefits of their new products!

Regardless of transducer type, the outlay for a top-of-the-range product is high. This in principle allows various good cartridges to be compared on an equal basis, without requiring that moving coil types be much better to justify higher prices.

It is obvious that a lot of people will be saying: "I don't have to spend £100 to get a good cartridge". And to a certain extent this review is an attempt to find out if that is indeed the case.

Cartridge types: the choice

What is the choice in cartridge types? There are the moving irons in their various guises, and moving coils. The majority of moving iron cartridges tend to be high-compliance types with the accent on tracking ability. Top-quality moving coils, on the other hand, embody a different philosophy. Compliances are normally low to medium, with less accent on tracking ability but more on good sonic performance.

Moving coil types generally have low outputs and in most cases require some form of step-up device to match the input sensitivity of most pre-amps. However, an increasing number of pre-amps with direct inputs for low output moving coil units are now becoming available. This aspect is quite important because normally it is considered essential to include a step-up device when considering moving coil units so financial outlay may be reduced.

There are also high-output moving coil types, three of which are included in this review. This type is intended to match straight into the normal RIAA input of a pre-amp. But there is a lot of evidence to suggest that such cartridges are better switched to a lower input impedance than the normal 47k ohms. A figure of 1k ohms has been suggested, and that was tried during the review.

Pickup arms also come into the story, for high-compliance moving iron types require a low-mass arm to optimize LF resonance, while moving coil types with their lower

compliance require a higher-mass arm to keep their LF resonance sufficiently low and out of the sonic region.

This, however, is not quite so simple in practice. Certainly, on paper, the resonances are easily calculated and mass can be optimized, but in practice the situation changes. First and foremost, the compliance of a cartridge under dynamic conditions is quite different to its static compliance — it may be as much as half the latter. This means that the only way to find the correct arm mass is either to measure the low frequency response or be guided by the manufacturer's literature (which hardly ever quotes the right parameters).

The problem of arm matching is further confused by other problems which are not easily identified.

It is obvious that any pickup cartridge needs to be rigidly mounted in a stable arm free of any resonances. This, in itself, is virtually impossible to find, but different cartridges upset arms in different ways. It seems that moving coil units need arm rigidity most if the best performance is to be realised. This is reasonable if people are happy with high-mass arms which can be more solid, but even the higher compliance moving iron types achieve a better sonic performance if they too are mounted in a rigid arm. In fact, the more rigid the better, so long as mass does not become a problem.

To get a clearer picture of this, we

should perhaps stipulate more accurately what we require. First and foremost, we are not really talking about mass, but effective mass.

Imagine the lightest of arms, which might have a small diameter tube of minimal thickness. At first sight this would appear to be a low-mass arm (which it might be), but if it had a heavy-cast headshell and a counterweight several inches from the pivot, it would certainly have a high effective mass.

If, on the other hand, a second arm had a colossal pivot arrangement with a massive counterweight close to the pivot, a large-diameter tube of unknown thickness and a sensible headshell, it could have a far lower effective mass than the slim version. Appearance can thus be deceptive and, what is more certain, it is no guide to the important factor of effective mass.

To complicate matters further, moving coil cartridges can also benefit from low-mass arms, provided LF resonance can be kept at a suitable frequency and rigidity does not suffer. The Grace G707, for example, is a well-known partner for the Supex 900, which is a cartridge demanding a very stable platform. The G707 is a low-mass arm with an effective mass of a little over 5gm. It is an arm with virtually no resonance problems and certainly a very rigid platform. The sonic quality of this combination is better than a Supex with a similar high-mass arm

Overleaf ▷

Clash of the Cartridges

From previous page

of equivalent mechanical properties.

What are you trying to remove from the grooves and how are you trying to do it? Both questions may seem obvious, but they are often overlooked. Obviously, the vital element removed is music, but what is forgotten is just how small the groove modulation can be. For instance, the actual breathing of singers forms an important part of a performance's atmosphere, but the deviations are microscopic.

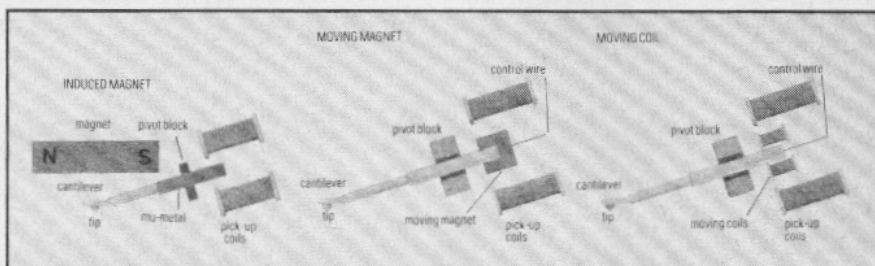
The relevance of this should be obvious. Any movement in the arm, no matter how small, will remove information. For example, if the cartridge flexes in its mounting, if the arm tube flexes, or if there are minute resonances in the arm system, recorded detail will be destroyed.

The second question — how you are trying to extract the information — is, to a large extent, just as problematical. Bearing in mind what I've already said about the size of the modulations and remembering that the stylus has to stay in precise relationship with the record groove to do it, you'll see it spells doom mechanically. The relationship has to be maintained through the record mat, platter, bearing, chassis, arm mounting, arm bearing, arm tube, headshell, cartridge body, cartridge suspension, cantilever, and finally the stylus. It's a miracle it works at all when you consider that the information which you are trying to remove from the groove is perhaps as small as a *micron* (one thousandth of a millimetre) or less.

To put this into perspective, substitute an inch for the micron and scale the rest of the system accordingly. If we were trying to remove information with a modulation depth of one inch, the stylus tip would then be 30 feet high, a thin cantilever would be about 50 feet in diameter and its suspension point would almost vanish at some 275 feet distance. At 3.78 miles you would stumble across the arm pivot.

All this may seem a little melodramatic. It's not. It merely emphasises that, because all these mechanical items have termination impedances like their electronic counterparts and with such enormous variations, it is virtually impossible to make them all match.

Incidentally, the whole set of parameters changes as the tracking force varies, so we are not even dealing with constants. From all this I



Three basic structures account for most pickup cartridges available

think it is easy to visualise the vast problems which exist before the system even stands a chance of working — let alone working well.

The next aspect of cartridge types is again tied up with compliance — tracking ability and tracking force. It is well-known that the high-compliance moving iron types play at quite low tracking forces (less than one gram is claimed at times, which is perhaps farcical). On the other hand, moving coil types have lower compliances and usually track at around two grams or more. There are many arguments about the merits of the two philosophies and I will try to outline the two basic schools of thought.

The main claim of the low tracking force brigade is that record wear is reduced and hence the useful life and quality of a record is extended. One thing is certain — that far more records are hopelessly damaged by too low a tracking force causing mistracking than by a shade too much.

On the other hand, the high tracking force fraternity claims that it is necessary for the stylus to have sufficient tracking force to overcome the spring-back of the cutter. Broadly, this means that, when the original acetate disc is cut by the cutting stylus, there is a tendency for the disc to be compressed by the cutter and to spring back after the cutter has passed. This movement is transferred to the stamper which is used to press the vinyl record we buy. Therefore, in order to obtain a signal which is faithful to the one fed to the cutter in the first place, spring-back has to be overcome.

Certainly, there is a lot of sense in this argument as spring-back and the modulus of vinyl are quite well-known and it seems reasonable that it has to be overcome.

On the subject of record wear, it is natural to assume that more weight means more damage, but here I can only relate my own experiences. I have been using cartridges which track at two grams or more for about two years now and my records do not seem to suffer. Moreover I have been surprised to find that some of my old records which I had once thought past it really sound quite good after all!

So much for the theory, but how does one go about reviewing a number of cartridges? There are a number of avenues open which fall into two main categories — to listen or to measure? Certainly it is not difficult to measure the basic parameters of a cartridge but the normal measurements are basic and only tell you if the cartridge stands a chance of working — not whether it is any good.

There are a number of tests which reveal a bit more about cartridges, but these are complex and require laser equipment, computers and other devices to make much sense of it. There are also the attendant interpretation problems.

So, for this review, basic measurements are all that have been attempted to see whether the cartridges have any major shortcomings.

Listening is a more direct method of viewing a cartridge's worth, but how does one listen to a lot of them? You could have a number of turntables with different cartridges in each, but it has been established that all turntables sound different, even if they are all the same make and model. Perhaps the difference could be minute if a lot of care were taken in setting up, but it would hardly be fair to blame a cartridge for even a minute deficiency under such comparative circumstances.

The next possibility is to use more than one arm on a single turntable, but this usually causes problems in setting up. Additionally, it is not possible to play one record with two or more cartridges at once as there can be serious interaction problems.

We are thus left with the choice of one turntable and one arm — but which? My choice of turntable is obviously my own reference unit, a Linn-Sondek LP12. However, the choice of arm is not so simple. I normally use a Grace G707 but the problem is that it has a fixed headshell. With the number of cartridges under review its use would be impossible. It was necessary to find an arm which had a detachable headshell and would be compatible with the wide range of cartridges on test.

The choice is close to impossible, but one had to be made. The arm

which is fitted to Rega turntables was my final choice. It may not be a perfect match for all the cartridges, but at least I know that it was developed to enable it to work well with cartridges at both ends of the compliance spectrum — which is just what I require here. In an attempt to reduce differences further, the same type of headshell had to be used for every cartridge. The ADC magnesium type was selected.

With the playing arrangement established, how should the listening test be done? One obvious method is to compare the reproduction from disc to that of a master tape — a method I've used before but one of limited application. Making certain that what is on the disc is the same as what is on the tape is difficult and requires hard-to-get specialist recordings. The comparison of a large number of cartridges with each other is also difficult, so a means of simplifying the task had to be found. Originally the idea was to compare cartridges in pairs in a sort of knock-out competition, with the pairs chosen by myself, but the listening panel having no idea what they were.

This was how the test started, but as it progressed there were obvious problems. The first problem arose

when the panel either liked both cartridges equally or disliked both equally. At no time was the panel totally divided in its choice — which was amazing. On a few occasions, the panel could not decide which they liked or disliked more, but on such occasions the panel members were in conflict with themselves, not each other. These problems were not serious, however, as every cartridge was paired at least twice.

The tests consisted of listening to at least five pieces of music for one-and-a-half to two minutes each, and then repeating the music on the second cartridge. The music was



Sony have an answer!

changed as the test progressed, as this was the easiest way to prevent the panel becoming quickly fatigued, and also to ensure that the discs were not becoming worn or damaged. That could have had a disastrous effect on the result. The music chosen was a mixture of classical and modern with the particular discs picked for revealing qualities they were considered to have.

At the end of a little over one-and-a-half days listening, a shortlist of preferred cartridges emerged. The rest of the time was spent listening to the shortlist which was further subdivided into smaller categories. But there was no outright winner at the time.

The listening tests were conducted in our editor's lounge with the following supporting equipment: Yamaha NS1000 speakers, Lucas speaker cable, Sirac 50W power amp and Naim 32 pre-amp. The Naim was chosen not only because of its excellent reputation, but also as it has both moving coil and high level inputs. This made the task simpler and allowed comparisons to be made between the Naim's moving coil input and the recommended step-up devices for the low-output moving coil cartridges.

Notes on lab tests

No measured test is absolute. There are always limitations in any procedure. This is true of virtually any sphere in hi-fi these days, with tuners performing better than any test equipment and amplifiers with lower distortion than the best oscillators.

In measuring pickup cartridges, the limitations are quite severe. We are always bound by the test disc. I hear with amazing regularity that such-and-such a disc has a perfectly flat response — but use it once and it's totally knackered! For this reason it's vitally important to realise the limitations of the test disc used and to interpret the results accordingly.

The minimum standard of the test disc used can be seen from the

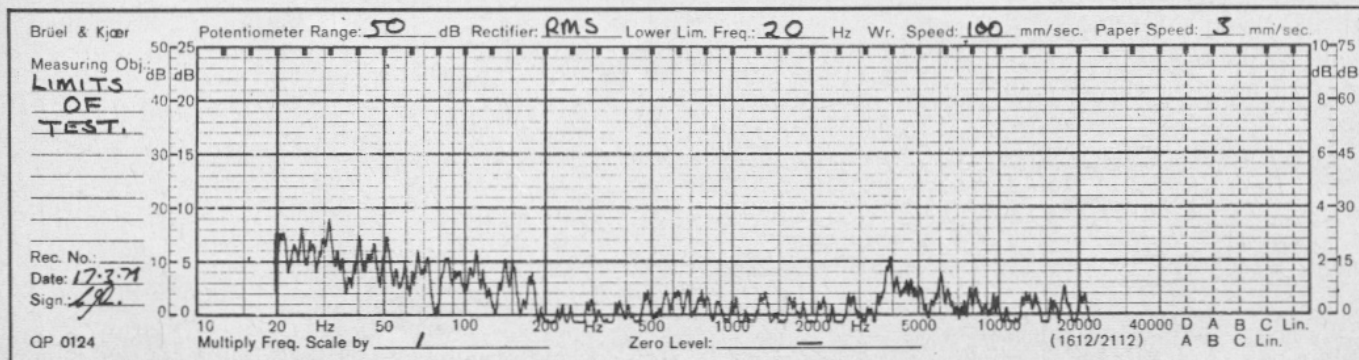
curves along the noise of the test set-up. However, it can be seen in practice, by careful examination of the test results, that the limits of separation are around 5dB better than the minimum specified for the disc. By the same token, the frequency response is more likely to be within 1dB rather than ± 1 dB. This, then, is the tolerance of my measurements.

There are a number of other considerations to be taken into account when interpreting the curves from cartridges. The way in which the measurement is done will also influence the result. It's normal to use either a third octave tracking filter or some form of spectrometer when measuring cartridges. That's because it excludes everything but

the actual frequency (or third octave) which is being measured at that moment. So you can be certain that hum or some other component such as distortion is not being added to the result.

This approach is fine since you see only frequency response and crosstalk. This is the method usually used for reviews and for manufacturers' curves. If you only want frequency response and crosstalk, and are aware of what is being excluded, that's fine. But, it's my personal opinion that this method is misleading and totally invalid if the consumer wants to know just what a cartridge is up to. There are numerous factors which this simple process of measurement won't show

Continued on page 53 >



This plot shows the inherent noise level in the test rig electronics. It applies to all traces above 20Hz

TEST BENCH

Clash of the cartridges

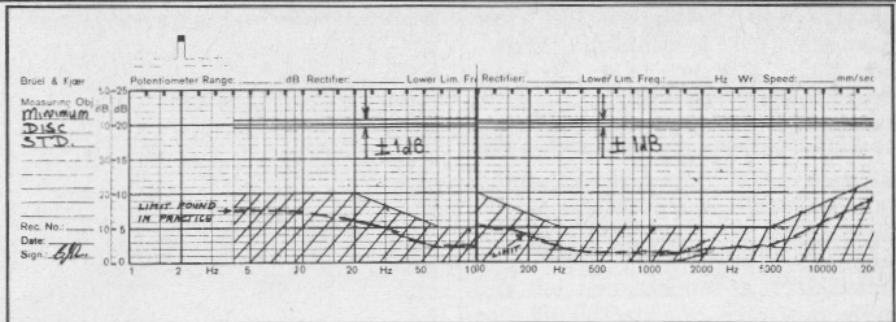
From page 51

up. For instance, the system is totally open to all kinds of disturbance and influence. It's of vital importance to see that the turntable introduces a minimum of hum, rumble, wow, flutter, and noise. The measuring system must have a minimum of noise and hum. The test disc must be clean and in immaculate condition or surface noise and clicks will affect the result. It's also vital to ensure that no external rubbish — traffic noise, doors slamming or people stomping about — is being added.

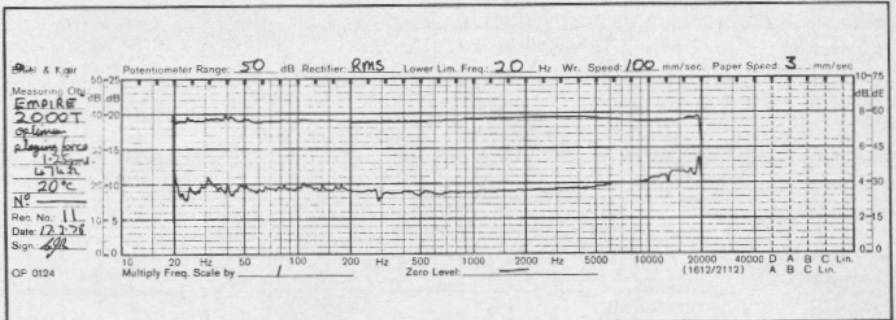
In an attempt to achieve all of this, I used the Linn-Sondek LP12 with Rega arm which had been used in the listening as the test bed.

For this reason it's vital to show a curve of the limits of the test. In this way a clearer picture of just what is happening will emerge, but interpretation has to be made with care. One concession I have made is to increase low frequency limiting as the curves progress upwards. The changes occur at 10, 20, 50 and 200Hz and employ 6dB/octave high-pass filters built into the B&K level recorder. This helps to show the amount of low frequency rubbish which affects the performance of a cartridge.

Another problem with performance curves is that they are usually taken at the tracking force which gives the best measured performance. This may not necessarily be the best tracking force for playing music. The majority of moving iron



Traces of minimum disc standard found in practice, taken in two sweeps



Curve for the 20-2000Hz response of the Empire, taken at 1.25gm. Compare it with p.57

Except where otherwise stated, all of the graphs on the following pages are amalgams of two separate plots. Division between traces occurs at 100Hz. In the case of the HF plots the potentiometer range was 50dB, writing speed 100mm/sec, paper speed 3mm/sec and rectifier RMS. On LF plots, writing speed was decreased to 40mm/sec and paper speed to 1mm/sec.

cartridges give best measured performance at the lower end of their tracking weight scale but, in practice, offer the most-secure tracking at the upper limit of their recommended range. The best playing force is an arguable point — so if I were to present measurements at what I had found to be the optimum tracking force, and the measurements were less than ideal, manufacturers would complain that my tests were invalid because of non-optimum tracking forces. So I had to

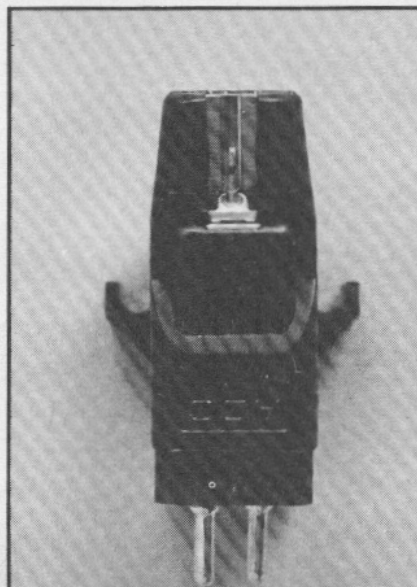
resort to the best-measured tracking pressures. To illustrate the point, we show a curve of the Empire 2000T taken at 1.25gm — considered to be the optimum playing force. This is very different from the measured result taken at 1gm which I found to be optimum for the test. The moving coil cartridges gave optimum performance for both measurement and playing near the upper limit of their recommendations — possibly a significant factor.

ADC ZLM

ADC has been manufacturing cartridges for many years, and has built up a reputation for some fine products such as the famed ADC 26. The ZLM, launched last autumn, is now top of the range.

The ZLM looks similar to the other cartridges in ADC's range, a microscope being required to see the real difference — the use of an Aليptic stylus assembly. This is basically an elliptical type but has the large radius of the Shibata tip to give greater contact area. The tip also has reduced mass. The cantilever is tapered, a style I believe ADC pioneered with the model 26. All these factors allow the resultant tip mass to be very low.

The ZLM operates on the induced magnet principal, on which ADC has a patent. This allows the magnet to



be suspended above the cantilever and not fixed to it. That in turn means reduced mass in the stylus/cantilever assembly.

Listening Tests

In the pairings, the ZLM was compared with the V15-IV, which was preferred, and then with the Signet, which was thought to be inferior though there were similarities. In general terms, the ZLM received a somewhat lukewarm reception. At the bass end it was considered perhaps a little forward, and definitely lacking tightness and definition. Mid-band character was considered good, but the treble end was thought harsh and gritty.

Moderate and low level sounds were retrieved with a reasonable

overleaf >

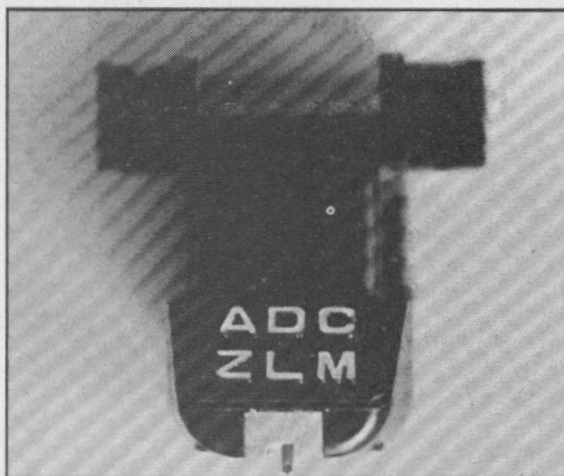
TEST BENCH

Clash of the Cartridges

From previous page

balance, but high modulation tended to emphasise treble problems. Stereo image was only fair, with a loss of defined central image, although information at the extreme left and right was quite obvious. Depth also suffered, but nevertheless was more in evidence than with some other units.

Overall, this cartridge suffered from a lack of sparkle and life, coupled with a tendency to be somewhat harsh. Thus it was unrewarding and unable to portray the interest and atmosphere which the music had to offer.

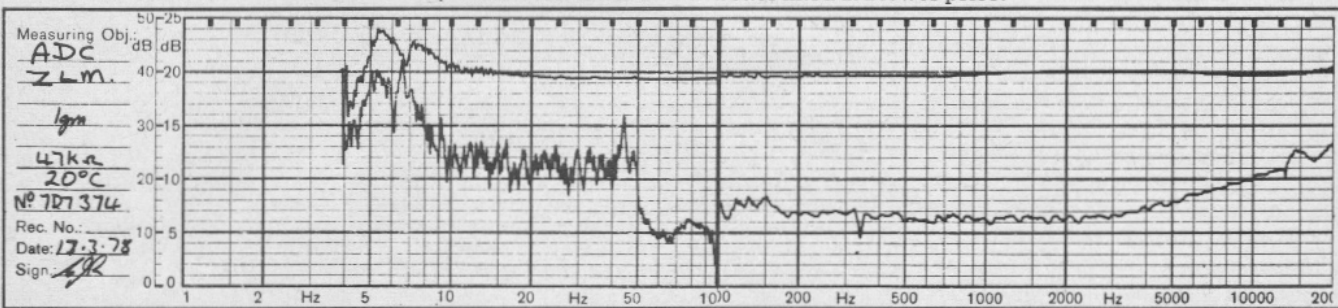


Summary

While the ZLM had a sonic performance which was considered better than some, it is expensive at £92. More to the point, several units such as the Ultimo 20A and Satin M117E were much better liked at a lower price.

Lab Tests

The measured performance of the ZLM is quite reasonable, but what the curve does not show is that, while the separation is around 27dB in the mid-band — a good figure, it deteriorates with increased tracking force. The LF curve shows that resonance is reasonably well controlled, but that LF rubbish is badly suppressed. All this muck will upset performance.



Audio Technica Signet TK7SU

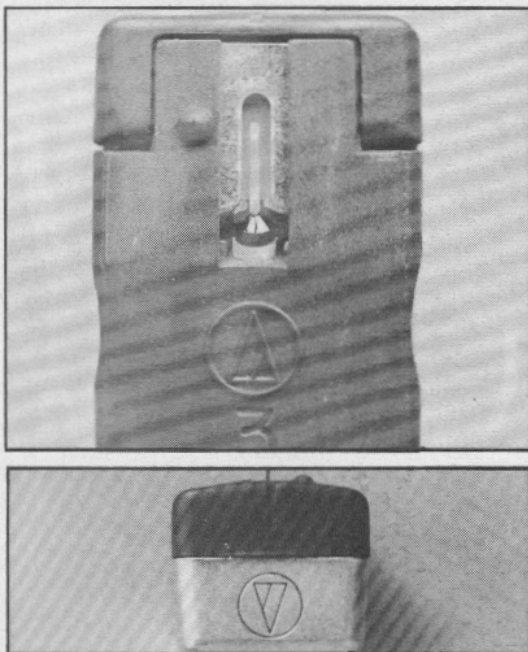
Audio Technica is another company which has made cartridges for a great many years, and I think it fair to say that the reputation gained is for good-quality, low-cost cartridges which in the main are intended for the budget end of the market. The new Signet range is a departure from this, and it enjoys a factory of its own where all cartridges are hand-assembled.

Signet is perhaps a misnomer, for the cartridges are large, and moreover I wonder why there is so much excess plastic in the construction. In spite of their bulk, however, they only weigh 6.8gm, which only leads me to believe that they could be quite a bit lighter still. The Signets operate on a dual magnet principal, where two small magnets move at 90° to each other, one for each channel. With this system both magnets weigh less than the single magnet in the more conventional system, thereby reducing the moving mass.

The Signet reviewed here is the top model, the TK7SU. It utilises a Shibata stylus with a square shank which can be very precisely aligned in the long, tapered cantilever.

Listening Tests

This unit was paired with the ADC ZLM and Grado Signature 1. Both



Summary

This unit is quite highly priced and has a performance which was unliked. Any evidence of erratic performance implies that it will be difficult to set up. It therefore cannot be recommended.

Lab Tests

Frequency response and separation is good, but an obvious problem exists at the HF end, with a premature roll-off and some definite shortcomings shown by the separation curve. LF resonance is a little pronounced, but the main problem is that this unit is very susceptible to disturbance. This indicates to me that the TK7SU has suspect stability and would not be able to track a music disc happily. Noting the results of listening tests, the apparent problems could certainly be caused by such instability even though the unit had no problems with heavy modulations. The hollowness could be explained by the cavities in the cartridge body. Separation worsens with increased tracking force.

were preferred. The panel were not too enthusiastic about this cartridge, finding it lacking in several areas.

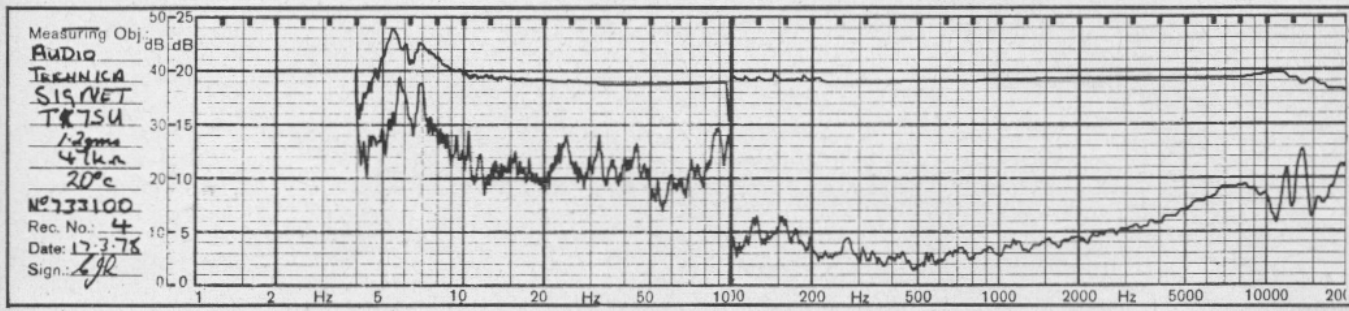
In the bass region, the Signet

seemed to have a good balance, but lacked tightness, impact and detail. The mid-band had a very pronounced hollowness which made many instruments seem unreal and

tended to give many sounds the same character. This was particularly noticeable on voice, which had an unnatural quality. Treble was below par, with a lack of detail and cleanliness.

On the whole, stereo image was reasonable, but there was an overall lack of presence and depth, all of which gave the sound a very flat, dull character. The Signet coped with heavy modulations with no

apparent problems, tracking the 'worst' discs easily. This unit was in general considered to make the music boring and uninteresting, not offering the listener any chance of becoming involved.



Coral 777EX & Videotone Head

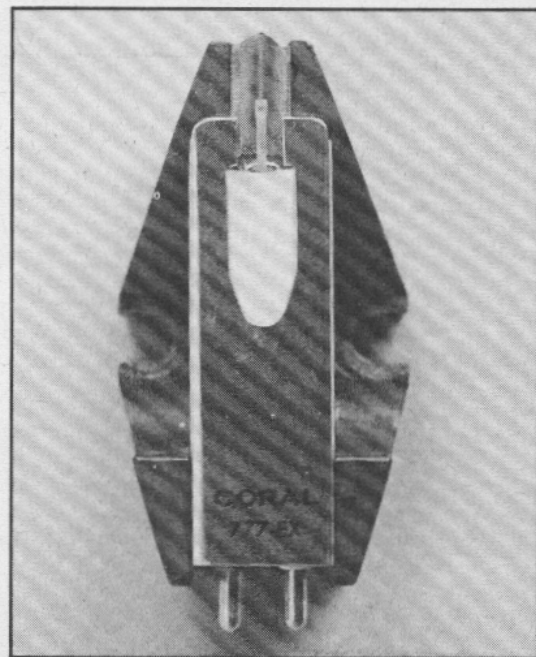
Coral is a name new to the UK market. That's perhaps a little strange in view of the size of the company. Coral is a transducer manufacturer in no small way. Not only does it manufacture the two moving coil cartridges on sale in this country, but it also produces a very large number of cartridges for other companies to put their own labels on. Allied to this, Coral makes one of the world's largest ranges of loudspeakers and drive units.

Videotone, the importer of Coral, has introduced the H200 head-amp which is designed for use with the 777 cartridges and is made in Britain.

The 777EX is the dearer of the two available Coral models and has a superior specification. It is similar to the majority of moving coil units, with a specification and appearance much like the Supex and Nakamichi. In terms of construction, it is well-made, with a rigid body and an excellent sturdy mounting. Internally, it has a large magnet and coil assembly similar in design to the other two units mentioned. The stylus is a 0.2 x 0.8mil. elliptical, mounted on a medium-length straight cantilever. Compliance at 15cu is a little higher than usual for a unit of this type. With an output of 300µV, this is a low output type and requires a step-up device or pre-amp with provision for an MC input.

Listening Tests

For the test, the Coral's per-



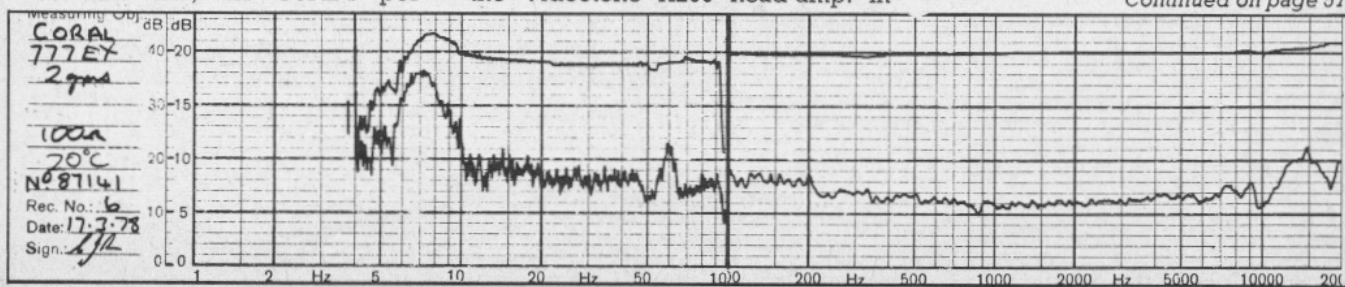
Summary

The 777EX did extremely well in the listening test and emerged amongst the top three units. It was preferred with the H200 head amp and this is probably due to better input matching which suits the 777EX. However, it is a shame that the H200 had a derogatory effect on the bass end. The improved HF smoothness with the H200 is probably a matching effect which removes the minor HF edge present in the 777EX. No doubt there are other step-up devices which will match the 777EX and not have the difficulties noted. If you already have a step-up device, then at £54 the 777EX is an outstanding bargain and makes some of the other units of the group seem stupid as their sonic performance is inferior and their price quite a bit higher. Even with the H200, the package is still only £99 and quite attractive. It is definitely the bargain of the group.

formance was checked using firstly the Naim head-amp and secondly the Videotone H200 head-amp. In

later comparisons it was matched against the Supex, Entré and Sony.

Continued on page 57.



Clash of the Cartridges

From page 55

The Supex and Entré were preferred, but not the Sony.

The bass end was quite good — tight and clean, but just a shade light in balance. With the H200 the bass quality deteriorated a little, becoming less tight and slightly for-

ward. Mid-range quality was well-liked and thought detailed and clean. With the H200, ambience and depth seemed to improve, tending to make some detail a little more accessible. At the HF end, a slight harshness was noted, but not to a serious extent. The H200 tended to remove this, making the treble sweeter and cleaner.

In later comparisons, criticism of all units became more severe as the competition improved. However,

the 777EX held up well. The main complaint was a slight loss of ambience and precision. Neither the Entre nor Supex suffered from this. Performance generally was preferred with the H200 head-amp, but the panel did wish that this combination exhibited the superior bass properties of the Naim. The H200/777EX combination was considered to be one of the few which allowed access to the performance as well as the music.

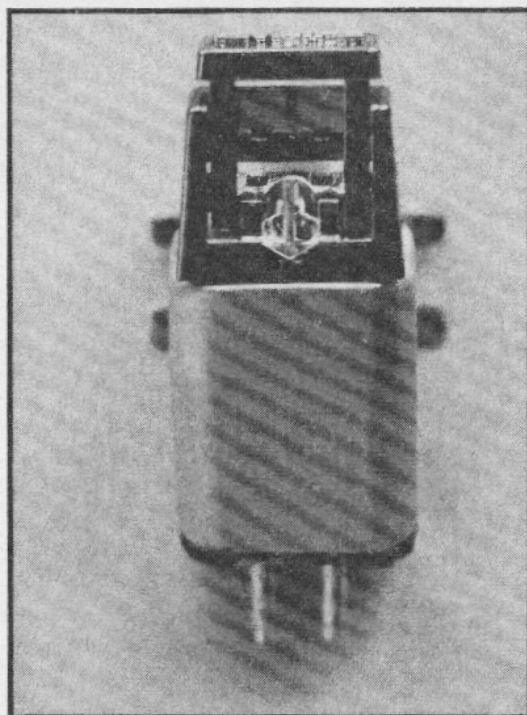
Empire 2000T

While Empire is a well-known American manufacturer, the 2000T is probably not as familiar to the hi-fi world as other units in the range. The 2000T has a very similar specification to the 2000Z, which is the top model in the current Empire stereo range. The obvious differences in the specifications are that separation, tracking ability and crosstalk are marginally worse, although stereo balance is better. The major difference is that the 'T' costs considerably less than the 'Z'.

Internally, this unit is fairly conventional, with four coils positioned in such a way as to minimise hum pick-up. The magnet structure is unconventional in that it uses three magnets. The third magnet is included to prevent the cartridge being microphonic and picking up unwanted signals such as airborne feedback. The body of the unit is totally metal-encased to prevent hum (which it does very well). The body clip-fits into a mounting bracket which is fitted to the headshell in the normal way. I do not consider this mounting to be totally satisfactory and I would prefer to see a far more rigid and stable arrangement, as I am certain that this would benefit sonic performance.

Listening Tests

The 2000T was paired off against the Ortofon M20FL and Ortofon M20E. There were no clearly defined preferences, but merely different criticisms. As the panel had no knowledge of what they were listening to and their comments were quite harsh, I judge them to be quite reasonable, considering the price of this unit.



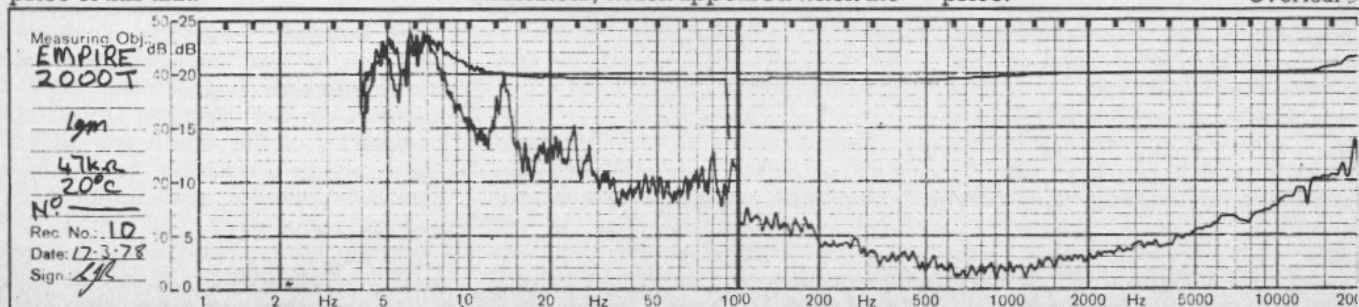
Summary

The 2000T didn't set the world on fire, but considering that it was one of the lowest priced units in the group, it did compare well with far costlier units. So in terms of value it can be recommended. If your budget is limited to less than £40 I doubt whether it is possible to find a better cartridge.

Bass was thought to be well-balanced, with good detail and impact, but having a tendency to overhang. Mid-band was considered quite detailed but lacking in low-level information. Treble was similar, but it had some harshness and a metallic edginess.

The stereo image was reasonable, but tended to shift a little on high modulations. Most criticised was the harshness, which appeared when the

going got tough. Highly modulated piano, guitar and voice took on a particularly steely character. Ambience and depth were lacking, giving a flat perspective, and there was a loss of presence which made the prominence on loud passages even more noticeable. Overall, this cartridge was considered to be a barrier between the music and listener, but no more so than any other at the price. Overleaf >



TEST BENCH

Entré 1 & Lentek Head-Amp

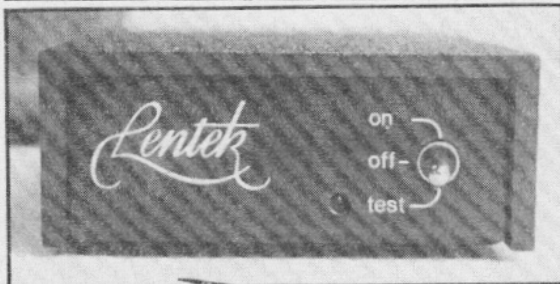
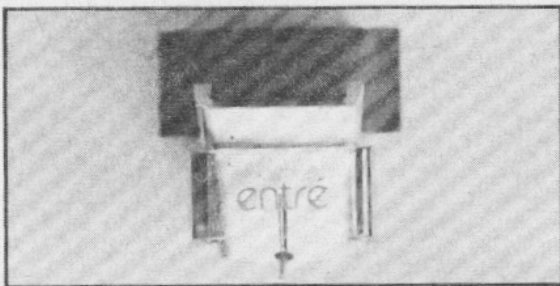
The Entré 1 is new but has nevertheless become reasonably well-known. It is imported by Lentek, which is best known for loudspeakers. Lentek also manufactures the head-amp which is specifically designed for the Entré 1. Although the Entré originates from Japan it arrives in the UK by way of the Discwasher Corporation in the States, who appear to be responsible for its distribution.

This unit is a low output moving coil, with several interesting features. It has a low overall mass of 5.8gm (similar to the Coral at 5.5gm) which is probably achieved at the expense of magnet size. The coils in this cartridge are wound with silver wire, which may seem to be a little strange in view of the weight, but the electrical and sonic improvements which it offers are considered worthwhile. Another interesting feature is that the body is heavily gold-plated in order to achieve good screening. The stylus is elliptical mounted on a tapered cantilever of the type found in some moving magnet designs.

Listening Tests

Initially, the Entré 1 was checked with the Lentek head-amp and without. Later comparisons included Supex, Coral and Sony. It was preferred with the Lentek head-amp and performed better than the Coral and Sony. The Supex, however, had a marginal lead.

The bass was considered very extended and clean, though a shade forward. With the Lentek head-amp, the bass became a little more full



Summary

The Entré came through listening tests extremely well, being one of the top units in the group. For this reason alone it can thoroughly be recommended. When its price is considered it still does well, since it's a little cheaper than some units which were not liked. Performance with the Lentek head-amp was marginally superior, no doubt because of better matching. Even if the price of the total package is considered (£137), it's not excessive if you want to get a better rendition of what is on your records.

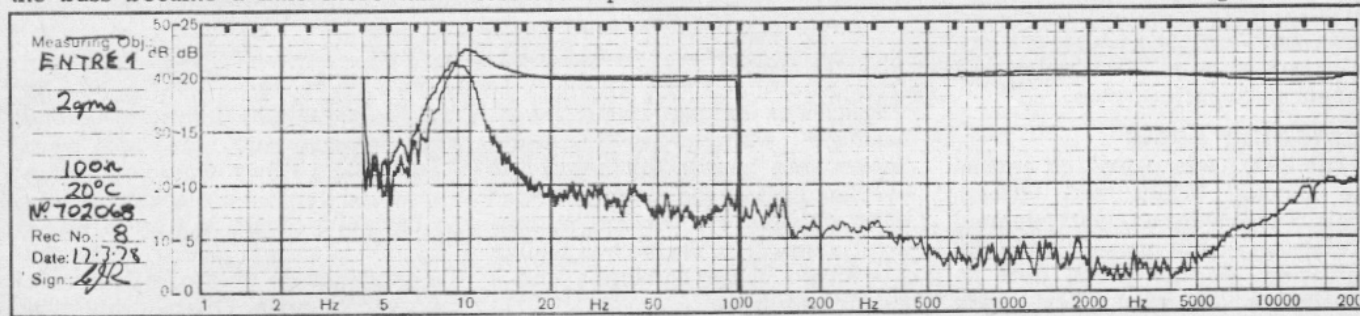
and warm. Mid-band was detailed and precise, but a shade prominent in its lower octaves. At the top there was a slight sting, but no harshness or failing.

Stereo image was considered excellent, with good depth and ambience. The Lentek affected performance only slightly, in a way that could only be described as putting the panel a little more at ease and allowing the music to be got at with less interruption.

Lab Tests

The measured performance of the Entré is, without doubt, one of the best in the group and shows virtually no faults. Separation is excellent and probably responsible for the outstanding stereo performance of this unit. Allied to this, it does not change with tracking force, so there will be no change in performance with modulation level. LF performance is excellent and shows how this unit is virtually independent of sub-sonic disturbance.

In later comparisons the Entré with Lentek was still found to have a first-class image and perhaps the best depth of the group. Detail and warmth were a little less in evidence than with the Supex or Coral, but the Coral was thought less accurate than the other two. The Entré was, in general, very well received with the main criticism directed at a slightly clinical nature which removed a small amount of feeling that could otherwise be gleaned.



Grado Signature 1

Grado cartridges have appeared in the UK from time-to-time but have never achieved the popularity and reputation which they enjoy in the States. Grado is now handled by an enthusiastic import company called Transonic which, in the main is interested in promoting top-quality equipment.

Two Signature cartridges are available, the 1B and 2. The 1B tested here is the cheaper unit — the

2 costs £250! All Signature cartridges are built by Joe Grado in person and most certainly are made to very close tolerances.

The operating principle is moving magnet, but it differs from the norm in that it has four coils and four sets of pole pieces, with each pair wired in a push-pull arrangement. In this way, the inductance of the unit can be much lower, shifting the electrical resonance well above the audioband.

For this reason, the instructions state that the cartridge is non-sensitive to load capacitance — a problem which plagues many other moving magnet designs. Another peculiarity of the Grado range is that Joe Grado does not believe in bias compensation and states that it should not be used.

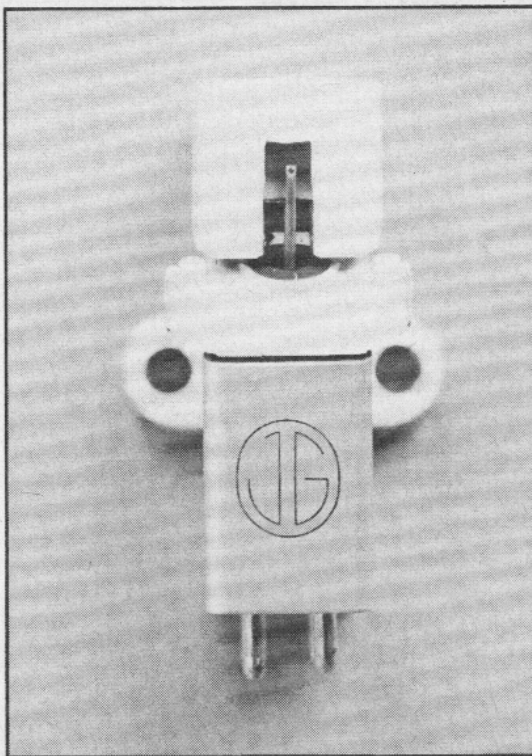
Listening Tests

The Signature was paired with the

Signet, Shure V15-IV, Coral, Entré and Supex. It was preferred to the first two units but not to the moving coils.

While the panel in general quite liked this unit, it had one or two obvious faults as well as virtues. The bass end was the area most criticised. It was considered light in balance and a shade woolly on occasions, but mid-band was reasonable detailed and open, with a slightly forward character tending to emphasise sibilants and similar sounds. Treble was also in a little trouble, with certain sounds taking on a wiry, thin quality.

Stereo image, placement and depth were considered good, with a better-than-average portrayal of ambient information, but not as good as the moving coil units in this respect. While the panel liked this unit, it would have been rated higher if it did not have the slightly rising top. As it stands, it was considered to be mildly inferior to the Coral, Supex and Entré, but on a par with the high-output moving coils — and marginally better than the V15-IV because it had a better image and depth as well as portraying more of the life in the music.



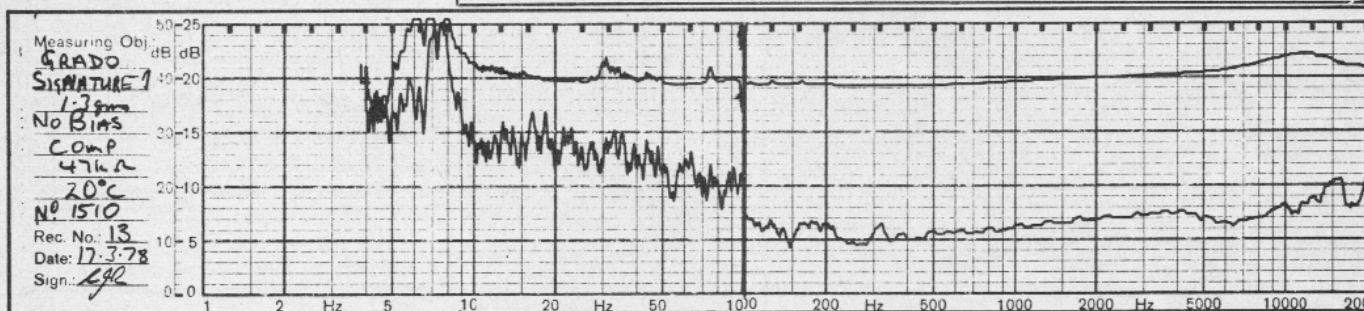
Summary

While this unit fared well in listening tests, it did not equal the performance of the best moving coil units which all cost less. So the Signature 1 is not, to my mind, worth its high cost, even though this is no more than the Supex or Entré when the price of a head amp is taken into account.

Lab Tests

The emphasised high frequencies noted in the Grado's listening tests are evidenced by its response curve which certainly does lift somewhat objectionably.

HF separation is good and no doubt is a major contribution to this unit's good image and depth properties. Mid-band separation is good, but not exceptional. Low frequency performance is not so good with respect to the magnitude of the LF resonance which may be responsible for the lack of bass noted. LF separation and susceptibility to disturbance are also questionable.



Ortofon M20E & M20FL

Ortofon requires little introduction, as it has been making a wide range of cartridges for many years. It's perhaps best-known for continuing to manufacture moving coil units over the years and not forsaking the principle in the 50s when others did. Now that moving coils have again become popular, it's still making them and embarking on research into future models.

Two of the top moving magnet designs, which have received good comments from other quarters, are tested here.

The units are basically the same cartridge, but they have different stylus assemblies. The E has a conventional elliptical stylus and high compliance, thus intended for low mass arms. The FL has a fine line stylus and lower compliance and is intended for use in higher mass arms. The fine line stylus is similar



Summary

In the listening tests, both units were reasonably well received but the FL was preferred. However, at a price of £64, the FL costs the same as the Satin M117E and is definitely inferior. In these terms, even though it came through reasonably well, it is not good value and cannot be recommended. By the same token, the 20E was considered no better than the 2000T which costs a good deal less.

Lab Tests

The frequency response and channel separation of both units are quite good. However, the performance of the 20E above 5kHz is poor. The 20FL also shows a slight rise above 10kHz, but this, in itself, need not be a problem. If, however, these rises are due to pronounced HF resonance which is too close to the audio band, then sonic results will suffer. Susceptibility of both units to subsonic rubbish and disturbance is quite high which can upset performance.

TEST BENCH

Clash of the cartridges

From previous page

to the Shibata shape in that it has a wide contact area, but it approaches the contour of cutting styli more than other types.

The cartridges operate on the Variable Magnetic Shunt principle. This essentially means that there is a small armature which cuts the flux lines of a magnetic field, and hence does not have to move the entire magnetic structure, greatly reducing moving mass.

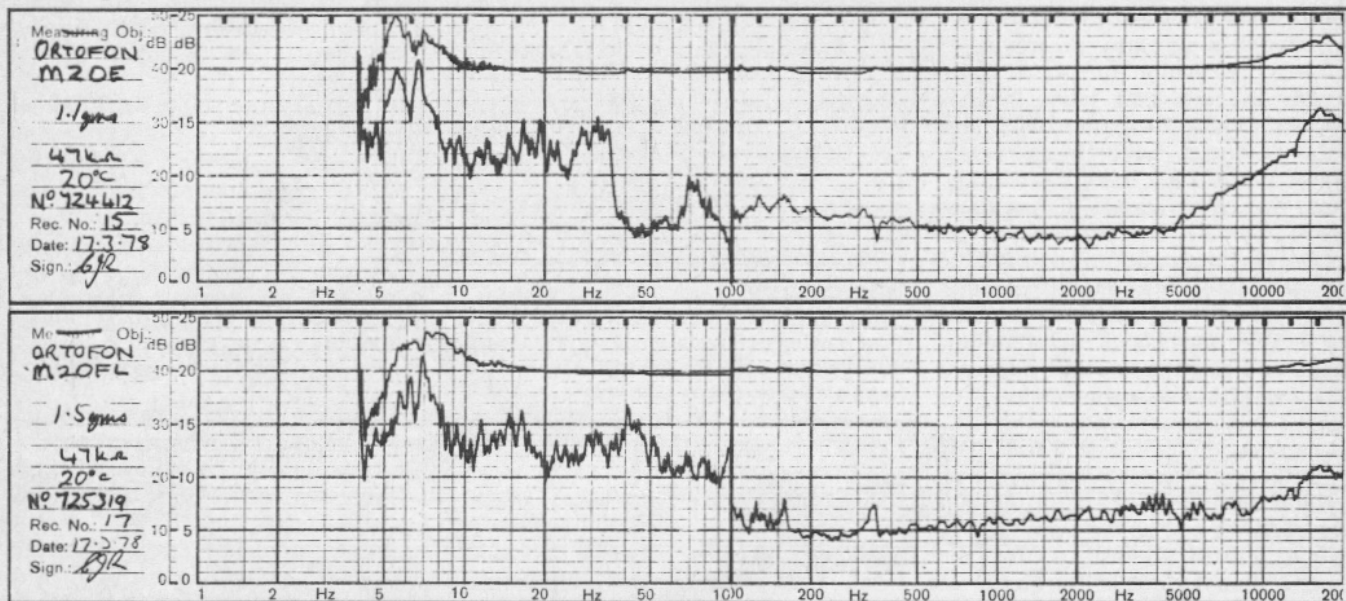
Listening Tests

These units were compared with the Empire, Philips and ADC. They were both preferred to the Philips and ADC, but the E was considered to be on a par with the Empire and the FL superior.

At the bass end the FL was clean and tight, with a fuller and more solid character than the units with which it was compared. The E, on the other hand, was in general light in the bass, but it did tend to become a little pronounced on heavily modulated passages. Mid-band of both units was reasonable, with good detail. However, the FL had

better imaging, with more openness and depth. On high level modulations, both units coarsened considerably, with mistracking evident on several occasions. At the HF end the units were thought strident, the E having a pronounced harshness absent in the FL.

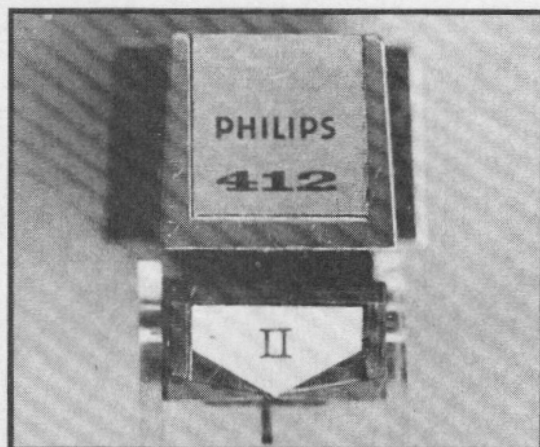
In general, stereo image of both units was considered good, with the FL possessing better than average depth. The FL had a fair balance, but the E had a rising character. Overall, the FL was considered superior to similar moving magnet types, but neither had the kind of naturalness which the panel had come to expect.



Philips GP 412 II

Philips is very well known as a manufacturer of consumer electrical goods but tends to be overlooked when it comes to top quality hi-fi equipment. This is perhaps a little unfair, as it has produced a number of good products with innovative and original ideas. For example, Philips is to be credited with the compact cassette, motion feedback loudspeaker and iron tape. In the field of cartridges, Philips has never set the world on fire but instead consistently made products which have offered a fair standard of performance.

The basic 412 cartridge has been around for a number of years, the 412-II being the latest version. Internally, it is quite conventional and does not boast any miracle features. Development of this unit has been concentrated in the region of the magnets, where Philips has achieved an optimal magnetic flux density of 8500 gauss — a high figure for such a small assembly. The stylus assembly fitted is a bi-



Summary

In listening tests this unit was not liked. Even when one considers its low price, it does not compare with the 2000T. This unit cannot be recommended as it stands.

radial type of 7x8 microns radius and a tip mass of 0.1mg.

Listening Tests

The 412 was paired off against the Ortofon and Empire. In all cases the other units were preferred. Generally the 412 was not too well-

Lab Tests

The measured performance of the GP412-II is quite good, but the deterioration at the HF end no doubt contributes to the harshness heard. From the LF curve it can be seen that stability is poor, as evidenced by the mucky resonance which is susceptible to LF rubbish. Channel separation deteriorates considerably with increasing tracking pressure.

received, but was not without virtue.

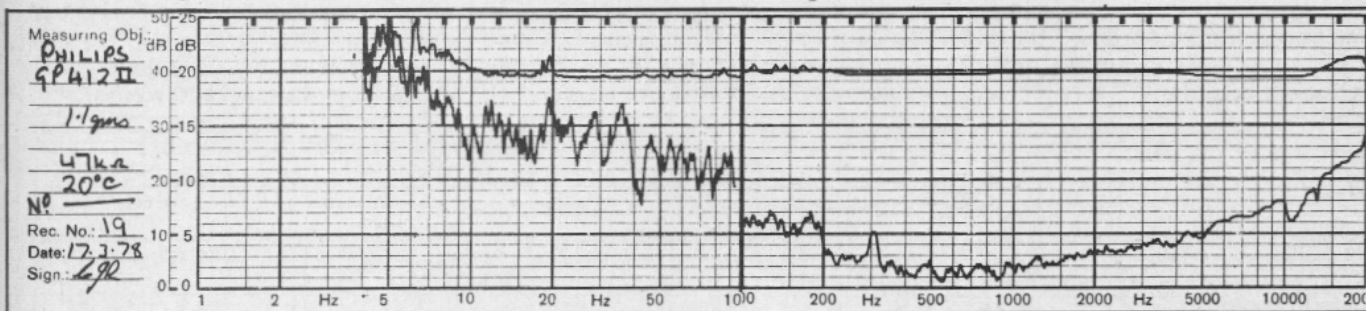
The bass end was prominent, with a lack of real extension. The prominence was of a soft and poorly-defined nature, and certainly not the equal of its opponents. Mid-band was considered a little fierce, col-

oured and lacking in subtlety, which imparted a brashness to the music. At the HF end there was a brittle harshness which overall lacked any real life or sparkle.

Stereo image was reasonable,

but lacking in precision and depth. High level information caused its share of problems, as already noted, but in an overall sense the sound coarsened with an increase in modulation. With the exception of

the sting at the top this unit was considered inoffensive, and perhaps acceptable if you had heard nothing superior. It must, however, be considered mediocre in the light of other units.



Satin M18 & M117E

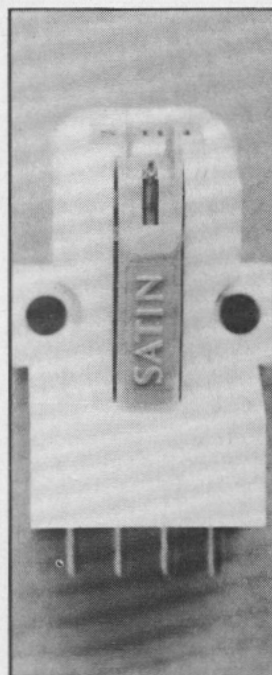
Satin is another name new to the UK and comes from a small specialist manufacturer in Japan. The importer of these units is Howland-West, well-known for distributing Lux.

Both of these units operate on similar principles and so the description can be common to both. The units feature detachable styli, a feature I believe unique among moving coil cartridges. The styli assemblies do not clip into place but are held in place with a magnet. The cantilever is then coupled to the coils by way of a minute beryllium cruciform. In order to achieve a high output in these devices, large high-quality magnets are used, the coils having dozens of turns of aluminium strip. This allows the mass of the coils to be kept low while achieving the high turns ratio. Both types have high rigidity polycarbonate moulded bodies which certainly mount rigidly.

No literature was available on the M117E, so I can only presume that it has a less exacting spec. than the M18E. Mechanically it is similar. It has been suggested that these cartridges may work better into a load of 1k ohm instead of the normal 47k ohms, so 1k ohm was tried.

Listening Tests

Initially, the M18E was pitched against the Supex, and the M117E against the Ultimo, both into 47 ohms. The Supex was preferred to the



Lab Tests

In terms of frequency response, both units are very similar. The M117E has a marginally smoother response, although they both have a rising characteristic. Separation of the M18E is superior in the mid-band and in fact in this region it challenges the limitations of measurement. However, at the extreme HF, the M117 is better. The M18E leaves a little to be desired. LF performance is remarkably similar with the M117E marginally superior. There is nothing to indicate why the M117E should sound slightly bass light or why the M18E lacks LF impact. Both units were measured into 1k ohms as well, but measured results were the same, so the curves are not presented.

Summary

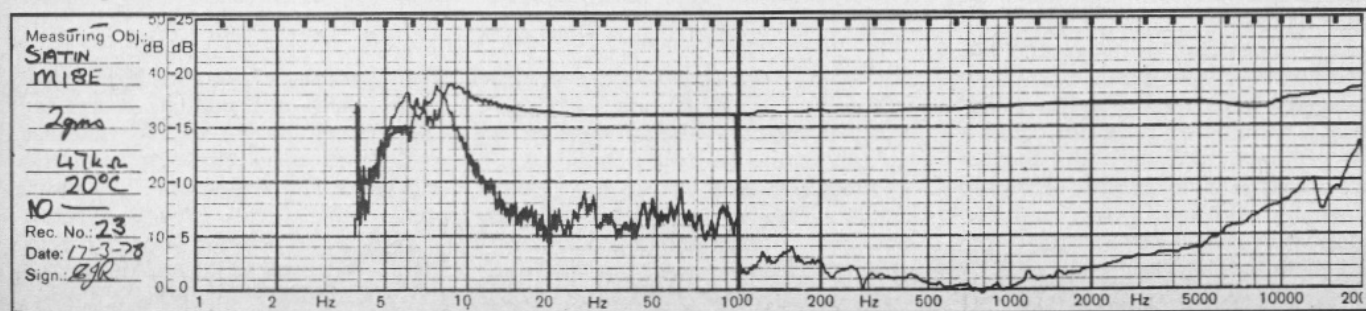
In listening tests, the M117E was preferred to the M18E. This alone makes the M18E suspect as it is nearly twice the price of the M117E. There was a slight preference for the Ultimo 20A in comparison with the M117E, but this was small and it is reasonable to assume that other listeners might reverse the preference. The M117E is also cheaper. It can be recommended as an alternative to low output moving coil devices and could be cheaper if the elimination of a step-up device is taken into account. As a package, I doubt whether it is possible to do better for £65.

M18E, and the M117E was considered similar to the Ultimo.

Bass on the M117E was thought to be a little light, with a slight loss of tightness. The M18E had a more correct balance but lacked weight

and impact, although the bass was tight. In the mid-band, both were clean and detailed, though the 117 had a slightly veiled effect not present on the 18. Both were highly

Overleaf >



Clash of the cartridges

From previous page

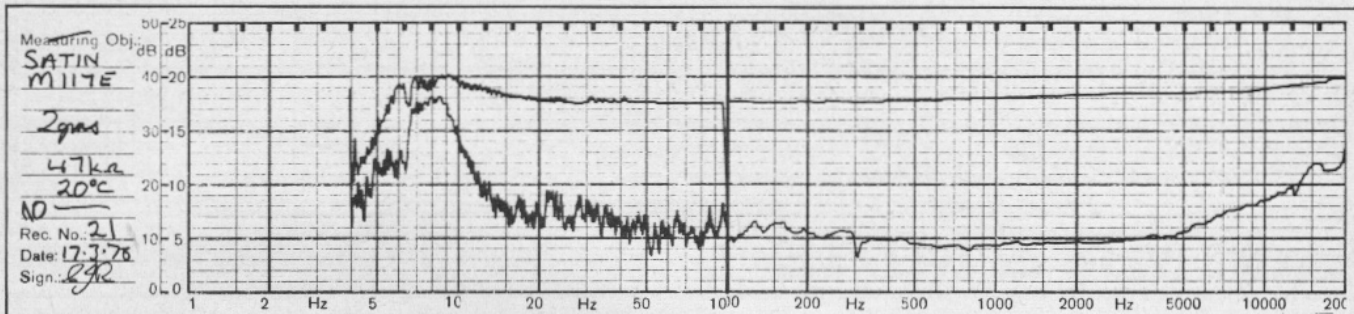
ranked. At the treble end both were considered a little harsh — the 117 more so. Overall, stereo image placement and depth were consid-

ered good.

Loading into 1k ohm did not help much but went some way towards taming the edge at the top of the 117. Nothing else changed.

In later comparisons, both were preferred to the Grado and V15-IV as they portrayed the ambience and subtleties of the music far more convincingly, but both were accused of

having tracking problems on high level modulation. By comparison, the Ultimo benefited far more from the 1k ohm loading and was preferred to either Satin. Both units seemed to excel over any of the moving magnet units for enjoyment, the panel finding the 117 the most pleasing with the 18 faulted mainly on its lack of impact and weight.



Shure V15-IV

Shure needs no introduction, as the name is without doubt the most widely known in cartridge manufacture. The V15-IV is its new top-of-the-range cartridge and follows on from the successful V15-III.

Tracking ability has always been the principle parameter in Shure's design philosophy, and certainly there are a number of features in this new model to improve it.

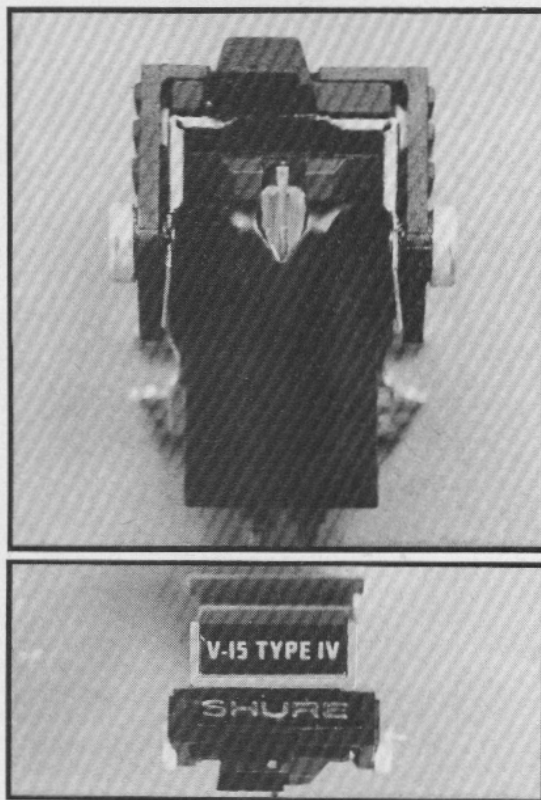
Most obvious is the small brush on the front of the cartridge. This appears to be merely a stylus guard with brush but is in fact a silicone damper. The pivots of the unit house the dampers and, with the brush in contact with the record, improve low frequency stability. The brush itself has minute carbon fibre hairs which not only operate the damper but clean the record and minimise static at the same time.

The cantilever has received a lot of attention to minimise flexing and harmonic modes which can affect sonic and tracking properties. The internal damping mechanism has been improved to give better tracking and improved HF resonance suppression.

Listening Tests

The V15-IV was partnered with the ZLM (to which it was preferred) and latterly to the Ultimo, both Satins and Grado (all of which were its equal or better).

At the bass end, performance was considered quite pleasing, being clean and tight most of the time. But heavily modulated bass did cause a few problems and made the character change to a slightly forward overhang. Mid-band was considered clean and precise but lacking depth and perspective. The treble end, by and large, was thought accurate and



Summary

In the listening tests this cartridge did quite well, but had limitations. Measured results are less than good, so overall the V15-IV can be recommended but with reservations. It will probably appeal to people who do not like or want a moving coil unit, but I consider it inferior to moving coil units at a similar price.

articulate, but a slight sting became evident on some sounds — particularly cymbals — which tended to harden up and become prominent.

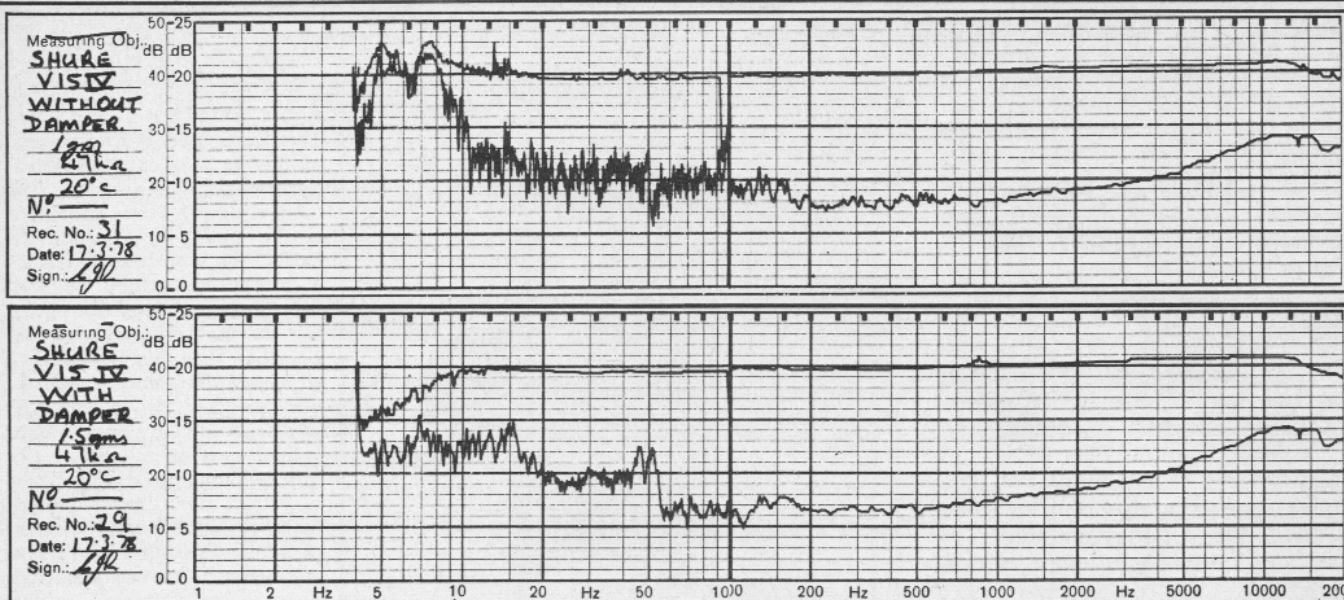
Overall, stereo image was good but lacked a broad spread. Depth and ambience seemed particularly lacking. This removed much of the life from the music and added to our

Lab Tests

There are two sets of curves presented for the V15-IV — one set with the damper in use and one without. It can be seen from the low frequency sweeps that the damper certainly does have a beneficial effect with reference to low frequency resonance, but even without it the resonance is not pronounced. The LF curve without the damper has not had the benefit of the filters (see discussion in 'Methods of Test'), so it can be seen how much rubbish there is normally. The LF curve with damper used the filters, and it can be seen that the damper does not remove much rubbish.

It is clearly visible that the V15-IV is very sensitive to minute disturbance. Higher frequency cross-talk can only be called poor and is no doubt responsible for the lack of life, image and depth apparent in the panel's comments.

main complaint that the music became sterile and clinical. It was for this reason that the V15-IV was less well-liked than the top moving coil units. The Grado also had more atmosphere. It did, however, score over the high-output moving coils because it tracked a little better — but only a little.



Sony XL55 & HA55

Sony is certainly a well-known name in hi-fi, but it has not in the past had a name for cartridge manufacture. It is interesting that Sony should suddenly launch an expensive moving coil.

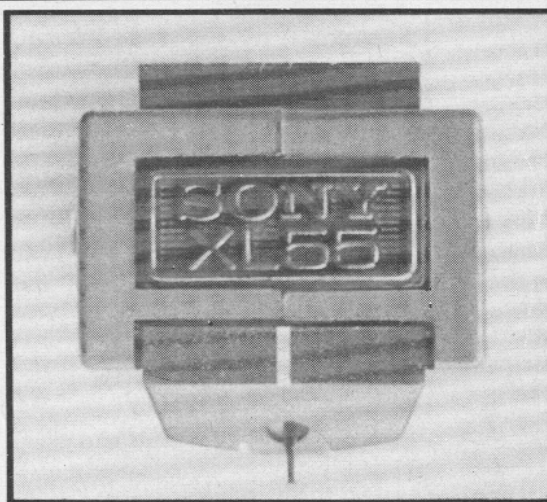
The XL55 has been the subject of much research and, as a result, contains a number of quite forward-thinking features. The stylus assembly is elliptical and mounted on a beryllium cantilever, the upper half where it joins the armature being carbon fibre-clad to improve rigidity. The coils are arranged in a figure-of-eight, which is intended to improve linearity and dynamic qualities. The magnet structure is quite large, contributing to the chunky package.

The HA55 head amp is a mains-powered unit with either 3 ohms or 40 ohms input impedance (40 ohms is used with the XL55). It uses differential amplifiers throughout, and thus is quite complex.

Listening Tests

Initially, the XL55 was tested with and without the HA55. In subsequent tests it was compared with the Coral, Supex and Entré. It did better without the HA55, but still couldn't match the performance of the other three cartridges.

At the bass end it has a good balance, but a loss of impact and



Summary

The XL55, with price tag similar to the best of the group, cannot be recommended. The deterioration noted with the HA55 is not easy to identify but is obviously a product of subtle masking. I can only speculate that there must be some losses when the signal has to pass through so much electronics. The XL55 obviously has a lot of potential and, if its specific problems can be overcome, it stands a chance of outstanding performance.

what was described as a woolly character. The mid-band was thought to be detailed with good depth and perspective, but lacking in presence and life. Treble was considered clean and precise, but again lacking in sparkle and life.

When the HA55 was used the picture deteriorated slightly. The overall character became more

Lab Tests

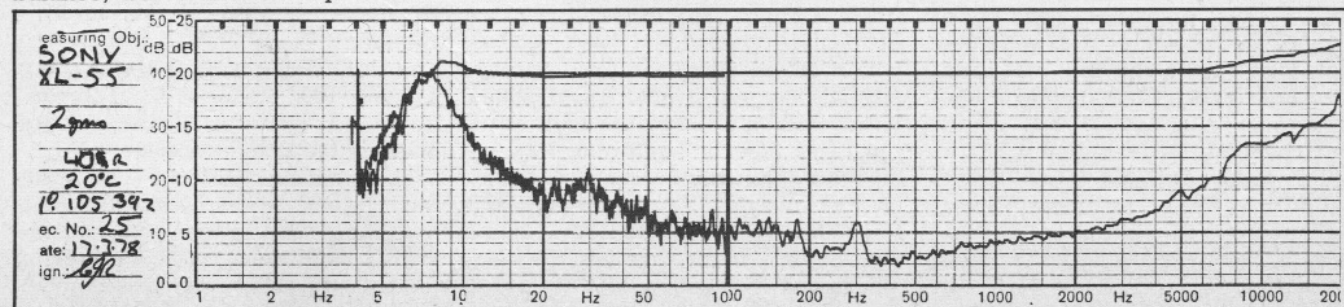
Below 4kHz the XL55 approaches measured perfection. Above 4kHz, however, both response and separation become poor, with definite problems arising. LF performance is undoubtedly the best of the group, with performance approaching textbook expectations. Overall, the faults found in listening could be attributed to poor HF separation as this will certainly reduce sparkle and transparency. But the woolly bass must be due to something not found in measurement. The measured HF rise was not detected in listening.

veiled, with a loss of detail and precision.

Overall, stereo image was good and the music was accessible. Detail was there but mildly lacking in transparency. This, in turn, detracted from the immediacy of the music.

In the final analysis, the Coral, Entré and Supex were preferred.

Overleaf ▷



Supex SD 900 Super

Supex is a name that isn't as well-known as most other cartridge manufacturers, but it has a very enviable reputation. This unit is imported by Linn Products and naturally is best known as a partner to Linn's turntable and Grace arm. The Supex has already become a standard.

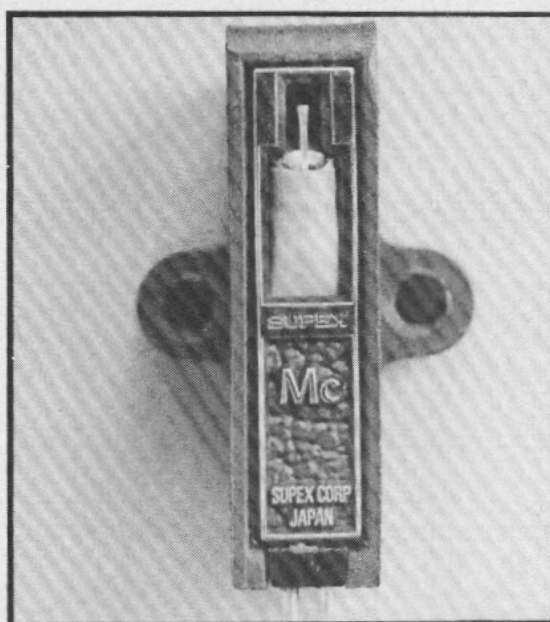
Mechanically, the SD900 is just about as conventional as a moving coil can be. There is, however, creditable attention to detail, and to its large magnet. This is cerium cobalt which contributes to the higher than average output. This, in turn, offers better immunity to hum and noise than lower output types.

Linn Products recommends that the SD900 be used with a Naim head-amp or moving coil pre-amp in order to achieve good matching to the cartridge. So this is what we did.

Listening Tests

The SD900 was partnered initially with the Satin M18E, and subsequently with the Coral and Entré. The SD900 was preferred on all occasions.

At the bass end the SD900 was considered very extended and firm, with good detail and impact. Lower mid-band was a little full, but not excessive. This in fact gave some warmth which was lacking in other units. The remainder of the mid-band was considered extremely detailed, with good depth. Lower treble had a slight colouration noted, but overall the treble was clean and detailed.



Lab Tests

The measured performance of this unit is excellent and approaches the limits of the test set-up. The only criticism is the peak in crosstalk at 8kHz. This is probably due to a minor resonance in the cartridge but does not show up in the response. It is possible that this is responsible for the minor colouration noted in the treble. LF performance is good with virtually no problems at all. The resonant peak is perhaps a little more pronounced than I would like but it causes no sonic difficulties. The peak at 65Hz is due to external disturbance. Crosstalk is not affected by changes in tracking pressure and disturbance due to subsonic hash is non-existent.

Summary

This unit was just about the best-liked of any in this group with a measured performance to match. It takes first place and cost cannot qualify this rating. The best costs £110 — it's as simple as that!

Footnote

The Cartridge used for the listening tests was not the sample measured. Our review sample arrived too late for listening and we are grateful to Dave Gerrard for loaning his own SD 900 for that part of the tests.

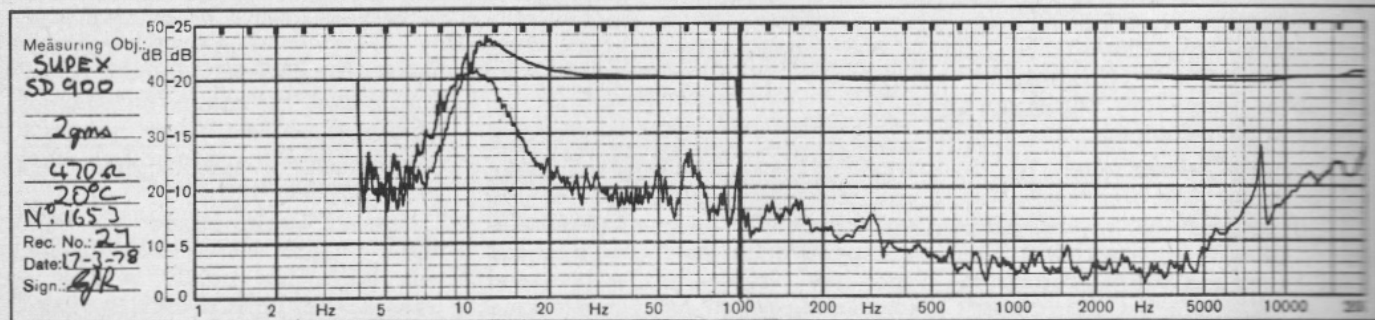
At a later date, Charlotte and I compared the measured review sample with other top units in the group and found that it was not merely preferable but an order of magnitude better. It allowed hitherto unheard detail to be extracted from discs.

I don't believe that there are large sample variations, but deterioration or stylus-silting could be culprits. Dave Gerrard's cartridge is almost two years old and well-used.

I hope to substantiate this personal opinion in the near future.

Stereo image was good and detail outstanding, this aspect being preferable to all others in the group. The Coral had a similar sound, but was less exacting.

The Supex was marginally better than the Entré, but it did not have the outstanding placement of image which the Entré possessed.



Ultimo 20A

The Ultimo cartridge has been around for a while and was the first high-output moving coil unit seen in the UK. It has gained a fair reputation, although it has some shortcomings. In the States it has a better following, but only when loaded into 600 or 1k ohms. A load of 1k ohms was tried as an alternative to the recommended 47k ohms in this test.

All Ultimo cartridges have a distinctive translucent red body which looks peculiar. Inside is a sizeable magnet structure and quite large coils to achieve the high output. The 20A is equipped with a tapered aluminium cantilever to which is attached an elliptical stylus. The 20B has a beryllium cantilever with Shibata stylus, but the 20A has the better reputation and is pre-

sented here.

Listening Tests

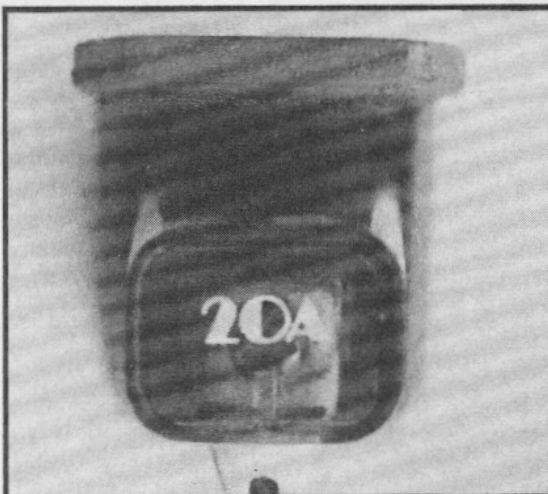
The 20A was compared with both Satin models, the V15-IV and Grace. It was, in general, preferred but failed a little in some areas.

Bass was considered a little light, but tight and detailed with little or no overhang. Mid-range was considered detailed and open, but with a tendency towards harshness in some

areas, particularly on sibilants. At the treble end, detail and dynamics were good although there was a marginal tendency for high-level sound to be edgy and splashy.

Loading into 1k ohm improved the overall character giving more depth and openness in the mid-band and seemingly more detail. The edginess in the treble was removed but there was still a slightly hard character. The bass end did not change.

Overall, this cartridge was well liked, portraying the atmosphere and character of the music and the immediacy of the performance. Others in the group were preferred but the 20A nonetheless came through well and offered the virtues claimed for moving coils.

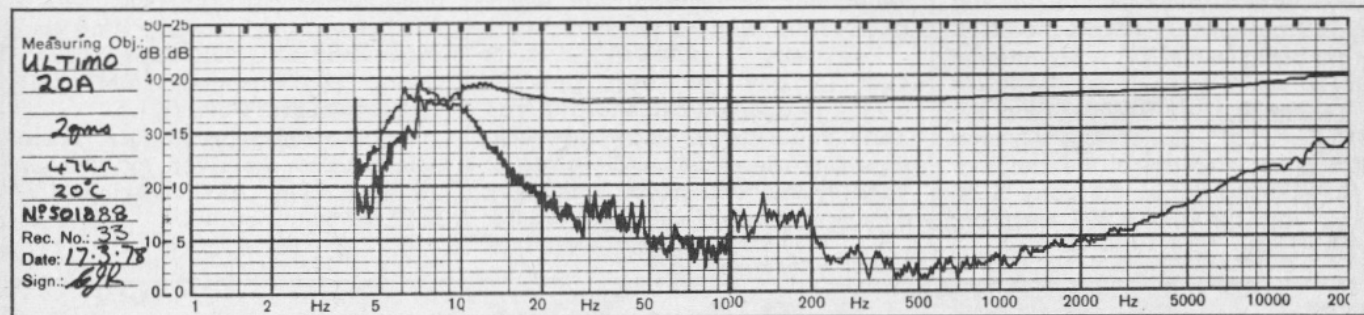


Summary

The 20A was, in general, preferred to all but the best low-output types when loaded into 1k ohm — and on this basis can certainly be recommended. It was, however, only marginally better than the Satin M117E which is an alternative and in the same class at a slightly lower cost. If you already have the facility for a low-output device then the picture changes. But if a step-up device has to be purchased then the 20A becomes an attractive proposition.

Lab Tests

Frequency response indicates a rising characteristic which can certainly be responsible for the bright character. A 1k ohm load made no difference to measured performance. Separation at the HF end does leave a little to be desired but elsewhere separation is excellent. LF performance is very good, resonance being well controlled with separation of a high standard.



CONCLUSIONS

Without doubt, the listening panel preferred the moving coil units. This, to me, is no great surprise since I've had such a preference for some time.

It raises the question: 'is there a reason why moving coils should have a superior sonic performance?' I believe that there is not one answer, but several. Two of these have shown up during the course of measurements for this review.

It was obvious that most of the moving coil units measured fairly well. It became apparent that the frequency response and separation of the moving coil types varied little when tracking force was changed, but all of the moving iron cartridges deteriorated as force was increased. This is important as effective tracking force changes with modulation, and the static tracking force can become much greater.

The second discovery was that the moving coil types seemed relatively impervious to rubbish on the disc such as subsonic irregularities and general disc noise. Added to this, there is the question of stability. The moving coils tracked

faithfully through all kinds of warps and problems, but the moving iron types in general wobbles around like a jelly with even minor irregularities affecting linearity and sonic performance. Of course, the Shure, with its damper, is immune to subsonic problems as are many units when used in a damped arm. But even with a damped set-up, the higher frequency hash still affects performance.

Other reasons are speculative on my part, but naturally I believe them to be worthy of consideration. If an engineer is asked to choose between a moving coil or moving iron meter movement, he will invariably choose the moving coil type. The reason for this is that, due to the large coil inductance required in the moving iron types, linearity and accuracy are poor, particularly at high frequencies. As a result, hysteresis also becomes a problem. While I'm not suggesting that moving iron cartridges suffer to the same extent as meters, I believe that similar problems do exist and, for this reason, moving coil cartridges are far more linear devices under

dynamic conditions and do not suffer from nearly as much electrical hysteresis. Added to this, there is the question of vinyl spring-back: discussed earlier which, with the heavier tracking weights employed with moving coil units, is overcome. Certainly I believe in this philosophy.

So, in an effort to summarise the units in this group, it is certain that moving coil units rule OK. This fact alone makes it hard to make a rational summary of all the units. It may seem brutal, but to me it is obvious that moving iron cartridges are only worthy of consideration if you cannot afford a moving coil.

At the top of the group are three units which excel: the Supex, Entré and Coral, in that order. To the panel, the first Supex only just came out on top but the later sample was, to me, far superior. The Entré was well liked and articulate, with excellent stereo image and depth, but a little clinical. Finally, the Coral had a sound similar to the Supex, but lacked its transparency, extension and excellence. These units have quite a wide variation in price, the

Overleaf ▷

TEST BENCH

Clash of the cartridges

From previous page

Coral undoubtedly being a bargain even with head amp.

I think it fair to say that the top quality, low output devices have to be considered with step-up devices because so few amplifiers are at present equipped with a moving coil input. If you do possess an amplifier with such an input, the situation is different. The lowest price for a unit in the top three is £99 for the Coral 777EX and H200.

The Grado at £150 is out of the question as it does not approach the standard of the top three and costs more.

In terms of panel preference, the Ultimo 20A, Satin M117E and Satin M18E came next, in that order, but the difference between the 20A and M117E was small. At £120, the M18E is out because the 20A is £73 and the M117E is £65.

Taking cost into consideration, the V15-IV, ZLM, Signet and Ortofon M20FL are also out of the running.

In acoustic terms, the Sony XL55 came after the Ultimo 20A and Satin

M117E, so cost-wise this too can be considered a non-starter. If its marginal deficiencies can be ironed out it could be amongst the best.

This then leaves the Empire 2000T, Ortofon M20E and Philips GP412 II. The Empire was marginally preferred to the Ortofon and the Philips was not liked. This makes the Empire a clear winner when cost is considered.

Do you have to spend £100 to get a good cartridge? You have to spend £100 to obtain something approaching the best in cartridges — and quite a lot more for the very best. If you already have the facility for a low output device, then the Coral is something of a bargain if you can't afford any more money. If £100 is too much, then either the Ultimo or Satin can offer a very good performance but both lag behind the top group.

For the impoverished, the Empire is about as cheap as you can go while still deciphering the major part of what your records contain.

Personally, I believe that it is vital to buy the best possible cartridge that you can afford. If you don't you'll never know just what your records contain and the rest of your system will never stand any chance of showing just what it can do.

Acknowledgments

I have to offer my sincere thanks to all the people and companies who made this review possible — not least the manufacturers who submitted cartridges.

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My gratitude must also go to the long suffering listening panel: Jane Scrivins, Charlotte Craske, Dave Gerrard of Plessey Opto-electronics, Ted Howlett and Trevor Preece — our Leader.

A final word of thanks to Dee, the editor's First Lady, for providing unlimited cups of tea and coffee. Without them we would certainly have perished.

Postscript

In addition to cartridges included in this review, the following were also requested: AKG P8E, Supex SD901, Grace F9L, Stanton 881, EMT XSD and Zeepa Black Devil.

Unfortunately the SD901, Grace F9L and Zeepa arrived too late for inclusion. The AKG, Stanton and EMT never turned up.

Manufacturers & Price List

ADC ZLM Serial No. 7D734

Price £92.00 + VAT

Manufacturer:

Audio Dynamics

Importer:

BSR Ltd, Powke Lane,
Cradley Heath, Warley,
W. Midlands B645QH.

Audio Technica Signet TK7SU

Serial No. 733100

Price £71.62 + VAT

Importer:

Shriro Ltd., Shriro House,
The Ridgeway, Iver, Bucks.

Coral 777EX Serial No. 87141

Price £54.00 + VAT

Videotone H200

Price £45.00 + VAT

Importer:

Videotone,
98 Crofton Park Road,
London SE4.

Entré 1 Serial No. 702068

Price £87.50 + VAT

Lentek Head Amp.

Price £49.50 + VAT

Importer:

Lentek Audio Ltd.,
Edison Road,
Industrial Estate, St. Ives,
Cambridge PE17 4LF.

Empire 2000T

Price £35.00 + VAT

Importer:

Hayden Labs. Ltd.,
Hayden House,
Churchfield Rd.,
Chalfont St Peter,
Bucks. SL99EW.

Grado Signature I

Serial No. 1510

Price £150.00 + VAT

Importer:

Tranasonic Imports,
13 Whitsed Street,
Peterborough, Cambs.

Ortofon M20E Serial No. 724412

Price £64.00 + VAT

Importer:

Harman International,
St Johns Road, Tylers Green,
High Wycombe,
Bucks. HP10 8HR

Philips GP412 II

Price £34.00 + VAT

Philips Electrical Ltd., City House,
London Road, Croydon, Surrey.

Satin M18E

Price £120.00 + VAT

Satin M117E

Price £65.00 + VAT

Importer:

Howland West Ltd.,

3-5 Eden Grove,
Holloway, London.

Sony XL55 Serial No. 105392

Price £85.00 inc. VAT

Sony HA55

Price £135.00 inc. VAT

Importer:

Sony UK,
134 Regent Street,
London W1R 6DJ.

Supex SD900 Super

Serial No. 1653

Price £110.00 + VAT

Importer:

Linn Products Ltd.,
235 Drakemire Drive,
Castlemilk,
Glasgow G45 9SZ.

Shure V15-IV

Price £91.20 + VAT

Importer:

Shure Electronics Ltd.,
Eccleston Road,
Maidstone ME15 6AU.

Ultimo 20A Serial No. 501888

Price £73.00 + VAT

Manufacturer:

Onlife Research Inc.,

Importer:

Condor Electronics Ltd.,
100 Coombe Lane,
London SW20 0AY.