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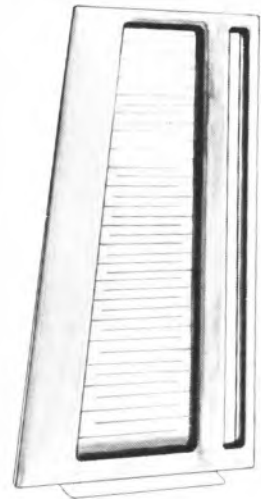
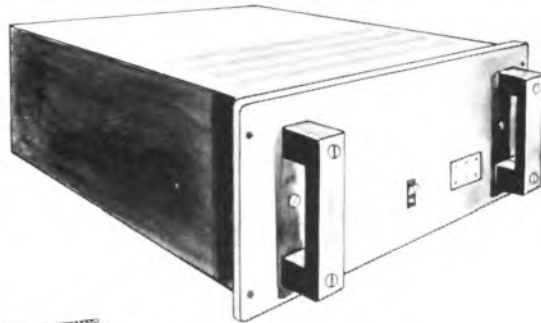
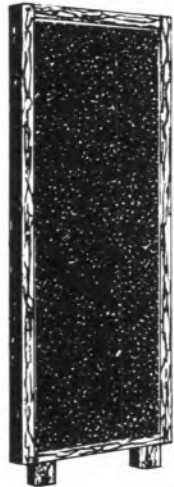
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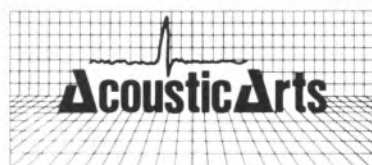


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Enquiries regarding the content of this book should be made in writing to Hi-Fi Choice Editorial, 14 Rathbone Place, London W1P 1DE. We regret enquiries cannot be dealt with by telephone. While every care has been taken in the preparation of this book, the publishers cannot be held responsible for the accuracy of the information herein, or any consequence arising from them. Readers should note that all judgements have been made in the context of equipment available to Hi-Fi Choice at the time of review, and that 'value for money' comments are based on UK prices at the time of review, which are subject to fluctuation and are only applicable to the UK market. This edition © 1987, Felden Productions.

Following the conspicuous success of the first 1986 *Hi-Fi Choice: The Collection*, we proudly present *The 1987 Collection*, a unique guide to the very best in world hi-fi equipment, at both sensible and silly prices. From the editorial seat, packaging together the best is an enviable task. Time, space and cost considerations temper my wilder enthusiasms, but there is still more than sufficient budget to ensure that *The 1987 Collection* will be the year's single essential guide to high performance audio equipment.

I use the term 'high performance' rather than 'high end' because the purpose of *The Collection* is to search for excellence irrespective of price. Deftly avoiding discussing the semantics of excellence, it has become increasingly clear that its cost has been dropping steadily for a number of years now.

*The Collection* represents a golden opportunity to tackle a handful of the real exotics. They are a lot more fun to write about than a dozen budget loudspeaker or cassette deck clones, and we naturally like playing with expensive toys. But getting to grips with these frequently maladjusted (or at any rate poorly house-trained) esoterica is also the only possible means of discovering the boundaries of the current state of the art — and hence creating the frame of reference within which the subjective performance of all hi-fi equipment can be assessed.

With such laudable aspirations (or rationalisations), on to the content. Lest accused of obsessive navel-gazing, we do of course acknowledge that some would-be hi-fi purchasers are deterred by the stark functionality of today's 'real hi-fi', not to mention the emotional and lifestyle demands that sometimes accrue. So to keep everybody happy, there's the nicest CD Midi System from our Autumn compilation, plus a nice new not so midi system besides.

Much has been compiled from the various *Hi-Fi Choice* editions published over the past year, including last year's *Collection*. The Turntable Arm and Cartridge information is only two months old, so needs little additional work. Similarly not a great deal seems to have happened on the Cassette Deck front in recent months. Everyone waiting for R-DAT, huh?. However, our Amplifiers & Tuners edition is now twelve months old. And specialist amplifier manufacturers are forever tweaking the product — changing a capacitor here, a power supply regulator there. We've done our best to catch up by doing a lot of extra listening, but the full story will have to wait until the next Amplifiers and Tuners, published April.

The learning curve for CD Players is still pretty steep, so products evolve and change quite rapidly. Those with particular pretensions to sound quality are still quite thin on the ground, so we can still manage to cover the majority, with a number of updates and new reviews. Any casual watcher of the hi-fi scene cannot fail to have noticed a sudden surge in the introduction of elaborate and interesting new loudspeaker systems. Which ones do we choose? (Close eyes, pin in right hand . . .)

Rather more important perhaps than the individual reviews, we have made a serious attempt to look at the whole business of system building and 'supercompatibility' within high end hi-fi. However good the individual component, its interaction with other parts of the system has much to do with the final result.

Paul Messenger



# The Collection II

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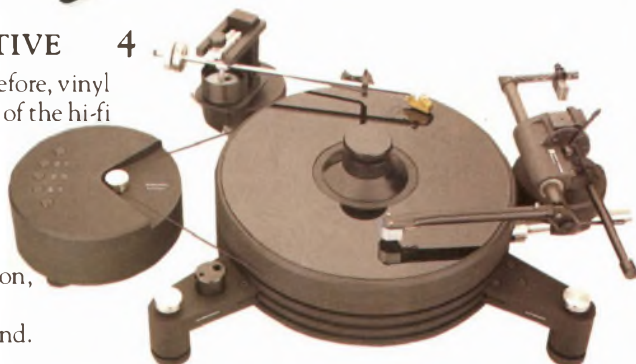
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# THE VINYL

**H**i-fi for the enthusiast is about playing black vinyl discs. Despite the subsequent appearance of various alternatives over the years, modern hi-fi was a direct consequence of the modern stereo LP, and the two remain inextricably linked.

The microgroove vinyl disc, in both 33rpm and 45rpm versions, first appeared about 35 years ago. The first hi-fi boom really began soon after stereo discs were introduced in 1958. Microgrooves quickly supplanted the brittle, fragile and short-playing 78s, though the latter are still affectionately retained and played by many collectors. Moreover, a brief listen on today's equipment will quickly show that these high speed shellacs can still teach vinyl a lesson or two about midrange dynamics and 'life'; *plus ça change*. And of course many classic performances were cut originally on 78rpm, and have been transcribed and preserved for posterity with varying degrees of success.

Radio as a hi-fi medium received a shot in the arm in the late 1950s, when FM broadcasting was introduced. Again this higher-quality source was originally mono, but a compatible stereo version followed a few years later.

The BBC's policy of extensive live and serious music meant that radio became a major source for the minority of classical music listeners. Rock and pop listeners (some 80% of the total audience) would have been better served by the more *laissez faire* US attitude to needletime and station licensing.

When the source is live or from studio recorded tapes, FM radio is a worthy alternative to LP as a source of high quality home music. It is, however, a qualitatively different medium, replacing the choice of the listener with the choice of the broadcaster. It has its place, but it is no substitute.

## TAPE FLEXIBILITY

The mid'60s saw vinyl's first real rival appear in the form of the Compact Cassette. Being tape-based, it was much better suited to portable/car use, and had the inestimable advantage of having a recording capability in addition to the replay of pre-recorded material.

Compact Cassette was invented by Philips, whose cleverest move was to license other manufacturers without royalties, leading quickly to its successful establishment as a world standard. After 20 years, cassettes have now overtaken vinyl LPs for sales of recorded material, with additional enormous sales of blank unrecorded tapes.

*Paul Messenger examines the relationship between the hi-fi enthusiast and the various sources of music.*



Where vinyl has remained almost exclusively a music storage medium, with its development closely linked to the music industry, the cassette has spread its tentacles into all manner of different fields since its inception. These have all served to increase research and improve economies of scale in the manufacture of mechanisms and the tape itself.

The cassette tape medium has also received a series of distinct major stimuli. Some five years after those early portable Philips players and their Japanese competitors, Ray Dolby invented his remarkably clever noise reduction system, and Du Pont introduced chromium dioxide tapes. An American company built a high quality stereo machine around a rugged industrial transport mechanism, and so, at the end of the '60s, the hi-fi cassette recorder was born.

By the mid '70s, hi-fi cassette deck production was in full flow, while in-car units were also starting to appear in real numbers. The company car with generous fitted extras has probably had as great an influence as any other factor upon the growth of the market for pre-recorded cassettes.

In the '80s, Sony's *Walkman* created a whole new market for 'personal' players, battery portables auditioned through headphones, the very best of which could be regarded as 'hi-fi'. Ghetto-blasters with fitted cassette decks now enliven homes and shopping arcades. And at the same time cheap personal computers came on the scene, and the volume low-price examples invariably used adapted cassettes for storage of programs.

The cassette has had some success as a hi-fi medium, particularly for creative enthusiasts and in countries where the radio transmits original material. But historically the pre-recorded cassette has never succeeded in coming up to the expectations of the enthusiast, though quality does steadily improve. The avoidance of disc surface noise has won some converts, but those with good quality turntables and cassette decks invariably find they can get better results making their own recordings at home.

The reasons are that commercial tape duplication uses more transfer stages than disc pressing, and the horrendous 'loop bin master', operating at 64 times normal speed, makes compromises which may well be acceptable enough for the general consumer, but which do limit the potential compared with vinyl.

## THE CD EFFECT

Whereas cassette may still be seen as complementary to vinyl disc, the newest development in hi-fi is clearly intended as a straight replacement. Compact Disc, developed jointly by Philips and Sony, has been around for four years now. It was conceived as a 'high-tech' replacement for the LP, offering a claimed superiority of digital sound quality, an absence of surface noise and freedom from scratch damage, plus the potential for in-car and personal applications.

Record companies were attracted to this new replay-only medium. Their hostility towards the copyright piracy capability of cassettes has never been fully assuaged by the profits that they make from musicassettes. And they foresaw that compact discs would sell at a premium price, margins on vinyl having slipped significantly over the years.

Compact Disc may have started to take its toll of confidence among the bigger cartridge and



# IMPERATIVE

turntable manufacturers, but any adverse influence on the specialist sector so far seems to have been offset by the stimulus CD has given to the whole hi-fi scene — providing a touch of extra interest and glamour around the time that the gilt plating of personal computing has become a little tarnished.

The CD format has an undoubted appeal for its convenience, consistency, and a sound quality that many regard as more than adequate. But even its most ardent supporter will acknowledge that the need to build a new collection of music from scratch is tiresome and expensive. Though CD is winning its share of supporters, other customers have had interest in their LP collections re-awakened, and are upgrading record playing systems instead.

Compact Disc is still very much the 'third format' in terms of availability of material, and will remain so for the medium term future, until such time as the world population of CD machines represents more than a drop in the ocean of record and cassette decks. And from the consumer perspective, CD lacks the capability of making recordings, which did so much to establish the Compact Cassette as an alternative to the LP.

Perhaps most significant of all in the context of this book, there is no doubt that the 'CD sound' has little appeal to a significant number of hi-fi and music enthusiasts. Whereas one body of opinion is enthusiastically welcoming CD as an end to pops and clicks as we know them, an equally vociferous set is making it quite clear that they would much rather listen to analogue for its musical qualities, notwithstanding the odd pop or click.

Recent experience suggests that some listeners still prefer a modest hi-fi turntable to CD, and once one reaches £300+ the turntable starts to move decisively into the lead. Amongst exotic separates, CD is in a no-win situation, revealing its limited horizons and 'common denominator' aspirations.

The reasonable success of CD in the mass market is evidence enough of its undoubted strengths. But to 'go CD' is still taking a plunge, necessitating a financial commitment, for a player and 25 discs, of maybe £500. In the meantime, turntable, arm, and cartridge manufacturers will happily go on selling devices which can improve the sound of an existing collection at a stroke, as well as being easier on the pocket.

## ▼ THE DAT THREAT ▼

It stands to reason that tape manufacturers don't want to lose their business to laser-read discs.



So it's not surprising that a digital tape equivalent to compact disc is currently waiting in the wings, while various interests from the music business and consumer electronics manufacturers squabble over launch dates. The fear that has postponed its introduction so far is that it will adversely affect the long-term chances of the fledgling CD, or that it will be a licence for digital music piracy, both suppositions rooted more in paranoia than good sense.

R-DAT is now almost definite for a Spring launch in Japan, though it will be 1988 before the rest of the world gets a chance. Not only will CD have had a good five-year start, the initial machine price is likely to be £600+, and the tapes expensive. Availability and price of pre-recorded material is a completely un-

guessable factor at this time. And any tapes you make on your DAT machine won't be readily playable in the company car on the way to work, or on a tiny compact *Walkman* in the briefcase on the train.

R-DAT offers some advantages over CD that could cause its gradual takeover. Two hours playing time on something half the size of a Compact Cassette that could eventually become cheap to buy, plus a quality marginally better than CD will have its attractions. But it's unlikely to become a real force to be reckoned with until the mid 'nineties.

## ▼ THE VINYL IMPERATIVE ▼

Despite the protestations of the apostles of CD, there's not the slightest chance that vinyl will ever go away, and certainly not quietly. It is far too deeply entrenched, with billions of examples covering a repertoire that must be in excess of a million. In my town alone there are now as many secondhand as new record shops.

The irony is that CD was originally conceived more than a decade ago. The standard it achieves is probably more or less comparable to that which vinyl was capable of at that time. But ten years of enthusiastic development by hi-fi specialists has meant that the very best analogue LP systems make CD sound embarrassingly bad.

Agreed, the players and disc mastering systems of the new format are in their infancy, but the digital reproduction system is essentially a 'closed' one, fitting the music to an exact mathematical formula. The joy of vinyl is that each successive incremental improvement in the replay system brings the realisation that there is much more information on all the discs in one's collection — old and new — than one was aware existed at the previous stage. The entire collection awaits rediscovery.

And the bottom line question, which will only be answered once CD players and discs have properly penetrated the market in real numbers, is whether the consumer, who has shown he is happy enough to accept the standard of the musicassette for its convenience over the LP, will really be willing to pay a substantial premium for the silver disc over either of the alternatives.

The present arrangement whereby the customer can spend £50 or £5,000 for the means to replay nice cheap software, getting results more or less appropriate to his investment, is far too reasonable, logical, and defensible to be jettisoned lightly in favour of a 'convenient' new system with such limited ultimate horizons.



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Is this just fantasy

Caught in a landslide

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## MAPPING THE HIGH END



So you're interested in 'real' hi-fi, not the glistening feature-laden packages that lineup alongside the microwaves and videorecorders down at the local branch of a consumer electronics chain? You're faced with a bewildering variety of often bizarre-looking equipment from company names that mean absolutely nothing — and at prices which make those Taiwan-sourced midi systems look an absolute steal. Real/high end hi-fi's only possible justification is if it can give you more musical or aural pleasure than the aforementioned midi-system when listening to music at home. Before going any further, make sure that is the case by listening for yourself down at your local hi-fi specialist!

By starting this paragraph it is therefore safe to assume: (a) that you can hear some sort of difference between real and fake hi-fi; and (b) that your local dealer is not a total incompetent unable to demonstrate the distinction. But there are now some questions to ask and answer, because the range and variety of 'real' hi-fi equipment is much wider and deeper than that offered by the packaged system. (These offer little variation except for specification and price, though some, almost randomly it seems, do work much better than others — see Hi-Fi Choice: CD Midi Systems.)

Historically hi-fi began in Britain and the US, three distinct spheres of influence spreading out from the UK and the East and West coasts of the USA. An alternative Japanese approach has developed steadily over the past forty years, but (paradoxically) its influence has stayed concentrated on the home market. However, the last decade has seen considerable 'internationalisation' as US and UK specialist manufacturers have become increasingly export oriented. As enthusiasm for home music and hi-fi has spread, other countries have started to make a major contribution — France, Germany, and Scandinavia, for example.

Though national identities are becoming in-

creasingly blurred, there are still identifiable characteristics and traditions that may be discerned. Predictably the US goes for large loudspeakers — frequently panel-type designs, and usually with large amplifiers to drive them — reflecting their generally larger rooms. The Japanese, surprisingly in view of their much smaller rooms, retain great affection for large British horn loudspeakers that originated in the fifties, partly because their high efficiency works well with low power 'vintage' valve amplifiers which are also highly regarded. These are just a couple of the more obvious examples — there are dozens of other instances of national fashion and taste, but for brevity's sake this feature will concentrate on the UK market.

### ▼ A PEOPLE BUSINESS ▼

The search for the state of the hi-fi art is essentially a story about individual people. Most of the small companies active in specialist hi-fi are led by one or two individuals who combine creative design and development skills with the managerial and marketing expertise necessary to run a business effectively. And the distributors and dealers themselves — certainly the best ones around — are just as much enthusiasts at heart, anxious to earn your repeat custom by giving satisfactory results.

It is not surprising that the best and most timeless products are frequently the result of one man's vision of what was achievable, given patience and dedication. Nor is it surprising that such products quite clearly reflect the taste of such individuals — if not their whole personalities. Some designers listen to rock music, others to string quartets. There are therefore a wide range of alternative approaches, each of which has its own validity, makes its own assumptions, and gives its own particular result.

### ▼ DIFFERENT PATHS ▼

The crucial problem that has always faced hi-fi lies in defining its objectives. Human knowledge

is curiously weak in understanding even the basic mechanisms of the aural sense, let alone integrating this with this ineffability of the musical experience.

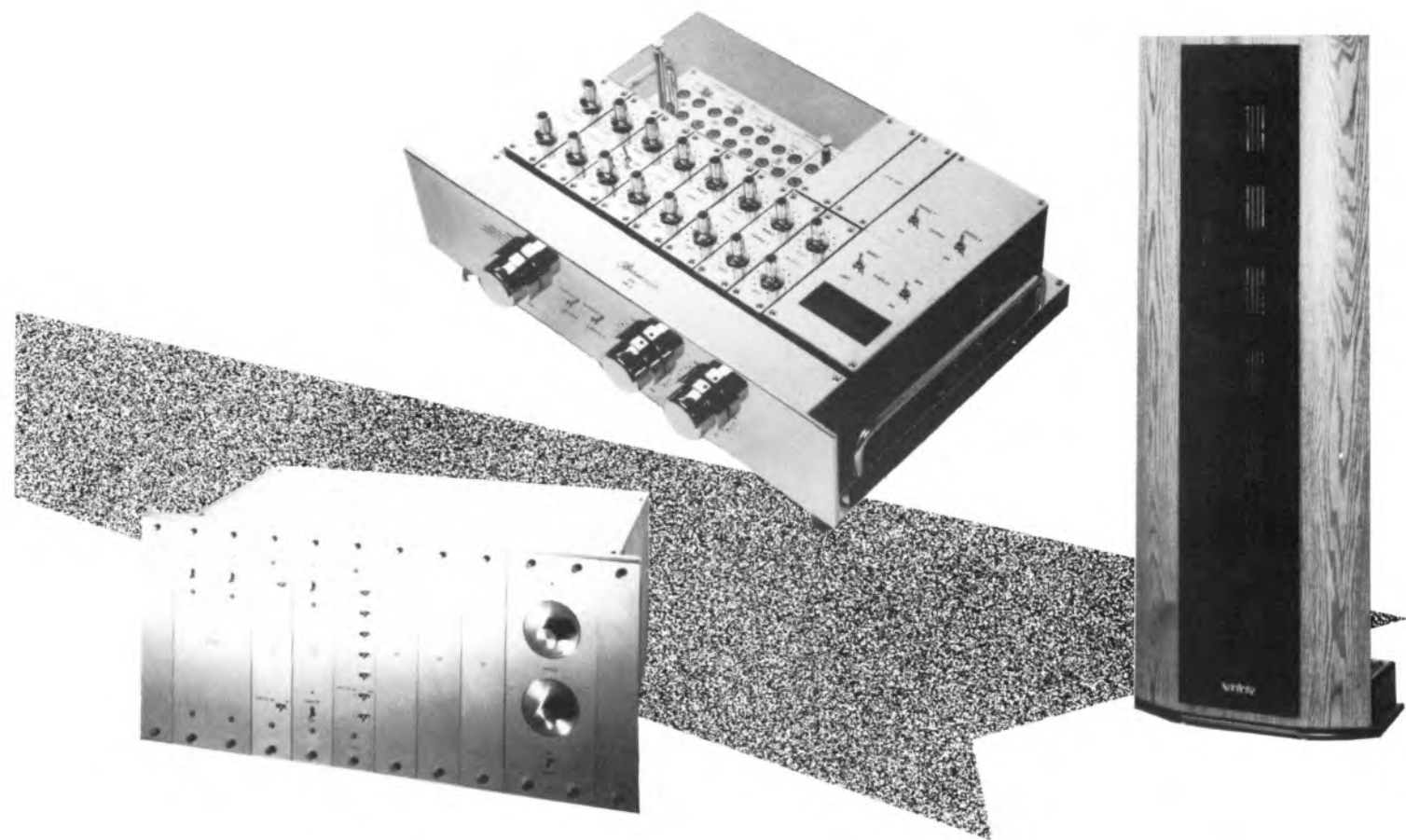
The history of hi-fi is littered with 'desirable objectives' that have been pursued relentlessly ad absurdum — yet with no recognisable sonic or musical advantage. The quest for ever lower levels of amplifier harmonic distortion, often at the expense of sound quality, is a clear case in point. Indeed, the steady — almost spectacular — growth of 'real' or 'high end' hi-fi over the past few years has been a direct response to the discrediting of many of the traditional engineering goals that were established in the immediate post-war era.

The realisation that measurement-oriented performance goals were hindering the quest for the reproduction of musical or acoustical 'magic' has been the single major stimulus in the last decade. However, the failure to replace definable engineering objectives with a truly coherent alternative is a two-edged sword. Subjective sound quality may be the only rational objective, but it is in an objective that differs markedly from one individual to another.

The appreciation and enjoyment of music is a very personal matter which probably varies as much as do musical forms. Consequently, the openendedness of the of the hi-fi quest can prove to be both a challenge to explore the limits of aural perception, or an opportunity to exploit the gullible enthusiast.

Some purists will argue that there is only one valid route, which encompasses all possible objectives. But in the real world there are practical constraints. Cost and engineering limits both loom large, and as one approaches the ultimate the architectural and constructional characteristics of the room and home start to play a part — as can the quality of the mains electricity supply and the degree of RF 'hash' in the immediate environment. These constraints set a basic framework where an experienced local





dealer can be invaluable in making the right selection.

### THE HORNE DILEMMA

The more one looks at the today's various 'high end' objectives, the more they seem to resolve into two rival philosophies. The first is oriented towards the reproduction of sound *per se* — and hence by implication the reproduction of music. The second places musical values first and foremost, letting the sound take care of itself. Most 'real' and 'high end' hi-fi companies claim some allegiance to both these *desiderata*, yet usually their hearts tend to be in one or the other whilst trying to embrace both. In a sense the first approach reflects an intellectual response — whether something sounds 'right' acoustically with respect to one's memory of reality, adding and subtracting nothing. The second approach in *extremis* relies entirely upon the emotional response of the listener, as to whether the experience has been a musical one, irrespective of presentation.

Simplistically, every enthusiast (like every manufacturer, dealer, or even journalist) has thresholds of acceptance of these two basic criteria. At what point does the quality of presentation interfere with the enjoyment of a system; and what degree of emotional quotient (EQ would be an unfortunate acronym) does the listener need for his emotional satisfaction. Or more mundanely, how much of the available budget goes into the emotional fix, how much into the intellectual.

More prosaic system objectives such as loudness capability, bass extension, dynamic range, coloration, stereo imagery etc etc are all subsidiary characteristics that relate in various ways to these two basic human responses. It stands to reason that trying to assess one's own balance of responses will be most helpful in choosing your own 'right path'.

### THE SYSTEM

The high end/real hi-fi system is almost invari-

ably vinyl-based, consisting of turntable, arm and cartridge, plus amplification and loudspeakers. That doesn't mean that the various other sources are ignored — serious enthusiasts are quite likely to have tuners, cassette decks and CD players kicking around. But however one may perceive the future, none of these alternatives has yet approached LP discs, either in terms of the quality of the source itself, or in the zeal and striving shown by manufacturers and enthusiasts. This view, which some may be tempted to dispute, is elaborated in *The Vinyl Imperative* (see pp4-5).

Component marching has become an increasingly important part of achieving high quality hi-fi over the last ten years, yet the mechanisms at work are still largely elusive, and achieving the state of 'supercompatibility' is often a matter of trial and error. The Systems section later in this volume will, it is hoped, help reduce the error and make the trial less expensive.

The relative importance of component or system will always be a matter of fervent debate. Few will deny the gains that system marching can make, but it is equally true that improvements are made on one component at a time. Furthermore, a company has to be pretty well established and/or capitalised to embark on system manufacture, so ignoring separate component specialists would shut out the industry's main source of new ideas.

Linn and Naim have been chief protagonists of the real 'hi-fi' systems approach for the past decade, offering a range of expandable disc-playing packages from about £1,000-£10,000. Although the various components can be treated as separates, they do seem to work most predictably well when combined, giving an approach that is inevitably rather self-contained for the separate enthusiast. But the fact that each company sold more than £1m worth of product onto the UK market in 1986 is a measure of their importance.

At lower prices there are a number of other

predominately UK manufacturers — Mission, Meridian, Heybrook, QED, plus AR and Rotel, for example — producing competitive well-matched packages that can frequently outperform poorly-matched assortments that may have cost far more.

High end importers like Absolute Sounds are equally conscious of the need to put together components sympathetically, though they naturally have less control over the process. Indeed, newcomer Audio Innovations seems to have deliberately adopted a Linn/Naim-like 'closed loop', based on carefully selected UK and overseas components.

The final point to make concerns the importance of expert setup and installation — setting up a top turntable takes quite a long time, even if much can be done before leaving the shop. And remember the need to devote a reasonable part of the budget to the cables and support furniture, which are essential components in the overall equation.

### TURNTABLES ARMS AND CARTRIDGES

Though such a statement would have been widely regarded as a hideous heresy only a decade ago, it is now generally accepted that the record player, consisting of turntable, arm and cartridge, is the most important part of the hi-fi chain. Much credit is due to Linn Products, whose fervent campaigning claiming the innate subjective superiority of their Sondek turntable eventually succeeded in persuading the sceptical that turntables really did matter.

At a time when it seemed that we were doomed to a direct drive future, Rega moved into the middle market and Dual the bottom end. Suddenly belt drive was the thing, with Ariston and Systemdek, then Michell, Pink Triangle and Oracle providing welcome variety. Thorens and AR dusted off and revamped old models, and various other exotica appeared at different mass

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and price levels — some of the Japanese heavy-weights using silk belts and other strange materials.

Tonearms have received just as much attention. Fixed headshells and near-rigid bearings are now mandatory even at quite modest prices. Given the advance in turntables, tonearm improvements become that much more worthwhile, and that much more tempting for the customer. The current crop of exceptional tonearms can have as much influence on the sound of a system as the chosen loudspeakers, so careful matching of turntable and arm is vital.

Cartridges too have evolved, though more slowly and sanely as a rule. The moving coils were always with us — it's just that the more primitive turntables, arms and amplifiers of a decade ago were unable to use them to their best advantage. Now the moving coil principle has become the rule rather than the exception, along with lower compliance for better system optimisation.

The review pages cover most of the turntables, arms and cartridges we wanted to include, but inevitably some interesting ones are omitted. The Elite Rock is decidedly different in conception and end result — and well worth trying for that reason alone. The Oracle Delphi is rather prettier and another highly rated, if expensive, contender. Other devices of merit, covered in detail in our Turntable Arm and Cartridge volume, include Systemdeks, Aristons, The Source, Michell's Gyrodek and others.

Compact Disc seems to have encouraged another spurge of analogue creativity, and several new designs are appearing which we have not yet had a chance to try. Three tonearm manufacturers have been busy: Alphason have introduced their first turntable; there is now a Well Tempered Table available at a quite modest price in the US; Kuzma too now have a platform to accommodate their good value arm. The Voyd is a most interesting new three-motor, vinyl

platter device which has built something of a reputation, while our efforts to obtain the new Omega Point have so far been frustrated.

Cartridges are appearing so fast it is hard to keep up. The Madrigal Carnegie is preceded by a superb overseas reputation despite its strange mixed parentage, but has yet to get through Customs and Excise. Van den Hul's skeletal Grasshopper remains as elusive as ever, while a current Audionote IO also failed to make it across the North Sea.

## AMPLIFIERS

The hi-fi world seems quite able to accept and live with an extraordinary variety of totally different devices designed for the apparently simple task of amplifying the signal.

About ten years ago the transistor appeared to have conquered all, but there was the fluttering of a revival of interest in valve designs. This flutter faded, rallied, and has recently grown steadily stronger and stronger. Nowadays there are probably as many valve as transistor designs amongst 'high end' amplification. Admittedly most are from the smaller manufacturers who seem to produce families of amplifiers, but the fact that they exist at all is only a reflection of consumer demand.

Meanwhile the transistor is available in a variety of forms — standard bi-polars, MOSFETS, class A or A/B, etc etc. And some very interesting products combine solid state and thermionic technologies in a single design. Amongst this profusion there can be no single 'right way', though everyone has favourites, models he respects, and others he'd prefer not to have to live with. Amplifiers can have many virtues, though few combine them all, and then only at outrageous prices, making the choice difficult for the normal customer.

With our specialist Amplifiers & Tuners edition a full year old, we have carried out extensive re-auditioning and new reviews for The

Collection. However, such is the profusion of choice that many possible contenders have had to wait until a future occasion. One such is VTL (Vacuum Tube Logic), who have a couple of pre-amps and a large range of stereo and monoblock power amplifiers from 25-200W. Grant are in a similar position, while Croft and Beard both have models we've not yet tried. And there's the revived classic Radford STA25 which we're still hoping to squeeze in if there's room.

On the transistor side, Exposure Electronics have an extensive range, Musical Fidelity's big A370 doubles as a space heater and delivers bags of mainly Class A power, Cambridge of CDI fame have reasonably priced 200W monoblocks, and Quad have recently introduced the 606 power amplifier.

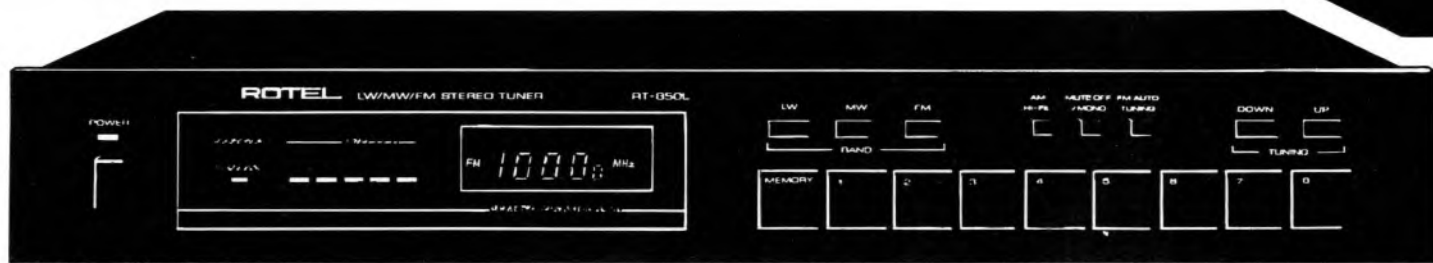
The cost of a single power amplifier channel seems to have risen to around £5,000 for high power US exotics — the Cello Performance, Audio Research M300, Krell Reference, Conrad Johnson Premier V to name but four. Below this extravagant price there is the Counterpoint SA20, and most of the aforementioned have several cheaper models at different price points. Eagerly anticipated for Las Vegas January launch is the Audio Research SP9, a £1500 'replacement' for the '8 which uses techniques introduced for the II/IO upgrade.

## LOUDSPEAKERS

Despite the attention focused on turntables in recent years, there is no shortage of exotic, varied and interesting loudspeaker systems. Expensive loudspeakers show much greater variation than cheap models, and each possesses its own individual collection of compromises. Most UK manufacturers have tended to go for compact full range box loudspeakers, in keeping with our smaller rooms, while the US makers have specialised on tall panel and ribbon formats. Horns are third distinct option, albeit a rare one.

The fact that these solutions are so radically

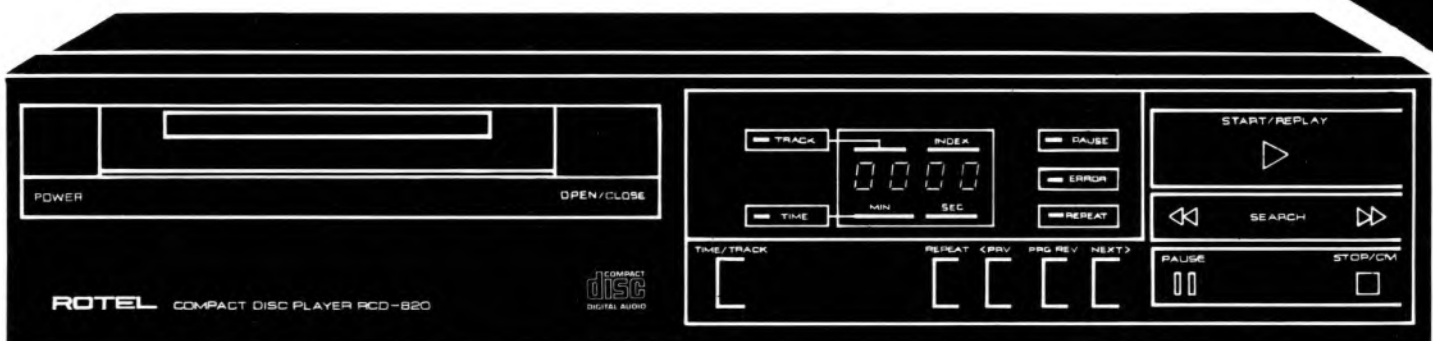
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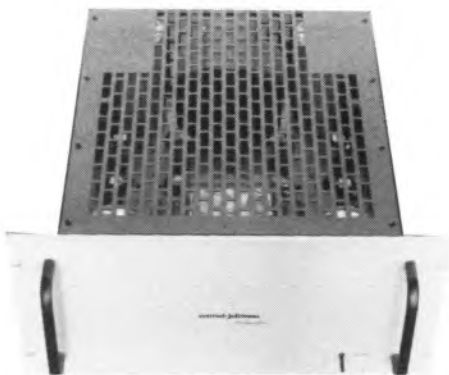
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different at least gives the customer a viable series of options. Some people become so totally smitten by panel (or horn) speakers, for example, that all other factors become secondary — others place high priority on bass extension and power, or accept the constraints that domestic harmony place on loudspeaker size. Somewhere amidst the confusion, there is probably a system just right for you!

The six months since our last Loudspeakers edition has seen an unusual number of new UK entries. Though we have covered the KEF, Celestion 6000 and Naim SBL, there are others just as stimulating that we'll save for next summer.

Wharfedale's Option Two is as interesting as it is unique, mixing dynamic, planar and room boundary techniques to create new solutions to room matching and stereophony. Bowers & Wilkins have a range of three Matrices, featuring advanced cabinetry and bi-wire option. Roksan's Darius is a fascinating controlled bandwidth/resonance device with an unusual decoupled tweeter and integral stand. SD Acoustics have introduced an unusual hybrid design with a ribbon tweeter element, and such a device also accompanies the electronic panels in Naim's eagerly awaited FL1.

Imported high end speakers are still dominated by American panel designs. Though we have covered samples from Apogee and Magneplanar, each manufacturer has several other models, including the giant Apogee and Tympani IV models. Untested by us as yet, a new name on the scene is Martin Logan, with



a full range CLS electrostatic (see cover) and a rather larger and more expensive hybrid model.

### OTHER SOURCES

Tuners, cassette decks and CD players remain peripheral to high end activity, though they are interesting nonetheless. Conventional cassette decks have been really in the doldrums with everyone working on CD players and R-DAT machines instead. Still there are one or three UK companies with quite advanced plans to produce cassette decks, and the appearance of any of these could well stimulate the audiophile palate.

Tuners too have been rather quiet. The appearance of the two Naim models is a boost, and hopefully this will act as a stimulus to the competition to come up with something comparable. Again there are some indications of busying behind the scenes, but less of actual product out there in the marketplace.

What we do have is a near flood of new CD players, all aimed at the 'top end' marketplace, and all appearing in the last few months. Besides those we managed to include in the test programme, there are two other slightly bizarre US

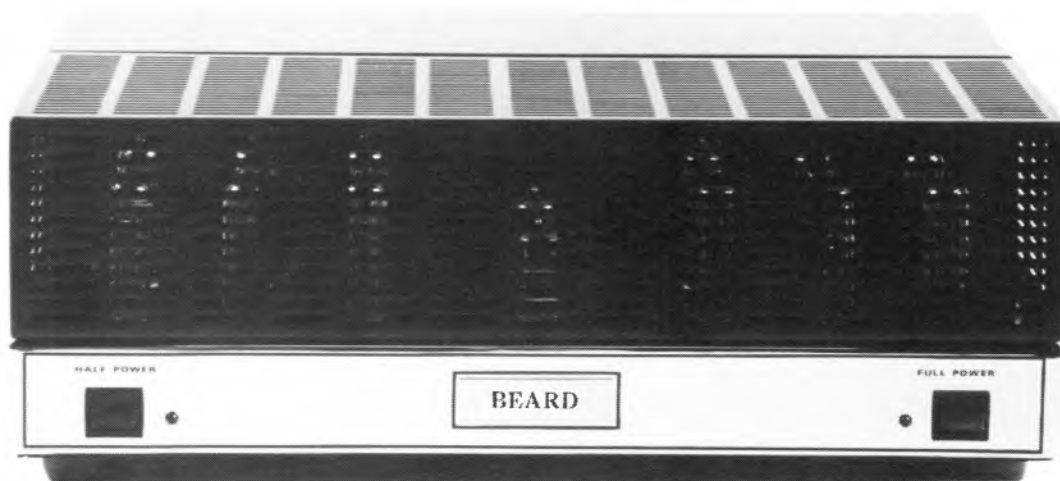
high end offerings, the valve-output CAL Tempest and the Kinergetics KCD20A, plus the rather less extreme PS Audio and McIntosh offerings. Tandberg reportedly now have a CD player of some note, while Far Eastern contenders include a brace of Nakamichis, the newer, cheaper of which looks well worth watching out for. But then Cambridge Audio are threatening to do something rather dramatic for around £500...

### CONCLUSIONS

One could spend pages discussing the compromises inherent in the various approaches to loudspeaker design, between valve and transistor amplifiers, or between different forms of turntable and tonearm construction and cartridge modus operandi. To a degree at least, this is all so much bullshit. The end result is all that really matters, and that is bound to reflect the taste of the manufacturer and dealer to a greater or lesser extent.

The enthusiast seeking a first class 'real' hi-fi system therefore needs to establish his or her own preferences, before choosing the equipment or system which is in sympathy with these preferences. There are all sorts of distinct qualities that a hi-fi system or component may possess, but the attempt to maximise any one of these is usually only accomplished by compromising one or more of the others in some way or another. In the end, you have to make the decisions, and accept such trade-offs with good grace.

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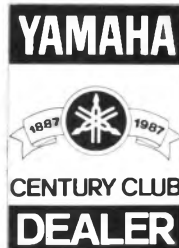
All these effects are at their worst on maximum rate-of-change signal i.e. transients. This is the worst thing that could happen to the intricate and complex music signal.

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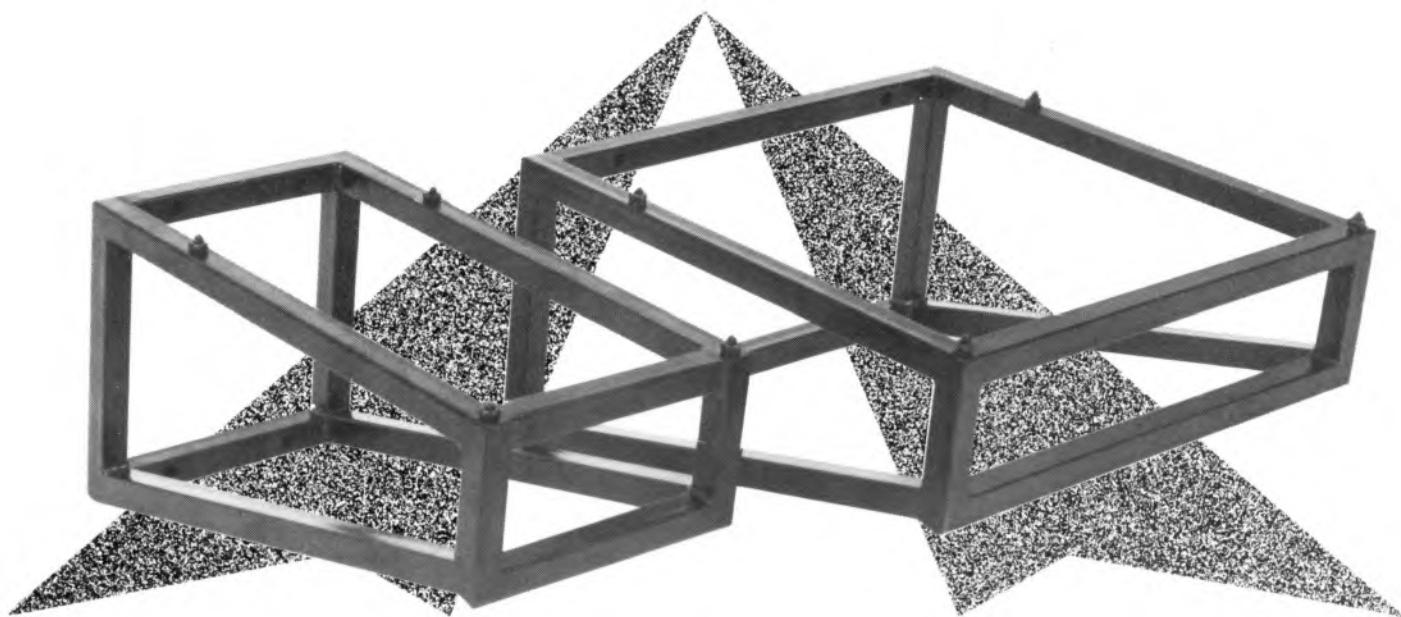
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## NUTS & BOLTS

*Stands, supports and connecting cables are the nuts and bolts of a real hi-fi system. They deserve to be taken seriously.*



Today's hi-fi purchaser entering a specialist hi-fi shop with £1000 to spend is quite likely to end up with £100 worth of tables, cables and stands, a situation that would have been unheard of five years ago. And as often as not he will have made the decision himself, based on a demonstration which has left little doubt of the vital role these elements play in the overall sound. Indeed it is becoming increasingly clear that the stand should be regarded as an integral part of the loudspeaker. Proper support is as important as proper siting, and both are nearly as important as the loudspeaker itself. Likewise a purpose-designed turntable table or wall bracket can transform the performance of the whole system, while using similar supports for amplifiers and the like can also be worthwhile.

Connecting cables demonstrably also benefit from more than a passing nod. And although decent quality cables are not excessively expensive, it is possible to spend a great deal of money on some of the more outrageous pure silver confections. This level of obsession tends to be restricted to the well-heeled audiophile with exotic equipment, probably paying more attention to the various low-level interconnects than to the speaker wire.

How much value can good or bad choices add or subtract from the performance of a system? Strictly 'guesstimating', poor support can knock a third off the value of a system, while the best matching can be worth half as much again in performance terms. Cable choice is more likely to add or subtract 10 to 15 per cent of performance, with the greater potential gains associated with the more exotic amplification.

It is in the grey areas, between merely competent and the nearly great, where attention to the little details really pays off, and the optimisation of the whole system assumes real importance.

15 years ago. Their purpose was to partner the BBC-influenced monitor loudspeakers like the Spendor BC1, Rogers LS5/6, KEF 104AB and their successors. These designs have unusually low inherent midrange colorations, and the stands helped avoid additional coloration from room reflections, first by raising the loudspeaker up from the floor, and also by allowing the speaker to be rolled out easily into free space away from walls when in use.

In this they were undoubtedly successful, but at the time no-one seemed conscious of the other influences that the stand had on the sound. Paradoxically, whereas the search for low coloration had originally spawned the stand, the search for increased dynamic contrast and liveliness — often at higher levels of coloration with wall-mounted designs — led to the second generation of rigid stands with floor- and cabinet-spiking. Almost simultaneously a third variation has appeared, adding substantial mass to an inherently rigid design.

Sacrificing the convenience of castors means that the loudspeaker is now fixed more or less permanently to its site in the room — this is certainly one reason for the rise in popularity of wall-mount over free-space designs of late. However, the improvement in sound quality from adopting rigid stands is so dramatic that one can no longer seriously consider older castor type stands for hi-fi applications. Rigid mounting improves dynamic contrasts and impact, stereo width and depth, and also the subjectively perceived bandwidth; it will also affect and may improve the coloration of the loudspeaker.

To believe this, you have to hear it for yourself, and the writer can still vividly recollect the incredulous faces of a pair of hard-bitten and cynical BBC engineers when they first heard the effect of spiking stands. More objectively, Martin Colloms recently substituted a **Cliff Stone**  $\pi$  stand in place of a *Foundation*, and noted that for the same volume control setting the bass/mid cone now 'bottomed' on a specific bass transient. The obvious inference is that the en-

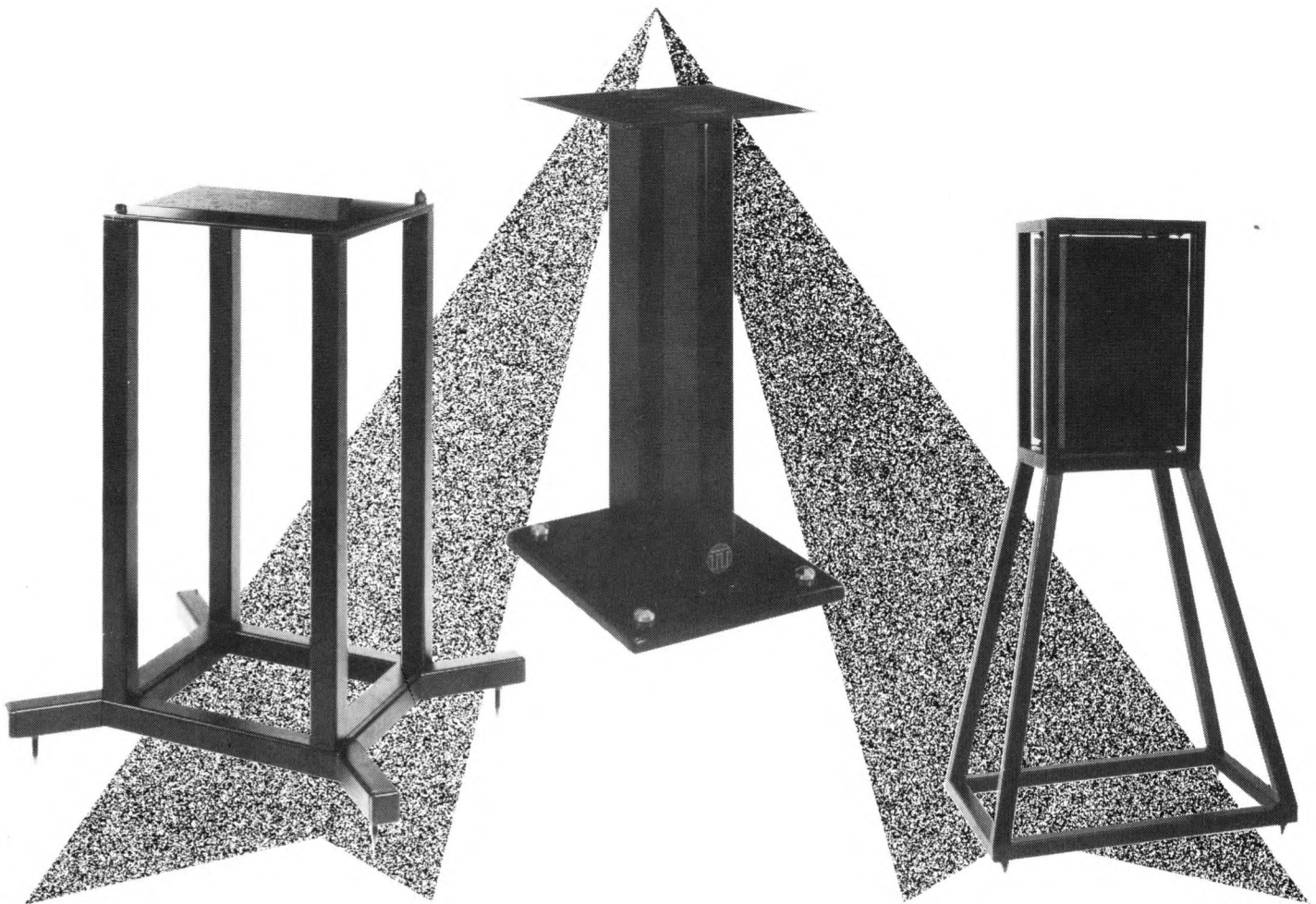
closure was now being held more rigidly so that the cone excursion was increased.

The loudspeaker has to create vibrations in the air which correspond to the signals with which it is fed, simultaneously covering a wide range of frequencies from around 20Hz up to 20kHz, and colossal differences in dynamic range. This is done by vibrating diaphragms mounted on the front plate or baffle, but the ideal signal transfer can only be achieved if the mounting plates are absolutely rigid with respect to the room. And it is easy to see why large movements of a comparatively heavy bass cone inevitably cause considerable vibration in the enclosure and baffle. This can shake the drivers and modify the wanted signal, and can be transmitted into adjacent surfaces such as tables or shelves. Non-rigid supports will allow the whole enclosure to move around to a sufficient degree to upset dynamics and stereo, while rigid supports effectively couple some of the mass of wall or floor to the enclosure and at least give the pair of speakers a chance to create a coherent stereo soundfield.

Beyond the question of rigidity which is now generally accepted, there is the question of the energy transfer between the enclosure and the stand (and the floor), and the complex effects which this can have. Here we start to get into rather murkier and more controversial waters. Different types of enclosure deal with vibration in different ways; different types of stands interact in different ways to the various forms of vibration which the enclosures produce; and further variations are created by the spike, 'tiptoe' or 'Blutack' contact between enclosure and stand.

Generally speaking — and there are bound to be a number of exceptions — the heavier loudspeakers do tend to prefer the lighter stands, and the lighter loudspeakers respond better to the heavyweight stand. Heavyweight proponents point out — quite correctly — that lighter stands produce more vibration and hence coloration, while lightweight fans note that the heavier stands are apt to store and return the





energy over a longer timespan. And then there is a further element of debate on the uses of different types of stands and floor-keying methods according to whether the floor is wooden, concrete, or some combination or alternative.

Wall brackets provide an interesting alternative to floor stands, where the loudspeaker in question has been balanced to cope with the bass and lower midrange augmentation that such siting provides, and where the compromise that results is considered acceptable. Rigid and spiked wall brackets are available from a number of suppliers, and are much neater and cheaper than stands. They allow the enclosures to be mounted significantly higher than usual, which further reduces floor reflection effects and is apt to enhance the subjective 'sense of scale' conveyed by a system. However, walls tend to be more easily excited than floors, and some speakers may interact badly with stand and wall. In this respect outside and load-bearing walls are likely to work much better than partition or stud types.

It is arguments like these that keep hi-fi so fascinating! Ultimately it will come down to choosing on demonstration or approval, and hopefully achieving a result which enhances the strengths of the rest of the system.

### ▼ TURNTABLE SUPPORTS ▼

Around the time that 'spiking' started to come into vogue for loudspeaker stands, it became appreciated that providing similar support for turntable was just as worthwhile. And although the effect is somewhat less pronounced, amplifiers and CD players plus electronic components in general all seem to benefit from a similar treatment to some degree.

I well remember a show just after the launch of Compact Disc, around the time that special turntable tables were catching on. One well known inciter of controversy tongue-in-cheekily placed a CD player prominently on a turntable

table in order to demonstrate his loudspeakers. Much to everyone's surprise and consternation, the CD player sound was actually improved!

While customers are happy enough to purchase a proper support for the turntable, the idea of filling the room with little turntable tables each supporting a component in an active amplifier system is clearly less appealing. Most attention has therefore been lavished on turntable supports, where there is quite a range of options, both in terms of tables and frames and in the shelves on which the turntable sits. In addition to 'standard' models like the **Sound Organisation** table, there are more unusual designs such as the three-legged **RATA Torlyte**, and substitute shelves of different materials and characteristics.

Several manufacturers are producing spiked or decoupled 'subshelves' — squares of usually light and stiff material which support a single piece of equipment and which are placed on top of a normal shelf. These can run from the modestly-priced **Mission Isoplat** to the extravagant (£90) **Sicom** from France (which transformed the sound of a £1,500 Oracle turntable, by the way).

Though there are various theories, the basic mechanisms that affect the sound quality of turntables and amplifiers on different supports remain pretty obscure. In the turntable's case, particularly with subchassis designs, performance is clearly more predictable when the plinth part is held still and rigid. However, the shelves not only need to avoid excitation from outside, they are also subject to motor vibration from the turntable itself, so the situation is particularly complex and 'suck it and see' still the only reliable approach.

### THE STAND MARKETPLACE

Stands and supports are sourced and marketed by three different groups in the industry, the accessory or stand specialists, the loudspeaker manufacturers themselves, and a number of

creative and enthusiastic dealers. They may be specific and unique to a particular item, or may also suit wider applications.

It is fair to say that the specialised stand is likely to work best of all for the specific item, while the universal stand, produced in greater numbers, is likely to be cheaper and may offer better value for money. Companies such as **Apollo**, **AVE**, **Target**, **QED** and **Partington** produce a wide range of general models to suit most applications, and at competitive prices, while several have been adding expensive high performance models recently.

Amongst loudspeaker stands specifically **Cliff Stone's Foundation** and  $\pi$  stands have successively broken fresh ground with high mass and high price tailored to different models, though the Atlas is a popular cheaper alternative. **Stand & Deliver** produce useful stands specifically for Spondor/Rogers and Quad loudspeakers. Amongst speaker manufacturers, **Linn** and **Heybrook** have enjoyed considerable success in the middle market, particularly for close-to-wall applications. Ultimately we are moving steadily towards the integrated loudspeaker and stand, but with the opportunity for stand specialists to improve upon and offer greater variety than the loudspeaker manufacturer, while the user has some opportunity to choose stands which help enhance the balance of the rest of a system.

Dealers have taken a number of initiatives in stand development, notably **The Sound Organisation**, **Sound Advice**, **The Audio File**, and **The Cornflake Shop**, the latter with an outrageous-looking creation that costs half as much again as, but sonically transforms, the popular **Wharfedale Diamond** loudspeaker.

The Cornflake Shop also have an attractive range of wall brackets aimed primarily at Naim amplifiers but suitable for many others. However, the piece de resistance must be the Tripod spiked modular stacking rack, again Naim-oriented but adaptable, from **The Sound Factory** (aka **Sound Advice**).



# THE MUSIC ROOM AWARDS

Time flies, and the Music Room Newsletter starts its fourth year. As usual, we commend at three price categories the product the year which we believe has most significantly contributed to High Fidelity. As usual, it is not easy to decide and the balance between the new and the distinguished is sharply brought to our attention. Has there really been progress in 1986.

The emphasis in front-ends has certainly shifted in favour of CD last year, but was this progress? We cannot even report that CD players have improved in quality because it became apparent that major companies are still playing the numbers game. In other words, the new Philips 16-bit, four time oversampling machines have finally overcome their serious teething troubles but emerge not to sound as good as the earlier 14 bit machines. Most of the Japanese machines also tumble in price but do they offer authentic music? In our opinion, if you want to approach listenable sound from CD, you will have to invest at least £400 in, say, a Mission PCM4000. If any one of us were enthusiastic about CD we would award a Silver star to this model, or a Gold star to one of the revised Nakamichi CD players. Here, I must admit to a sneaking admiration, both for the build quality, the space-age technology and for the ultimate sound quality. The OMS-4, for example, at £995 reveals just how superior Nakamichi are; and if anything, the gap widens.

They did not emerge this year, but the CR-5 and CR-7 Cassette decks also proved that Nakamichi are in a class of their own. Unprecedented quality of sound, simplicity of use and magnificent, uncluttered black beauty make the most non-cassette enthusiasts wish that they were. And yet, to confuse the scene even further, it seems certain that 1987 will see the entry of *digital* audio tape. The advantages over CD including home recording, with all the flexibility and economy that brings, will endear it to the public — just as Video recorders won over Video disc players — but put the fear of death into the record industry. In its initial year, the actual sales of DAT will probably be low but point to the future.

Perhaps because analogue manufacturers have been forced to try harder, quality and value of records and turntables has solidified the future of analogue by offering itself as still the best way way to achieve quality music at home. The excessive claims of perfect sound from CD, indestructible discs which will soon cost less, and the invidious pretence that LP's will soon die out is now obvious nonsense and certainly those who read the hi-fi press are aware of it. CD is still a mere appendage to the LP, although the year has proved that CD owners are willing to pay a fortune to catch up in terms of buying silver discs at almost any price.

At medium price level, our Silver Level award must go to the Elite Gramophone Company whose "Rock" turntable is well-named. The sound quality for only £299 has to be heard to be believed, and certainly outperforms and so redefines the state of the art below £500. The enthusiastic owner can apply his savings on avoiding silver discs to upgrading his Rock with the plinth/lid at £89, the Excalibur arm, and the Merlin power supply. During the year, a Radio programme broadcast music comparing the Rock with CD and asked listeners to telephone in their preferences. Even across portable radios, the difference was clear and the CD compromise was revealed. The CD machine was one of the newest, 16-bit 4-times over exaggeration, but we are too nice to reveal its famous manufacturers.

In Britain, Hunt-EDA do much to clean up our LP's and their carbon fibre brushes have won awards worldwide. Now their revised formula P2 is said to offer "CD clarity from ordinary record." A strong claim, yet with turntables like the AR, Ariston, Thorens and the Systemdek 2 all with arms yet leaving change from £200, we must investigate! P2 is a well-researched degreaser which removes the mould release which smears LP's but ensured easy exit from the factory stamper. Unfortunately, it attracts dust and micro grit and provides a barrier for the stylus. Fortunately, the LAST Company in America and Hunt-EDA provide a quick (once-only) and inexpensive solution (if you will pardon the pun). We award our coveted Bronze Level recognition to these companies and take the opportunity to remind audiophiles of the amazing truth about STYLAST. We can only accept on trust the claims to substantial extension of stylus and record life (not a problem with today's quality cartridges even without stylast) but anyone can hear for themselves the enhanced sound quality so simply and cheaply introduced. A pity for LAST that one tiny bottle lasts . . . what fun you can play with the name . . . for years.

Winners of the Gold Level of previous years are the Source and Audio Research. Wonderful things will come from these companies during 1987, but the connection between ourselves and the Source, like modesty, now prevents expressed enthusiasm. Our privileged vantage point cannot restrain us from a tantalising hint of things to come which will take listeners into the third dimension! No, we are certainly not going to make amplifiers, neither are we referring to MRM Audio cables. We have just been given a set of these (phono to phono 1 metre pairs expected to cost under £50) and they are capable of transmitting more open energy and musical detail than any other cable. As usual, we invite you to try before buying. Other distinguished accessories this year are of course the Tip-toes, Tender Feet of Topolinos (like all the terms in music, Italian, you ignoramus) and the acrylic mat from Presence Audio.

Short list for the Gold Level include the Nakamichi CR-7, the revised Decca cartridges, the Mission Mechanic tonearm but exclude the Sonus Faber loudspeakers from Italy because it seems that we shall have to go in 1987 to Italy to get them ourselves. Our personal choice, then, for the component which has most furthered the state of the art in '86 (but this year it *doesn't* cost the earth) is the GARROTT P-77 pick-up cartridge. Not to be confused with the A & R, a bargain itself at little over £40, it costs £184 and I'm sorry to labour the point, but it places both CD and many expensive cartridges on the defensive. The GARROT P-77 is a moving magnet design, with unrivalled quality of cantilever and diamond tip as would be expected of its respected makers from down under (another Australian analogue award) and it makes it clear just what real hi-fi is all about.

Happy listening! See you soon.

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✦ The difficulty for the customer is that comparatively few dealers take these accessories all that seriously, so getting any comparative demonstration is not easy, and Hobson's choice frequently prevails. Unless you are lucky enough to find a suitably enthusiastic dealer, you may be left to explore these areas on your own.

## CABLES

While strand and location can have as dramatic effect upon the sound as the choice of loudspeaker itself, the cabling can also have a significant influence. However, where even modest turntables and loudspeakers can benefit from a stand which may cost half as much again, generally decent cabling can be comparatively inexpensive, while the more exotic types only really seem to come into their own with similarly exotic systems.

The reasons why cables should influence sound quality are rather less easily identified than those which justify stands, so the industry has been forced to rely almost entirely upon subjective judgements. Why does the sound depend upon the metallic crystal structure of the conductor? Why can one also hear the differences between different types of insulator, or indeed no insulator at all? The observations are repeatable and undeniable, but theories are on or over the edge of conventionally accepted science, dealing with obscure areas of metallurgy and theories of electrical transmission.

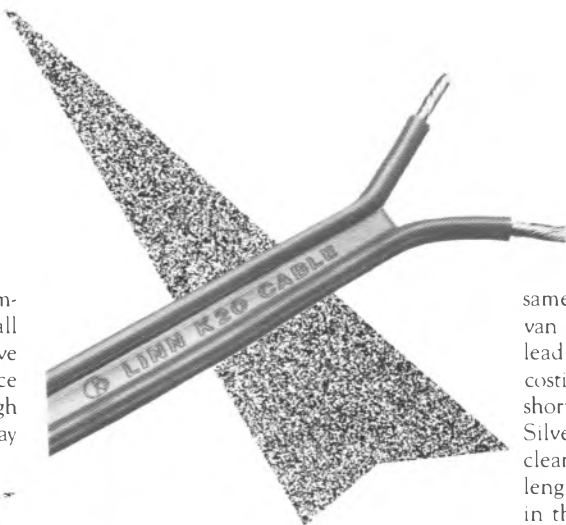
Because this is such a subjective area, there are inevitable controversies and disagreements. The soundest advice is probably that cables ought to be taken seriously, at least to the point of automatically using real hi-fi cables. The exotics will only start to come into their own in systems costing over £1000. However, cable experimentation can prove cheap and worthwhile for the enthusiastic.

The loudspeaker cable marketplace consists of several high quality and widely used brands at quite modest prices, notably **QED**, **Naim**, **Mission** and **Supra**. The middle market consists of what might be termed 'semi-exotics', such as the long-crystal oxygen free copper (LC-OFC) types from **Hitachi** and **Audio Technica**, the cleverly marketed **Monster Cables**, **The Absolute Wire**, **Vecteur**, **Soli-core** and the cheaper **van den Hul**. Upmarket we find even more exotic stuff, with pure silver wiring and unusual insulators, from such names as **Siltech** and **van den Hul**.

Interconnect cables come from much the

same sources, the wire specialists like **Monster**, **van den Hul**, **Siltech** and **Randall** taking the lead. During recent auditioning using a system costing close to £20,000, the substitution of a short length of the most expensive vdH MC Silver between tonearm and pre-amp gave a clearly audible improvement. Though this short length in fact cost several hundred pounds(!), in the overall system context the expenditure was worthwhile. Amplifier manufacturers frequently offer their own cables which match the system well at modest prices. For those wishing to experiment there are various interesting types at a broad range of prices. These include vdH MC Gold (somewhat cheaper than Silver!) and other vdH types, the US-derived **Monster Reference** series and **MIT** cables, and the UK single-strand cables from **Soli-Core** and **DNM**. **Deltac** have some interesting Litz-wire types too.

It is also worth mentioning New Malden dealer **Unilet**, who offer a specialist custom cable service based on a wide range of different connectors and cables. Their price list alone will be informative, and this is undoubtedly the UK Mecca for the cable fanatic. Once again those seeking cable improvements should not necessarily automatically choose the 'best' cable for a particular application. The overall balance of a system is probably more important, and in this area manufacturer recommendations are often reliable guides, while some experimentation can produce very worthwhile results.



# Alphason

## Arms and now turntables



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 Design Limited**

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

**USA & CANADA:** May Audio Marketing, 646 Boul. Guimond,  
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*"A naturally balanced classic now of superior performance and distinctly better than the competition in its price range, it represents fine value for money and is enthusiastically recommended."*

*HiFi News, August 1986*

*Tannoy Mercury, HiFi Choice Best Buy 1983, 1984, 1985*

*Tannoy Mercury Mk II, HiFi Choice Best Buy 1986*

**TANNOY®**



# Systems



Simply stringing together a series of superb components is not necessarily the recipe for satisfactory hi-fi sound. However, the 'real' hi-fi market has always been based on separate components, which magazines like ourselves attempt to assess individually or in comparison to others of the same breed.

This is a difficult task, because a hi-fi component only works as part of a chain and the interaction of components (including the room itself) plays an important role — indeed an increasingly important role as quality steadily improves. And when one comes to deal with really expensive 'high-end' systems, the synthesis of the whole frequently plays the major role in determining the overall musical satisfaction gained.

With extensive experience and knowledge of the individual components in a reference system it becomes possible to establish the relative performance of substituted alternatives with a fair degree of accuracy. But one must be wary of taking apparent cause and effect relationships for granted — too often a specific result can turn out later to have been due to something quite unexpected. I well remember changing the turntable in my own system a year or so ago, appreciating the undoubted potential of the new one but unable at first to enjoy the end result. Until, that is, I changed the loudspeaker stands. Ho hum! Now read on . . .

When such a £100 component change wreaks such a dramatic improvement in a system costing well over £5,000, one must pause for

thought, take stock of the situation, and admit that there are many grey areas where our knowledge is very incomplete. This is where the dealer is most vital, and where there is no substitute for a proper home installation service. The customer can then ensure that the dealer delivers the goods in his own environment as well as down in the dem room where the initial decision was presumably made.

In view of the frankly disturbing implications of system optimisation, I decided that this second edition of *The Collection* should devote a fair proportion of its resources to trying to get to grips with this most obscure and elusive aspect of real hi-fi. Easier said than done I have since discovered, admitting that the following section does little more than scratch the surface of the problem. System matching is so important that I should like to devote the entire issue to covering chains of components instead of bits and pieces, but the logistical difficulties appear to be insuperable. Even this 'first stab' has proved an administrative nightmare.

Certain manufacturers are more system-oriented than others, and we attempted to get some examples in. Though rivalry has now replaced cooperation, Linn and Naim still share a similar common philosophy, and we managed to borrow Naim's 'roadshow' for a couple of weeks, to re-assess their amplifiers and try out the new *SBL* loudspeakers; Linn took a raincheck on their active *Isobarik* system, which is currently being finalised. For want of an Audionote *IO* cartridge, the promised Audio Innovations system failed to materialise, so we lost out on a chance to try

their valve amplifiers, Snell loudspeakers, Voyd turntable and Heliuss tonearm; so it goes.

Coming from the consumer electronics side and representing an alternative approach, the new B&O 5500 system shows its unique 'round the house' capabilities. While those readers seeking something more mainstream than the rest of this volume can take in the *Sony Compact 91* — comfortably the best all rounder in our recent *CD Midi Systems* book, which covered some thirty-five of these attractive but alas frequently disappointing devices.

Many imported high-end products are bought in by a handful of distributors. So we have interviewed the four leading protagonists — Absolute Sounds, Automation Sciences, Presence Audio and Audio Innovations — in order to get their recommendation for matching up these frequently exotic products to best advantage.

Recognising that some of the best deals in real hi-fi lie in the carefully-matched packages at a lower price level, usually from UK manufacturers, we have also put together a feature to examine the systems and part-systems on offer from such as Mission, Heybrook, AR, QED and others.

Finally, it is worth stressing that if you are thinking about changing a hi-fi component, you will also be changing the system as whole to some degree, and need to take this into account. And it is also vital to allocate a reasonable slice of the budget to appropriate support furniture and wiring — the veritable nuts and bolts that make sure everything else is giving all of its best.

## LINN & NAIM



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Though these two companies now operate independently throughout world markets, their joint operations through an alliance which spanned a decade provided the foundation for 'real' hi-fi in the UK, and has had significant influence overseas besides. Even though Linn and Naim no longer cooperate and are busy developing products to compete with each other, there is still a common underlying philosophy which keeps them moving in broadly the same direction — a direction which is fundamentally distinct from what might be termed the 'high end' consensus.

That doesn't mean the individual components don't work well with those from other manufacturers — the *Sondek* is still the nearest thing to an industry standard. But it stands to reason that if each link in the chain is designed with the same general objective in mind, there is a pretty fair chance of the whole achieving something greater than the sum of the parts.

The Linn and Naim systems show a number of characteristics which were distinctly innovatory at the time. The 'law of the primacy of the source', specifically the turntable, has dramatically changed the whole industry. And only Mark Levinson has approached the business of creating a complete system with anything like the same zeal. Sharing with Mr Levinson an early dislike of tone controls, Naim should also be given credit for their 'modular' approach to amplifiers, whereby a dozen or so levels of price and performance can be achieved by mixing and matching a mere handful of components, allowing for relatively painless upgrade steps.

The fundamental philosophy that both companies seem to share is that the musical message is what really matters — the sonic carrier is merely a means to an end. The essence of the musical experience is that the artist is trying to communicate on an emotional level with the listener, and attempting to preserve this communication is the only thing that really matters. That doesn't mean that sound quality

as such is ignored, but the various products tend to reflect a greater willingness to compromise neutrality, imagery and transparency than others operating in the 'high end'. Whatever one's preferences, the state of the market attests the power of the argument.

Combining both manufacturer's ranges there are now quite a lot of products involved. The 'entry level' systems cost about £750, but the ladder proper starts at around £1,300 proceeding through many possible stages up to around £10,000. There was originally a clearly delineated path of improvement, changing an arm here, a cartridge there, a pre-amp power supply here, a power amplifier there — but this has become less clear now that Linn have an amplifier and Naim a loudspeaker, so in future there will probably be a point at which one chooses one path or the other.

### THE SOURCES

The current roster leaves Linn with the turntable (or rather a pair of turntables with the new integrated *Axis*), plus three grades of tonearm and four of cartridges. Most of these are covered in detail in the full reviews elsewhere in the book. Interestingly, they report that the *Axis* launch has also stimulated interest in and sales of *Sondeks*, providing a demonstration reference point from which customers can appreciate the superiority of 'the real thing'.

The record player 'ladder' starts with a *Sondek*, which can be fitted with *LV Plus* tonearm and *Basic* cartridge, though the significantly better *K9* makes more sense. The first upgrade is to the *Ittok* tonearm, which is happy with the *K9* but can also handle any of the three moving-coils — which in turn might mean an amplifier change.

Linn's latest *Troika* cartridge (see p89) goes a stage further than anyone for some while in promoting arm/cartridge integration, in that you would be hard pushed to use it in anything but Linn's *Ittok* tonearm — and even that involves getting out the Black & Decker. *Troika* is a three-legged cartridge, with a central 'foot' on

an outrigger at the rear, needing an extra hole in the headshell. (By happy accident or design, historic *Ittoks* have such a hole, though it needs to be reamed out a little to accommodate the fixing screw.) Furthermore, when setup, the geometry of the whole system is naturally fixed.

No sign of a Naim turntable system yet, nor any immediate likelihood of one, though they did produce a small batch of modified *Sondek's* recently, which made a number of people happy but didn't go down too well in Glasgow. These specials contained an interesting innovation in the form of an integrated moving-coil cartridge amplifier mounted at the base of the arm. In a world where it is possible to spend up to £500 on the length of cable which connects turntable and pre-amp, eliminating it by this means appears an eminently sensible practice.

The only alternative sources so far are the Naim tuners (see p127), which provide both a pleasant alternative music source and a quality target for others to aim at. Linn are understood to be planning a tuner to match their amplifier, and both companies have experimented with cassette decks in recent years. It is believed that Linn have shelved this at least temporarily, but Naim are known to be well down the road (as are Exposure Electronics, down in Sussex). There have also been persistent rumours of a Linn CD player, but one would frankly be surprised if there were *not* constant rumours of a Linn CD player, notwithstanding any truth in them.

### THE LINN LK1/LK2 AMPLIFIER

This fairly recent design was first reviewed a year or so ago, with subsequent auditioning of a current sample during the latest listening sessions. It is a neat and compact separate pre-/power combination, smartly finished in black; curiously, the two units are different sizes, though they are clearly intended to be sold as a pair. Unusually for a product aimed at the 'serious' hi-fi market, there is a most convenient (optional) remote control facility for source and





volume control, Linn claiming to have developed circuitry which avoids the sonic degradation that often accompanies electronic volume controls.

The pre-amp accepts moving-coil and moving magnet cartridges, plus line inputs and outputs, and uses Cannon XLR connectors which Linn can supply. The power rating is 60W/channel, and fully regulated power supplies are used.

Lab tests showed a solid power delivery to specification and well maintained down to 2 ohms. Distortions were generally good, though high frequency overload margins are only satisfactory. The volume control tracked well down to -60dB, the separation was fine throughout. The bandwidth on the disc input was quite tightly curtailed. DC offset at the power amp was a little on the high side (0.1V), while input impedances were on the low side — purchasers should check compatibility with their various sources, though problems are very unlikely.

Rating above average on sound quality, this is unexceptional for the £800 asking price, and there are cheaper alternatives which can sound as good or better. The sound was relaxing, euphonic and pleasantly musical, giving a fair impression of 'scale' with good control. However, extreme bass and treble both attracted some criticism, the former for some unevenness and the latter some dulling and grain, giving a somewhat 'shut in' effect. Reactions to the distinctive character provided by the tradeoff between bandwidth and control varied somewhat between listeners.

Accepting that this is the best sounding remote control amplifier available, the LK1/2 combination is rather expensive for formal recommendation on the basis of its sound quality alone. However, it is no mean performer and does have distinctive qualities that will be widely appreciated.

## THE NAIM AMPLIFIERS

The various building blocks in the Naim range consist of two pre-amps (broadly similar in

performance but with different facilities), two pre-amp power supplies, an active filter unit, plus three power amplifiers. Between them they can be combined in enough ways to fill the colour-coded wallchart looking a little like a railway marshalling yard schematic which Naim have produced.

The simplest configuration combines the NAC42-5 or NAC32-5 pre-amp with NAP110 or NAP140 power amplifiers (the '140 is a recent upgrade on the '110, but both remain available); in this instance the pre-amp draws power from the power amplifier. The next stage involves adding a separate power supply for the pre-amp, either the smaller SNAPS or the heavyweight HI-CAP. Thus far each unit is contained within attractively discreet black alloy 'half width' boxes.

Except in special circumstances, the power amplifier improvements are considered best left until the pre-amp is fully extended. The next step up the ladder is the famous NAP250 — possibly the longest standing amplifier still in current production. This is a full-width model rated at 70W/channel with four regulated power supplies, two of which utilise the same transistors as the output. The final passive step is the NAP135 monoblock, of similar power rating and size as the '250 but with improved supplies and a built-in cooling fan. This only comes into operation when the amplifier is working very hard, so it is effectively inaudible.

The passive ladder brings a maximum amplification price of £2,000-£2,500, but a price premium of around £700 can bring a near transfer to the active ladder, by adding an active crossover unit and its accompanying HI-CAP. Currently Naim's active systems are oriented towards their own and Linn's loudspeakers, though there is no specific electronic equalisation within the filters so suitably wired alternative speakers are certainly theoretically possible. There are alternative crossovers for two-way and three-way loudspeakers, for which one can use two or three NAP250s, or four or six NAP135s. The full 'six pack' carries a total

amplification price of around £7,000, which is well up into 'high end' territory if still a little paltry compared with some US offerings.

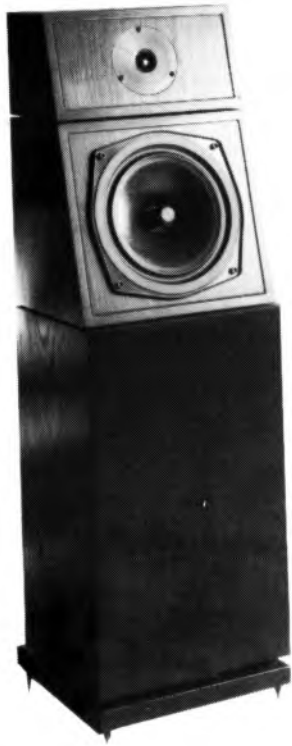
The pre-amps are simple affairs with minimal facilities — volume, balance and input selection, plus mute and tape monitoring. Inside, a series of sub-boards are plugged onto a main motherboard, allowing substitution for different cartridge matching or upgrading. Both mm and m-c disc boards contain appropriate equalisation and amplification in a single stage up to line level.

Fed up with the limitations of phono sockets, Naim have had the temerity to fit BNCs for their disc inputs — which is fundamentally an advantage, though inconvenient for dealers and reviewers! Again eschewing phono (and causing further inconvenience), XLR and DIN socketry in various configurations is used throughout the remaining Naim interconnects, appropriate leads with good quality locking plugs being provided. The power amplifiers are entirely plain, their substantial alloy casings providing the heatsinking (fan supplemented on '135). The rear loudspeaker terminals are simply recessed banana sockets — wire wrapping and spade terminals are regarded as suffering from gradual material compression, whereas a sprung banana plug preserves contact pressure and self-wipes on insertion.

The basic design configuration is bi-polar quasi-complementary, using selected high speed devices. Lack of output filtering requires the inductance provided by about 3m of Naim cable, so some caution should be taken with unknown exotic types. For similar reasons, there is a tendency to pick up RF breakthrough and mains-borne interference. Both these effects are unpredictable, depending upon the particular site, and seem to affect a fairly small percentage.

Naim amplifiers have always delivered a thoroughly sound if unspectacular lab performance. The '250 for example, rated at 70W/8ohms, delivers a fine power bandwidth into 8 and 4ohms, still holding up respectably into 2ohms with current delivery of +/-16A.

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**S**Y. The disc frequency response shows a precisely tailored characteristic, very flat through most of the range but rolled off fairly early at the extremes,  $-1$ dB points being at 20Hz and 20kHz, with acceleration beyond.

While there is little to complain about in terms of musical communication — the Naims are very involving, lively and informative, delivering a high 'boogie factor' with realistic dynamic shading — the sonics have a distinct character that is not to every taste. There is little of the 'air', 'space' and transparency that is usually associated with an 'audiophile' sound, while imaging sounds rather 'shut in' and constrained in depth.

The Naims continue to merit recommendation, subject to personal taste and appropriate system matching, for they do seem to perform best in a known and controlled context. There is impressive subjective commonality and coherence as one moves up the range, each step clearly audible, while excellent build quality and a good record on avoiding obsolescence are further plus points.

## **NAIM SBL LOUDSPEAKERS**

Launched at the beginning of 1987, the SBL is the first Naim loudspeaker for many years. It is a quite compact, floorstanding model designed for placing close to a rear wall. Two drive units are used with a very complex enclosure and integral stand, selling for around £1,000. The cabinets are finished in smart black ash, with acoustically transparent foam grilles. The top two enclosures taper towards the wall, further minimising visual impact. The cabinet complexities make expert installation mandatory.

In fact there are three separate enclosures, the larger, lower one acting purely as a chamber to absorb bass output from the rear of the main bass/mid driver (sourced from Mordaunt-Short, though heavily specified by Naim for this particular application). This lower chamber is a permanent part of the main, spiked stand, two of the verticals passing up through ducts in the carcass (the other two running up at the rear).

Gaskets seal a hole in the top of the box to like holes in the stand top-plate and the bottom

of the upper, smaller, bass/mid enclosure, with a carefully specified acoustic resistance controlling airflow between these two cabinets. This upper cabinet acts as the mounting for the bass/mid driver, and is spike-coupled to the stand top-plate. Finally, the tweeter has its own separate small enclosure, more to provide the appropriate dimensions for acoustic propagation, and this is fixed directly to the stand verticals via compliant frame elements that decouple somewhat at very low (subsonic) frequencies.

This highly complex arrangement of bass and mid/bass enclosures helps to preserve the control advantages of the small enclosure over the drive unit, while permitting the bass extension of a much larger enclosure. Meanwhile, the tweeter enclosure (using a variation of the Scandinavian Highquphon unit) should be immune from vibrations generated in the main cabinetwork.

Mass-damping techniques are used extensively throughout the design, for magnets and panels, small weights on flexible mounting providing a closely controllable alternative to traditional damping methods. The crossover network is supplied as a separate outboard unit that plugs into four terminals on the rear panel, so it may simply be left unused if using the speaker with active electronics.

Measurement showed a mild enough 8ohm impedance characteristic, with useful sensitivity at around 88dB. Response measurements showed that the anechoic falling bass response was generally well equalised by the room, to give even in-room extension to below 30Hz, without boom or lift, though there was some loss of energy in the upper bass region, 60-200Hz. The upper midband showed a slight prominence, and the mid treble likewise but rather less so, but the integration of various forward response directions was very good.

The sound of the SBL was generally well received, though not without remarking upon its particular distinctive character, which mirrored the response findings fairly closely, and not without some inconsistency from one occasion to another (covering some four in all). In the main sessions it seemed happiest working hard, with good, driving, extended bass, lacking

a little in upper bass 'crack'. The overall balance was quite relaxed, if projected somewhat in the vocal region, with some 'aw' coloration plus fair depth and transparency, and good detail and articulation. At lower levels the bass seemed a little lacking in 'weight', and the scale of the soundfield seemed reduced, while the mid tonal balance characteristics seemed more obtusive.

The various levels of amplification upgrade were clearly revealed as a steady improvement in resolution, dynamics and 'grip', the rather extravagant ultimate 4X '135 drive proving comfortably the most satisfying, conveying considerable scale and dramatic dynamics (particularly in the designer's home system).

The SBL is a very capable performer even at this early stage of its life, providing a generally well balanced and extended listening room response within an unusually attractive and compact package. It seemed to appreciate being driven hard, and responded best to the more expensive driving combinations, this potential for simple upgrading being a very worthwhile feature. It is rather expensive, due to the care taken to avoid cabinet coloration, and could benefit from some further drive unit refinements in terms of coloration, but it can be cautiously recommended nonetheless as an inherently musical performer.

## **OVERALL CONCLUSIONS**

Though various Linn and Naim models find plenty of successful applications in a general 'audiophile' context, their fundamental philosophy seems sufficiently different from most of the rest — stressing content often at the expense of presentation — that there can also be clashes. Used separately or together, in the various (increasingly complicated) permutations outlined above, the whole seems to turn out greater than might be expected from assessment of the individual parts in less appropriate contexts. Furthermore, their commercial success in the UK has created (or been created by) a network of experienced dealers to the point that the end result shows a measure of repeatability and consistency that other 'high end' manufacturers might envy.



# “Not just a pretty face”\*

Behind the stylish and sophisticated exterior of the Linx Stratos system, you will discover the exciting sound of a true professional studio performance amplifier.

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*\*HI FI Answers, April '86*

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# BUDGET SUI

**T**he British hi-fi industry has shown remarkable strengths over a number of years, notably in its staying power in the face of the real Goliaths of the consumer electronics world and in the way it has advanced and promoted excellence in audio reproduction. The idea most simply described as 'supercompatibility' is the real hero of this feature. Supercompatibility is what happens when all the capabilities and limitations of the individual components in a system mesh into one well-oiled and harmonious whole. It is the audio industry way of adding one and one together and making three.

But there are equally striking weaknesses that have led it to relinquish its hold over the volume section of the audio industry, for complete packaged systems. The UK industry has concentrated almost exclusively on manufacturing turntables (plus some arms and cartridges), amplifiers and loudspeakers, plus the odd tuner. In the past there has never really been a British built system, and this has probably led many buyers to ignore the indigenous industry entirely. Amazingly, many people don't even know a British hi-fi industry exists.

Happily, after a long hiatus, the British industry appears to be waking up to the system-oriented realities of the 1980s. A few years ago, Mission and QED almost simultaneously decided to manufacture their own in-house record playing systems, that would then be expanded to include other components. In Mission's case the latter came to mean compact disc players — they are now on their second generation of Philips based designs — whilst QED have been heaving away to bring a cassette deck to market to expand the capabilities of their embryonic record playing system.

These two leading lights almost single-handedly helped drag the industry one stage closer to what the market was asking for — a combination of Japanese style completeness and visual integration with audiophile, or near-audiophile standards of audio excellence. In 1987, Meridian are demonstrating what might happen when this trend is stretched as far as it will go.

Writing at the start of the year, the following is a summary of the present situation, presented by manufacturer:

## ACOUSTIC RESEARCH

Although US-based and owned by Teledyne, not only are Acoustic Research products produced



here for local (and export) sales, some are even designed here.

With an extensive range of loudspeakers and two competitive turntables on offer, AR have just introduced a range of matching electronics made on their behalf by Proton in Taiwan. The range so far consists of integrated amplifiers, tuners and receivers (the latter primarily for the US, but they'll be sold here too) and a CD player. There is no cassette deck so far, the manufacturer having decided like a number of others to bide his time until the future of digital audio tape (DAT) becomes clearer.

Being new, the electronics don't have much of a track record, but preliminary indications are that they are mostly if not all very strong performers at their respective price points. They are also competitively priced and have particularly friendly aesthetics (submissive looking 'sit up and beg' front panels, hidden minor controls etc) along with good ergonomics — enhanced in the case of complete systems by a very simple but effective infra-red remote control.

Remote operation doesn't extend to the turntables of course, which were designed some years before the other hardware. However, the turntables probably do more to make AR systems behave like truly supercompatible systems than any other single factor. There are two suspended subchassis models (AR along with Thorens pioneered the sprung subchassis belt-drive turntable), the £200 *Legend* and the £260 *EB101*, both of which normally come with quite a good low-cost AR arm. There was a time when the sharp, lively *EB101* sounded significantly better

than the dearer *Legend*, but the latter has been upgraded to the point where it again outperforms the cheaper model. It isn't quite as good value for money though....

From one point of view, there is little philosophical point of contact between the obviously mass appeal electronics and the fundamentally audiophile-oriented turntables (the speakers straddle both worlds). However, because turntables play a disproportionately important part in the performance of any record playing system, the various AR components get along surprisingly well.

Much of the current range of loudspeakers is excellent, though the writer has no great liking for the *AR66X*, a rather untidy sounding and monolithic £900s worth. The smaller models however appear to be consistently good. They come graduated for size and price, and unlike previous ARs are designed for use a foot or so clear of walls. The surprisingly lively sounding *AR18BX*, whilst strictly below the price floor of equipment covered here, makes a worthy and able transducer even with the more expensive AR turntable and amplifier combinations. The *AR44BX* is also a stand-out model which adds real balls and power to this basic mixture for £349.90 a pair.

## A&R CAMBRIDGE

A&R Cambridge (not to be confused with Cambridge Audio or AR) is one of Britain's older specialist manufacturers. Up until now they have been best known for what has undoubtedly been Britain's best selling medium

# PER SYSTEMS



price amplifier, the A60, which has been acclaimed consistently as an able and well built performer. Slowly A&R has built up a range of other products, including a tuner and three small to medium size loudspeakers. Currently though the electronics are in a stage of transition. The A60 may well continue for some time to come, but the serious development work has switched to a new range of products.

This is the *Arcam Delta* range. The £300 70 watt *Delta 90* amplifier has already been available for some months, and a £259 three-band *Delta 80* analogue tuner with presets should be available by spring. A *Delta 70* compact disc player is also scheduled, an up-market player based on Philips 16-bit technology to be sold around £400-£500.

It's too early to say how these products will shape up, but there are already some indications. Based on limited experience of the *Delta* amplifier and much greater experience of the *Arcam One* and *Two* loudspeakers (£330 and £220 respectively), we can expect the full system to sound relaxed, powerful and to display an architectural kind of solidity. We can also surmise that the system will be near-ideally matched component with component, though the *Arcam* loudspeakers have proved surprisingly at home in some quite exotic systems.

What we already know is that the equipment is styled to look more conventional (ie Japanese) than most British equipment. Standard 430mm widths combine with the visual designs to make A&R systems visually compatible with, say, a Japanese cassette deck. Well reasonably com-

patible at least....

## HEYBROOK

One key operator that has been quietly manoeuvring into a position where they can offer a complete record playing system is West Country-based Heybrook. The crucial step was taken about a year ago with the introduction of their first pre and power amp combination, the C2 and P2. Cost of this very capable Tim de Paravacini combination is a not insubstantial £825, or £846.45 if you include the optional *Apture* interconnects that Heybrook distribute.

Heybrook have more than one loudspeaker to suit this amplifier, namely the HB2 and the larger 3-way HB3. The original HB2 was a fairly small and painstakingly designed reflex model that was popular for years, but a complex and power-robbing crossover and inevitably limited dynamics offset its undoubted smoothness and all-round sophistication.

Heybrook set out to make a more efficient and dynamic HB2R version, distinguished by its recommend tilted back posture when used on stands. But the buying public apparently demanded more of the original model, so in the best traditions of Coca-Cola and Thorens, Heybrook have reintroduced the HB2 *Classic*, with an improved enclosure.

The HB3 has much more bass and offers a bigger and tighter sound, but it isn't the tidiest performer around.

To go along with these components, Heybrook also have a TT2 turntable. This strong middle range performer is a *Choice* recommend-

ation, but looks a little lightweight in the market compared with the amplifier. It is consequently being improved, first with a £100 optional outboard quartz controlled PPS power supply, which also provides speed change, and secondly by a new upmarket arm. This will cost around £250 and will be made by Alphason to a Heybrook design.

Heybrook do not intend producing a cassette deck or CD player, but are taking an active interest in DAT.

## MERIDIAN

Like other companies in this survey, Meridian are in the throes of introducing a range of new components, known generically as the 200 series. This innocuous sounding title conceals an extraordinarily ambitious gameplan which will pitch the company headlong into Bang & Olufsen territory in presentation and facilities terms, while maintaining the minimal sonic compromises of a hi-fi specialist.

Only the 207 CD player and the loudspeakers are available so far, so it is simply too early to talk of system performance. But the CD player is certainly one of the better ones on the market (see full review on page 000). The loudspeakers are all active designs with built-in power amplification. They tend to sound crisp and three-dimensional, if a little dry and explicit for some palates.

Meridian will not be making a record player but are keeping an open mind about the possibilities of a tape recorder, either analogue or digital. Indeed the system remote control (already available) is already able to control one, as it is ready to cope with a number of other future additions to the 200 family.

The CD player is based on Philips decoding technology (14-bit which they and others prefer to the sound of 16-bit) and comes in two compact boxes, one of which can act a a rudimentary preamplifier for systems that do not include a record deck. However, a more fully featured preamplifier will be available shortly, as will an FM tuner which features a timer that can control any cassette deck with a standby facility.

All of these components can be operated by a single remote control, a substantial diecast affair known as the 209, which includes such facilities as direct track and tuner preset entry, and which will also be able to control the system in different rooms where remote speakers with sensors are included. Power amplifiers for use

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## Martin-Logan:

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## van den Hul

"... provided the best link yet..."  
*Hi-Fi News & Record Review*

## Burmester

"... probably the best power amplifier I've listened to music through."  
*Hi-Fi For Pleasure*





with other makes of (passive) loudspeakers are also planned.

## MISSION

Mission was the first British company to sell a complete high grade record playing system, which they even packed in a single cardboard outer, but there has been some retrenchment since then. Although their turntable is an attractive and very well built solid chassis model which is still listed and available, Mission don't seem to have their heart in it any more.

However, the electronics are being heavily promoted, and the CD players and *Cyrus Two* amplifier (with or without the optional *PSX* satellite power supply unit) are of greatest interest here.

There are two CD players. The *R4000* is essentially a rebboxed Philips 16-bit clone with clever (if not wholly successful) Mission designed graphics and controls; the *R7000* uses Mission's own analogue circuitry to improve the sound and includes facilities like a proprietary remote volume control. The *R7000* is a smooth and sophisticated performer, but is quite expensive and not universally preferred to cheaper players based on the same technology (see also page 177).

The *Cyrus Two* (see also page 111) is a surprisingly compact if somewhat idiosyncratic looking device which has gone through an improvement programme just recently, and which also appears to have overcome early reliability problems. The *Two* is the consummate middle market performer with a level of liveliness and clarity quite without peer. Mission also make a marching tuner, and although this is adequate enough, it remains very much in the shadow of the *Cyrus Two*.

Mission manufacture a wide variety of mostly good loudspeakers, all in basic sympathy with the qualities of the *Cyrus Two* amplifier (as well as being real head turners in some cases). However *Cyrus Two* is far too good to be locked into any one make or type of loudspeaker. It will perform and perform well with just about any decent loudspeaker in the moderate price reaches of the market.

Although there appears to be no intention of producing a cassette deck, Mission fully intend to be the first British manufacturer with their own DAT recorder.

## QED AUDIO PRODUCTS

A complete QED system was available not long after the Mission system, and was again built in-house to a brief that required it to sell directly against Japanese rack systems. In fact the brief was both too ambitious and not ambitious



enough. Too ambitious because QED were not at the time in a position to deliver anything that looked like a 'complete system' in the Japanese sense — they still can't. And not ambitious enough because by selling through non-specialist outlets, they underplayed the sound quality their equipment could achieve.

The two key components are the *R232EN* turntable and the *A240CD* amplifier (true budget price versions of both remain available). The turntable is unashamedly Rega inspired in its basic conception, but has electronic speed control and comes with a RATA *RP40* cartridge at £199, making a very good value-for-money package on paper. The *232* is enhanced by minimal set up and is pretty close to being usable 'straight from the box'. It sounds taut and lively, and the cartridge is smooth and articulate. A good start.

Similarly, the *A240CD* is a deceptively powerful 'minimum facilities' amplifier built into a very small box, which has rapidly developed into one of the consummately musical amplifiers

in its area of the market. It can be upgraded by inserting a 'piggyback' *pcb* called the *SA* board, which further improves performance *via* all inputs. In this form it is known as the *A240SA*, and the price increases by £50 to £199. The amplifiers will shortly have new headphone arrangements and an improved *SA* board, but already represent red-hot value.

The electronics are currently completed by the £149 *T237* FM tuner, which like most British designs is analogue driven but incorporates presets. Performance is good and ergonomics simple.

Loudspeakers also remain available, but have never become a force in the market and are gradually being phased out. After all we are not exactly poorly served by recommendable loudspeakers from a variety of sources. However QED are working on a cassette deck. This much delayed product could be Britain's first for many years, and may be on sale by the end of the year.

## AND OTHERS

In addition to the equipment covered here, there are all sorts of even more fragmented systems, systems in the making, and in some cases systems supposedly in the making that will probably never turn into complete systems or that don't deserve to be regarded as systems at all.

So you find, for example, that Pink Triangle have a turntable and preamplifier — but no power amplifier. London-based turntable manufacturer Roksan offer their own loudspeakers, and have an arm to come, but have shown no interest in producing their own amplifiers — yet anyway. From Scotland, another much bigger turntable manufacturer, Ariston Acoustics, makes Scandinavian *QLN* loudspeakers under license, and act as distributors for the exotic and expensive Electrocompaniet amplifiers.

Of all these companies Ariston come closest to producing a viable 'supercompatible' setup, but at the time of writing there has been no real attempt to promote a selection of these components as a fully-fledged and debugged system in its own right. In due course this may happen.

In due course also Quad will launch their long expected CD player, and will then have a CD and tuner based system on offer, right down to their famous electrostatic loudspeakers. By next year we may also be able to talk about a limited Musical Fidelity system.

There is a message that comes clearly from this short survey. The British industry seems to be belatedly determined not to be as unprepared to meet the customer half way as it has been over the last decade. That's progress!

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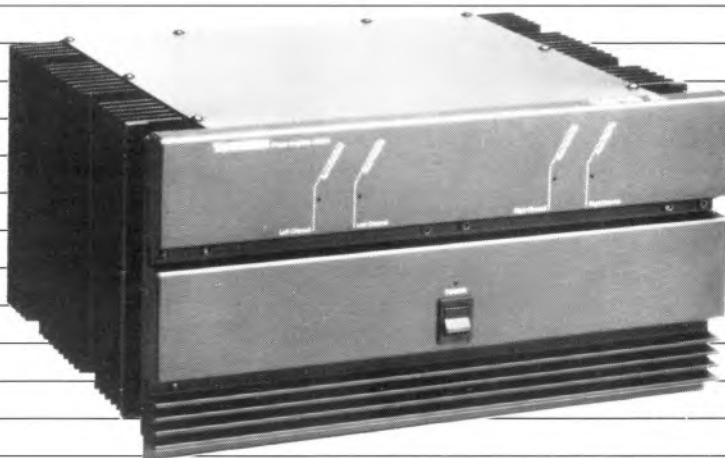
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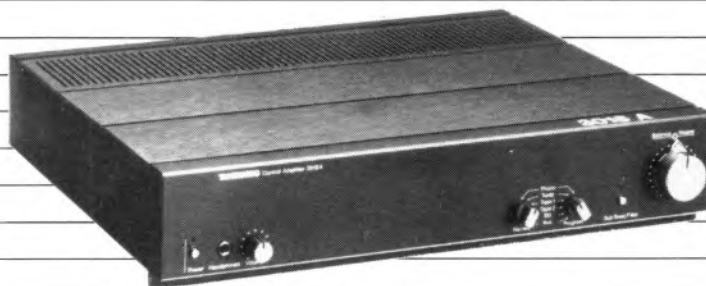
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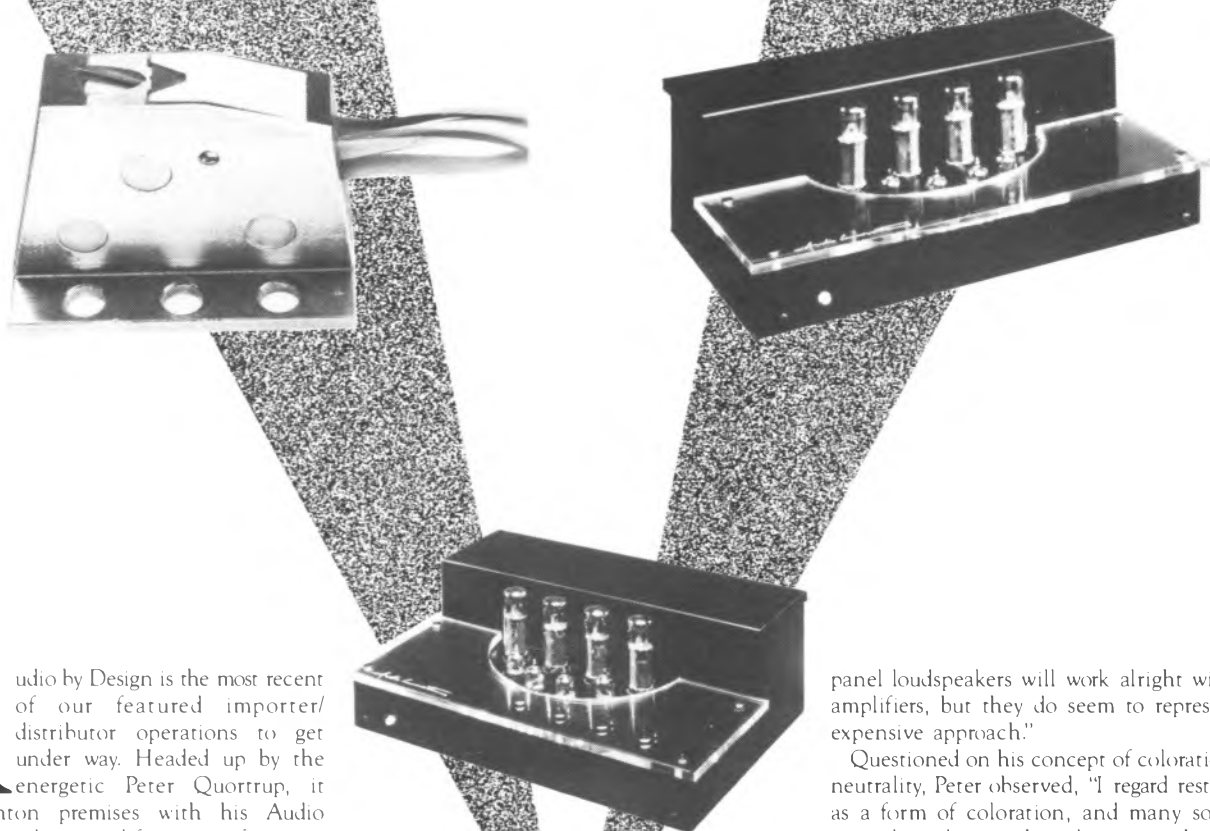
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## AUDIO BY DESIGN



**A**udio by Design is the most recent of our featured importer/distributor operations to get under way. Headed up by the energetic Peter Quortrup, it shares Brighton premises with his Audio Innovations valve amplifier manufacturers. Quortrup himself gained much of his high-end expertise in retail in Denmark, but his personal odyssey has taken him to some pretty exotic nooks and crannies. The group is devoutly systems oriented, to the point where the only way they were prepared to submit products for review was as a complete system; having laid plans the logistics got fouled up.

As importers, Audio By Design handle two main overseas brands, and some smaller lines. Snell Acoustics is a highly reputable and rare US loudspeaker manufacturer, who have six models up to the large Type As, whereas Audionore is a similarly well established Japanese cartridge specialist who pioneered the use of silver wiring. US valve amplifier brand Music Reference provides an alternative amplifier range to those manufactured in-house, while there are also plans to introduce the Maplenoll turntable from the US — a device with air-bearings for both turntable and arm, expected to sell for around £1,000. There is also an avowed intention to put horn loudspeakers back on the map — a very 'alternative' approach to loudspeakers which seems to have been driven underground in the UK in recent years, but which has never completely disappeared.

The heart of the Audio by Design systems is their Audio Innovations range of valve amplifiers, beginning with a £300 integrated model but moving up through full spec. systems in the £1,000 region, and with ambitious plans to go much higher — including such audio extremism as push-pull triode configurations.

To these is added the marketing of the UK

Voyd turntable, unusual for its three-motor drive, and plans for a single motor Audio Innovations derivative. But they do not shut out other brands, and feel that there are a number which fit in with their particular concept. Helius (tonearms), Goldring (cartridges), Systemdek, Pink Triangle and Elite Rock (turntables), and JPW (loudspeakers) are all regarded as inherently basically compatible brands which work properly in an Audio by Design system.

"We want the equipment to be as neutral as possible for a given price, so all the items will work well together, however they are configured and with whatever price mix. You ought to be able to take the Systemdek *III* with the cheapest arm and cartridge, put it through the most expensive amplification followed by cheap loudspeakers and end up with a good result. You should only be able to hear that there are limitations: it shouldn't start to sound specifically wrong.

"All products which we feel have an inherently neutral performance will work in our systems: most of the others will not — their limitations will be exposed. One of our marketing problems is that there is only a small proportion of products that do fit in properly, and that the vast majority do not — well they may work, but it's not predictable. Electrostatic and

panel loudspeakers will work alright with our amplifiers, but they do seem to represent an expensive approach."

Questioned on his concept of coloration and neutrality, Peter observed, "I regard restriction as a form of coloration, and many so-called neutral speakers are heavily restricted in terms of bandwidth, dynamic range and performance. A major factor with loudspeakers is getting ones that work properly in actual rooms; there are not many designs which do that well.

"The key task for the component is to reproduce the proper harmonic timbre of an instrument: if this can be accomplished or approached, and providing some of the dynamic impact is preserved, the rest seems to follow along.

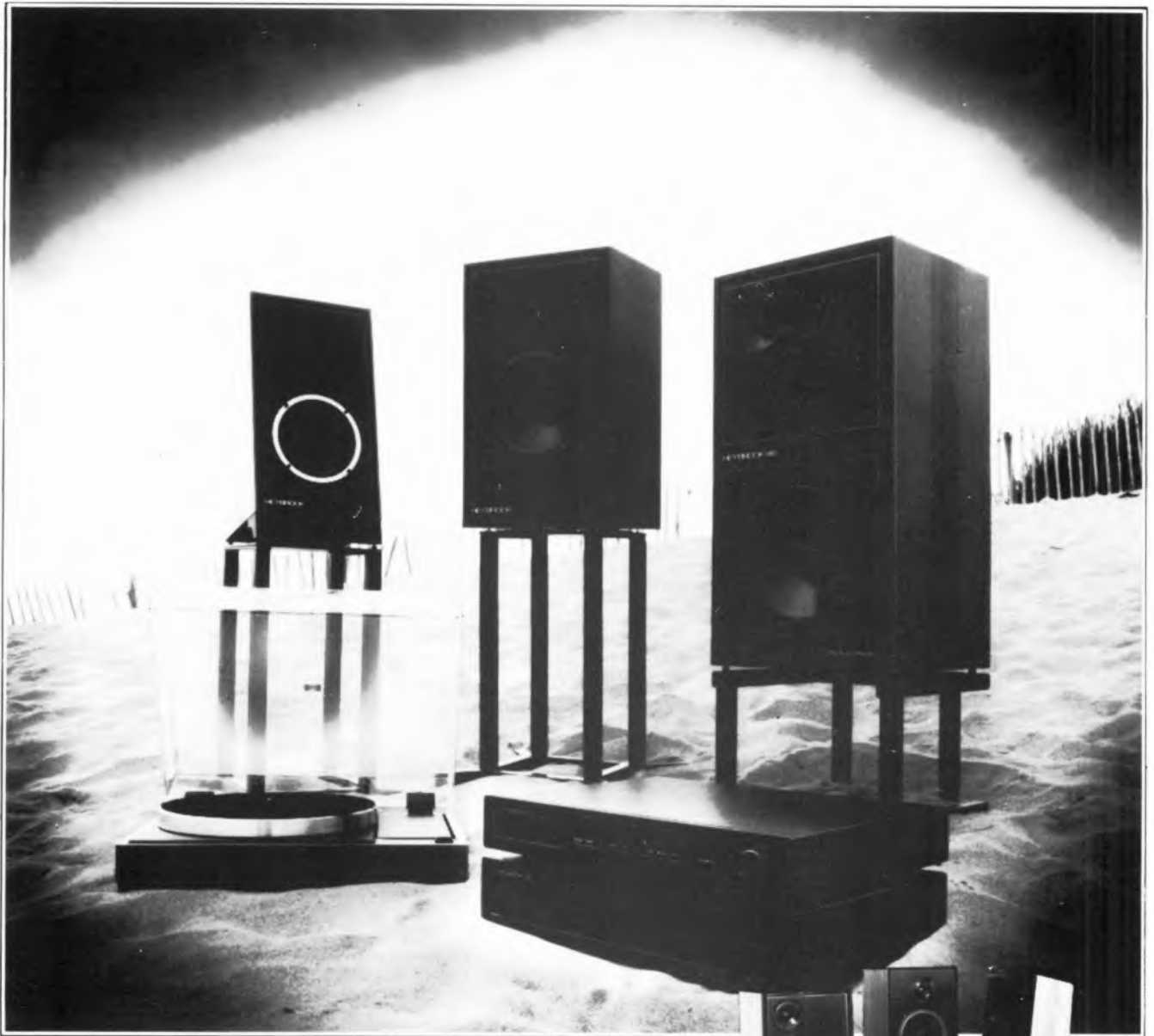
"I haven't heard one system that could reproduce instrumental timbre properly which didn't reproduce all the other things as well, but I have heard plenty of systems that can reproduce the structure of the music alright, but which were totally incapable of reproducing anything else, and so were basically unacceptable. Unless this can be done, you can't hope to achieve a clear 'window' onto the recording studio.

"I can establish the best product at any price point for what I'm trying to achieve, having first established a clear philosophy and direction plus the technology to back it up. But I'm not expecting everybody else to like it — if they did, how would I supply?"

Steadily building up momentum through the rigours of UK manufacturing, Audio Innovations seem intent on broadening the base of the UK enthusiast market. These intentions include bringing in variations of some of the engineering which has proved popular in the Japanese 'high-end' — triode amplifiers, horn loudspeakers and the like — which will be a welcome breath of fresh air.



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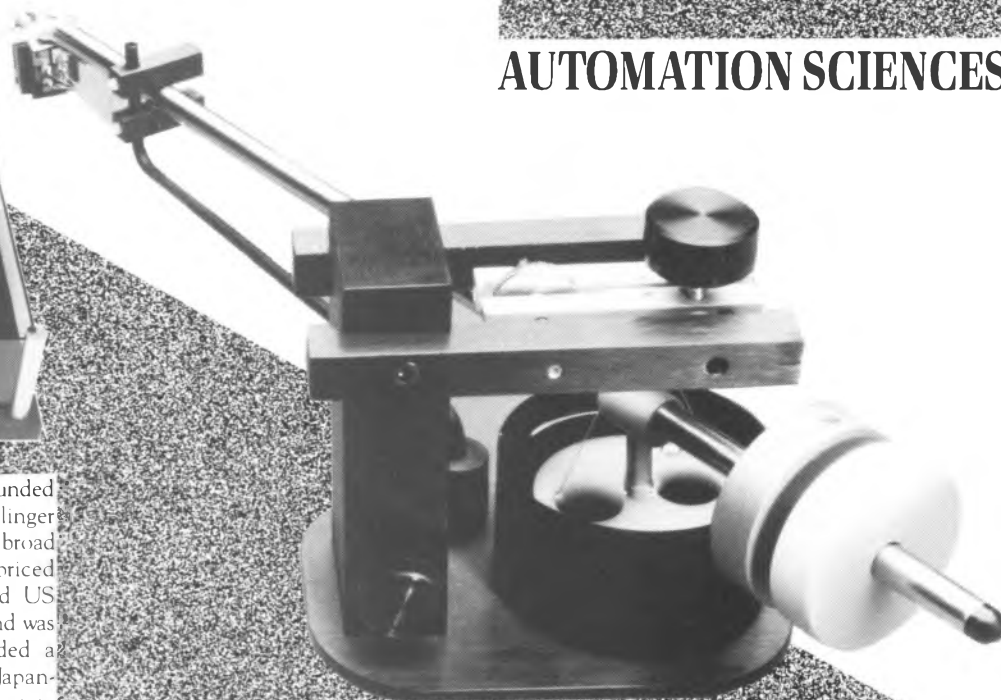
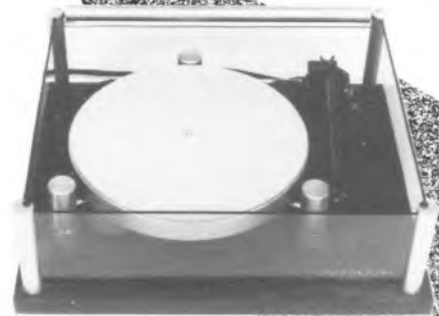
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## HEYBROOK



**66** **HB1** LOUDSPEAKER OF THE YEAR 1984, 1985, 1986 - WHAT HI-FI BEST BUY 1983, 1984, 1985 - HI-FI CHOICE. **HB2** RECOMMENDED 1979, 1980, 1981, 1982, 1983, 1984 - HI-FI CHOICE. "THEY POSSESS THAT EFFORTLESS SOUND QUALITY WHICH WAS ALMOST IMPOSSIBLE TO BELIEVE" PRACTICAL HI-FI 1980 "A CLEAR RECOMMENDATION" HI-FI NEWS 1983 **HB3** "EXCITING AND VERY DRAMATIC, WITH AN EFFORTLESSNESS AND EASE RHYTHMS ARE WELL DEFINED AND CRISP...A WARMTH AND RICHNESS OF TONAL COLOUR, HIGHLY INFORMATIVE, EXCELLENT LEVELS OF INSTRUMENTAL SEPARATION, AND DYNAMICS" PRACTICAL HI-FI 1983 "HIGH SOUND LEVELS WITHOUT ANY NOTICEABLE COMPRESSION, CONVINCING REALISM ANALYTICAL SOUND REMINISCENT OF STUDIO MONITORS" HI-FI FOR PLEASURE 1984. **TT2** RECOMMENDED 1983, 1984, 1985 - HI-FI CHOICE. "IN TERMS OF PERFORMANCE THE TT2 CAN BE WELCOMED TO THE SELECT BAND OF HIGH QUALITY UNITS" GRAMAPHONE 1984 "...EXCELLENT WELL MADE, ABOVE AVERAGE PERFORMANCE" HI-FI ANSWERS 1983 "THE TT2 IS A SUPERIOR PRODUCT" HI-FI NEWS 1984. **HBS1** LOUDSPEAKER STAND OF THE YEAR, FEDERATION OF BRITISH AUDIO AWARDS 1984. **C2/P2** "...ONE OF THE VERY BEST COMBINATIONS AVAILABLE UNDER £1000" NEW HI-FI SOUND 1986. "BETTER THAN ANY EQUIVALENTLY PRICED AMPLIFIER I HAVE HEARD" HI-FI ANSWERS 1986.

**99**



**A**utomation Sciences was founded by Canadian-born Jacob Zelinger in 1983, boldly providing a broad range of exotic and high priced products of European and US origins from the word go. A key early brand was van den Hul, whose cartridges provided a welcome European flavour amidst a Japan-dominated field, while Burmester solid state amplifiers were introduced from Germany. Famous US 'high end' manufacturers Conrad Johnson provided thermionic relief for valve fanciers, contributing to the general revival of interest in this alternative approach.

Pursuing the philosophy of offering alternative approaches, there are two 'heavyweight' turntables, from AudioLabor and Zarathustra — one solid, one suspended. There are two upmarket tonearms — the suspended Well Tempered, and air-bearing Eminent. On the speaker front, the dynamic Infinity range stands alongside Martin Logan electrostatics.

More recent upmarket introductions include the extraordinary Cello system by Mark Levinson, which is discussed at some length in the *Audio Suite* review, and C-J's transistorised *Mouf* amplifiers, plus the Swiss Physics range. But there has also been a distinct recent trend towards offering products at lower prices, notably the Kuzma tonearm and (imminent) turntable, the Well Tempered Table and Copeland valve amplifiers from Denmark.

Jacob defends the eclecticism of his selection: "One of the difficulties for a distributor is that you have to put aside personal prejudices and appreciate that each customer has his own individual preferences, the task being to satisfy those wishes rather than your own. There are many solutions to realistic music reproduction in the home; each designer has something valuable to contribute, and at this level his products are a creative personal expression."

"You might take the analogy with musical instruments. You can buy a Steinway piano which is manufactured in Hamburg, or one which is made in New York. You might think they should sound the same, but they don't. The New York Steinway sounds entirely different from the Hamburg one — it is produced to sound in a particular way for the style that American musicians like to play. This is a clear example of differences in character being entirely valid. It's not just the sound of different products, it's also the look, the feel, and the way they are presented."

Jacob deftly dodged a question asking his personal favourite combinations of the brands he handles, countering: "If you ask me who my favourite composer is, I might answer Beethoven



right now. But in six months I might be listening more to Mahler, or Schumann, or whoever, because at that particular time I might find myself responsive to what that particular composer is doing in his music. I think one responds to audio equipment in a little the same way.

"It's basically true that any of my components can work together, but you have to try and fine-tune the whole to suit the components, the type of music, the room, and the personality and preferences of the customer. There are orchestral, opera, organ or rock enthusiasts who regard the bottom octave as essential, but you won't manage that with the Logan CLS or the

smaller Infinities — you really have to spend a lot more money. Someone who likes harpsichord music may favour one transducer, whereas a string fancier might opt elsewhere — but even so personal taste in loudspeakers invariably seems to override any simplistic relationship to particular types of music.

"I seriously believe that this system matching is the crux of producing convincing results with high end products, though I don't have any easy answers: in the end much will come down to the quality of the dealer and his relationship with the client. I'd also like to see closer contact between manufacturers and dealers, to help the latter get the best out of the particular products, and to improve our understanding of this difficult area.

"We try to create an engaging and involving overall sound which allows the listener to discover his records and forget about the system. In other words, the best thing the system can do is 'disappear'. When you do get a system working right, it doesn't sound like a hi-fi system any more: it sounds like it's making music; that's a very exciting experience. It's not a matter of focusing on hearing a bit more of this and a bit less of that; it's more of an emotional, wide-ranging experience."

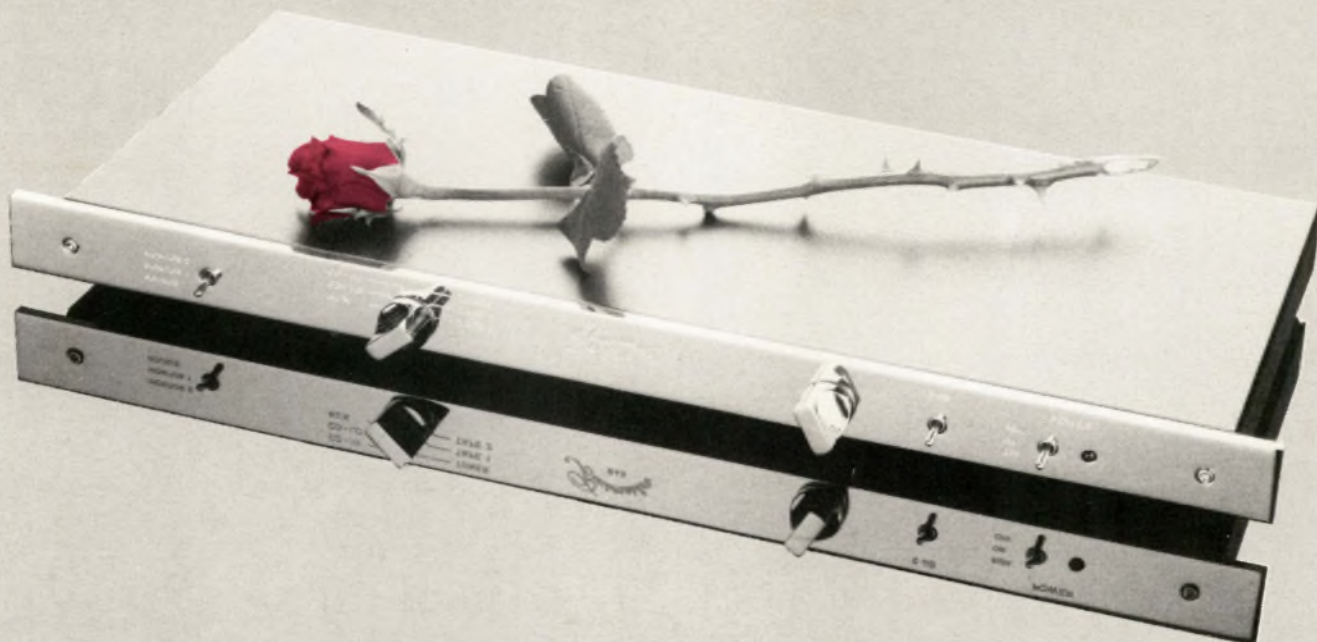
Pressed to nominate certain favourable combinations, Jacob noted: "We can put together a really good system from about £5,000, but that's without the turntable, and if you want to approach the state of the art you need nearer £7,000, again excluding front end. You start with around £2,000-£2,500 on either the Martin Logan or the new Infinity loudspeakers. The minimum requirement for amplification is around £4,000 — the C-J *Mouf* 8 with MV50, or Burmester 850/838 for example.

"Regrettably, though we're working away at lower cost alternatives, this sort of budget is really necessary for minimum entry to the high end. Effortlessness is a major and vital high end system characteristic, and if you try trimming costs too much, the system starts to sound more strained. That in turn starts to crack the fragile illusion of the real thing that only a state of the art system is able to create."

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# Burmester



What does a high end dealer listen to when he goes home? Certainly not to the equipment, that's for sure. Just the music. Therefore demands on neutrality, clarity, spaciousness and smoothness are high and have to be outstanding.

Having auditioned all the amplifiers currently available in this country, and some not so available, my choice for reference listening is the Burmester system. Burmester research and development are unusually thorough. I would not want to find that my chosen amplifiers were out of date, or flavour, the following month. Burmester products do not quickly become obsolete, do not require continual updating and retain their sonic and operational excellence for many years. The reliability of Burmester equipment is legendary. My Burmester amplifiers are permanently on and running at full temperature with no daily valve fatigue and sounding just as warm.

Ask for me personally if you would like to share my enthusiasm for Burmester audio products and make a note to join me at our forthcoming Burmester musical evening which is shortly to be announced. Just play the music and relax.

*Derek Aston-Darker, Managing Director.*

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# ABSOLUTE SOUNDS

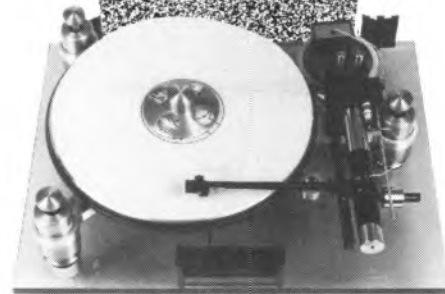
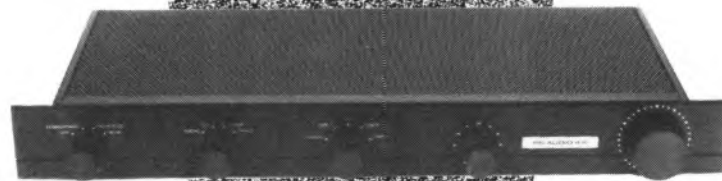
**R**icardo Franassovici could be said to bestride the UK 'high end' like a colossus, except he's actually of modest stature. However, his collection of agencies reads like the industry's Who's Who, and he must take the main credit for starting the high end ball rolling back in '79. Combining Gallic charm with disarming syntax he set about the considerable hard work needed to give such expensive products some credibility in a distinctly unprepared market.

Starting with Koetsu, which he still represents most successfully, Absolute Sounds have since added Oracle, Airtangent and Goldmund at the front end, Krell, Audio Research, Counterpoint, and more recently PS Audio amplification, plus Magneplanar and Apogee loudspeaker ranges. There are other brands here and there, and some toing and froing, but the fundamental strategy of a broad range of appeal at the very highest level is maintained, backed up by likely value for money contenders at somewhat lower prices.

Ricardo notes that the prime purpose of his system: "is to represent the effects of a real experience". But he warns against too close an analysis of the various characteristics of sound reproduction "I love the journalistic jargon that talks about transparency, distortion, bass control and so on, but no consumer will enjoy his system if he keeps on looking for those characteristics. It is important to get past this and into the magic of the music."

Questioned about the combinations of his various components he commented, "Quite a large group of us carries out long-term listening, and if we do find the occasional product that doesn't marry well with another we make sure the dealers and press know about it — Apogees are better driven by Krell than Audio Research power amplifiers, for example. But as a rule of thumb you can mix and match our valve and transistor pre- and power amplifiers without any problems.

"It all depends on what the customer wants from the system — a degree of subjectivity comes in here — and it is important to match the quality level along the chain to a degree. While I do agree with Linn's philosophy of putting the maximum resources at the front end, I tend to extend the concept of a 'front end' to include the pre-amplifier. Otherwise you can get a 'funnel' effect where the flow of information can be constricted.



"A personal favourite combination which I believe represents a true 'high end' system combines a Counterpoint hybrid power amplifier with a pair of smaller Magneplanars, plus pre-amp from Counterpoint or PS Audio (both with proper moving-coil inputs), and then allows the dealer to come up with a sensible Koetsu-based front end to give the gain for the SA-7 II. An alternative that still stays under the £5,000 mark could see the MG IICs with Counterpoint SA20, perhaps stretching to an Oracle/Koetsu front end.

"At a higher level a pair of Duettas or Scintillas driven by the appropriate Krell amplifier has become an international reference. Front end could be Oracle/Krell, or Goldmund/Audio Research, but at this level a degree of personal preference must come in, often related to the type of music listened to. Some music likes to be presented 'up-front', other types sound more natural with a more relaxing presentation.

"There is much more to this system matching business than simply looking for the 'cleanest' path. I recently heard a well-rated CD player which sounded better played via an SP8 than it did straight into the power amplifier, even though logic refutes the situation. The interaction of the components provides the 'tuning' of the system, while the endless pursuit of greater 'cleanliness' and clarity will probably end up in a corner, causing dislike of the system. It is important to get back to the emotion and pleasure, and not get obsessed by other characteristics.

"You must not listen to a system or component with your head, but use your heart and soul. Let the component blend with your personal feelings. If a component cannot reproduce your source material the way you want it, you will have to seek an alternative.

"We spend millions of hours listening to the different components to make sure our products satisfy a broad range of different tastes, and don't just follow one route. We have an open forum of views and exchange components around before deciding to go ahead and market an item. Sometimes manufacturers pressure us to push certain components from their lines that we may not be selling, and this is usually because they didn't come through in our tests, but we consider it vital that we only sell products we believe wholeheartedly in."

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## PRESENCE AUDIO



Having just celebrated Presence Audio's third anniversary, Brian Smith is pleased with the way his distributorship has developed, and feels that Presence has established a useful niche a rung or two below the more expensive brands marketed by Absolute Sounds and Automation Sciences, with products that reflect similar aspirations but at somewhat less exotic prices.

While still seeking to expand the number of outlets, he has found a number of dealers who prefer not to operate in the extreme high cost regions, preferring the middle ground. He particularly cited Abbot Audio who operate a home-based consultancy service in Newark, giving a level of service and skill in system matching that can match the best.

Presence started with the Audiostatic loudspeakers from Holland, a range of frequently large but attractively presented electrostatic loudspeakers, now available with *Foundation* support frames. But they have increasingly searched for 'gap-filling' products, often in the accessory field, and frequently from Europe. With Stax no longer available in the UK, the Jecklin *Float* is probably the only true high end headphone currently around. Other accessories include the Interface mats and clamps from Holland, Vecteur cables from France and the Gryphon moving-coil step-up from Denmark.

Presence represents no less than four cartridge brands, from the low (or high) cost Glanzes, via the unique and utterly British Deccas through the moving-coil ranges of Kiseki (including the high output Miltek series) to the £1,000 Odyssey moving-coil model which is made in Hong Kong. The Omega Point turntable is a major flagship line, with alternative Gold and Silver tonearms, but French turntable specialist Stad are returning to the UK with a slimmed down development of the principles behind the S at an expected £500 pricetag.

Aside from the upmarket SAE rack systems, their only audiophile amplifier is the Nuance/Plenitude, a sweet-sounding French transistor combination covered in detail elsewhere. Partnering speakers again fill in useful gaps in the market, not only with the aforementioned electrostatics but also the compact but lusty Ensemble PA1 speaker from

Switzerland, and the new Spika from the US — as its name suggests, one of the first to appreciate the importance of spiked stands.

Questioned on his own feelings about the qualities a high quality system should possess, Brian stressed the accuracy and realism of the reproduced sound. "The ear is particularly sensitive to human voice — yet in an indifferent system even basic recognition of a person one actually knows can be difficult. Nowadays attempting to reference against live sound is fraught with problems, from the recording methods to the current concert halls, many of which use sound reinforcement.

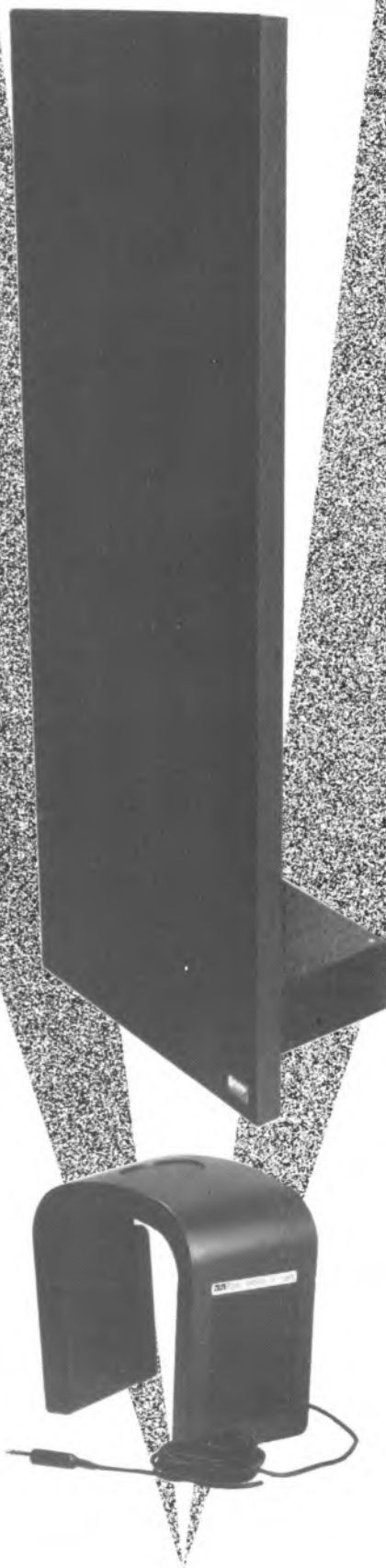
"The first priority is to reproduce the sounds themselves properly. After that, as a secondary factor, you've got the width, depth and height of the image: is the full ambience being reproduced; can the acoustic be heard clearly? And then there is the ability to sit back and enjoy — or at any rate be moved by — the music.

"One of the biggest problem areas is the listening room, partly because it is so difficult to do anything about it. This may well be the most critical factor of all — witness the problems of getting anywhere near decent results at hi-fi shows, even though the system may have been performing beautifully during a dress rehearsal undertaken before leaving home. For example, ceiling height seems to be a major factor determining the sound of the Audiostatics: the shorter ones prefer a lower ceiling than the big ones, and it can be quite hard to obtain good low frequency balance with rock music if you get the combination wrong.

"Another vital part of getting a good overall sound involves experimenting with the accessories. These can sometimes have as big an influence as the individual contributions of the components themselves, allowing the user to tilt the balance and dynamics a little here or there to provide a musically balanced end result. Stands and tables, turntable mats and cables, flux dumpers and what have you, all make some contribution. For example, in my experience, it is usually beneficial to use the same make of cable throughout the system.

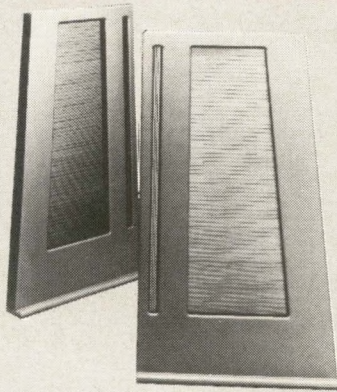
"The art of the skilled dealer is to get all of these factors working together — and then it is surprising how good a sound can be achieved without necessarily spending the earth."

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# BANG & OLUFSEN 5500 SYSTEM

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**F**or proof that image isn't always synonymous with reality, look no further than Bang & Olufsen. Their equipment is considered by many as the very personification of good taste, yet is often reviled by audiophiles because it looks too slick to be any good. It comes as a surprise then to discover the calibre of the brains behind the project that led to this system. Equally surprising is the thoroughness of its conception as a machine for listening to music, quite separately from its appeal as a technological toy par excellence. This is a toy that really knows how to sing.

Bang & Olufsen unwittingly struck a rich vein when they developed their original automated

system, the 5000, which was the direct predecessor of the 5500 covered here. For most of its several year lifespan, Bang & Olufsen were completely unable to come even close to keeping up with demand. It sold like hotcakes which is completely unprecedented for any system so expensive.

The idea behind the 5000 and the 5500 alike is simple. There are two main functional elements: a series of black boxes, which perform all the physical work — playing records, making tapes, receiving radio broadcasts and so on — and a control unit, a kind of super two-way communicating remote control that sits on any convenient surface near the user. But this is no ordinary remote control system.



## B&O 5500

continued from previous page

A normal remote control system consists of a number of components which are fitted with some kind of simple data link, where a simple send-only handset acts as an alternative to the major controls on the components themselves. The Master Control Panel represents Bang & Olufsen's own rather different ideas on how humans should interact with machines that play music.

The Master Control Panel is a stand alone item about the size of a large paperback book, but propped up at the rear. As with any good remote control, it contains everything you need to operate the system, but in this case just about everything else required is fitted too, including a rotary volume control (the same control does various other jobs too) and the wherewithall needed to perform housekeeping tasks like tuner presetting, adjusting the cassette record level control and so on. In addition, the Master Control Panel contains a master clock for the system, which doubles as a timer for unattended recordings, or to make it perform as an alarm clock.

Where the Master Control Panel differs most from the run of the mill, however, is that it is a two-way device, receiving operating status reports from the system as well as sending commands to the system. This information drives a comprehensive LED readout on the Master Control Panel, and also enables the controls to interact with the equipment as though they were fitted to the equipment themselves.

The Panel can be supplemented by hand-held remote controls for carrying around the house, if required. It is also possible to fit extension loudspeakers into various other rooms along with remote sensors. Operating the system via any remote device then does what has been asked, but only through the speakers in the room you're in at the time.

The previous 5000 system had a more or less full set of operating controls on the equipment as well as on the remote control, but for the 5500, these have been thinned out considerably, whilst the handset has an enhanced role. The idea is that the only time you really need to deal face to face with the main system components is when changing a record, tape or CD. However, there is still a certain amount of devolved control, and the 5500 system still has endearing traits like the ability to start play at any time by simply pressing the right hand edge of the appropriate front panel.

### CASSETTE DECK

The 5500 has been improved in other ways too. The cassette deck in particular is incomparably better equipped than before. It now has a full auto reverse capability, which helps make a lot more sense of the system's unattended recording capability, a major selling feature. It also has something fiendishly clever: whenever a recording is made, the type of noise reduction used

(if any) is encoded onto tape along with the music, and the deck switches itself accordingly, even if play is started in the middle. The deck also has automatic record level adjustment along with auto tape type sensing, so for the first time a Bang & Olufsen cassette deck can be used in full 'idiot proof' mode. The auto-level works downward only — that is recording levels will be pushed down when overload is threatened, but not *vice versa* — thus preserving dynamics. Normal manual record level remains available as an option. Fiendishly clever, those Danes.

That's far from being all there is to the cassette deck. As a taster, highlights include a very elegant control system based around the idea of using just one play control for both sides, CD player style programmability designed around locating the silent gaps between tracks, sophisticated metering, Dolby HX Pro headroom expansion (invented by B&O), and for noise reduction purposes, Dolby B and C.

### RECEIVER

The centrepiece of the system is the *Beomaster 5500* receiver. The older *Beomaster* had a flap down panel with tuning and other controls; this has now gone. At the same time, it now has an input which can be used for a second tape deck, or for the audio section of a video recorder (especially a hi-fi recorder). This does not amount to a full-scale video facility where the video signals can be switched and routed along with the audio, but the Master Control Panel will address a suitable B&O brand video recorder and television receiver linked into the system.

The tuner section has 20 random presets on FM, MW and LW, but the tuner circuit is quite unlike other synthesiser tuners. On FM for example it can be fine tuned in 1kHz steps (most others are limited to 50kHz), and on all bands any fine tuning found desirable can be stored against each preset. The amplifier has a 50 watt/channel rating and intelligent protection against abuse. Two pairs of loudspeakers can be connected directly, but there are methods of driving an indefinite number more if required.

### TURNTABLE

The rest of the system has changed less, or not at all. From the top, the turntable is a fully automatic parallel tracker deck with an ingenious leaf-spring and pendulum floating subchassis, a belt-drive turntable and a parallel tracking arm. The deck is astonishingly quick-acting. Whilst no match for a high-class specialist turntable, the *Beogram 5500* is possibly the ultimate system turntable, and one of the very few with any real immunity to shocks and feedback. The deck is fitted with a B&O MMC4, but any B&O cartridge will work without any further adjustment.

### CD PLAYER

The CD player, the *Beogram 50CD*, is more conventional than the other components,



except that the disc is loaded label down. Built by Aiwa for B&O, the player has direct track access, an intro-play feature (a few seconds from the start of each track) and a 99-track memory. There's no audible disc cueing though.

### LOUDSPEAKERS

The final item of equipment included with the review system was a pair of very costly loudspeakers called the *Beolab Penta*. These startling looking speakers have no less than nine drive units apiece and a 150 watt dedicated mono amplifier mounted in the base, and are driven at line level from an appropriate socket on the amplifier. They can also be driven by the main system amplifier output instead. They have one additional role: they act as status readouts for basic information, including the source and the volume level selected.

There simply isn't room to discuss the design of the *Penta* in great depth. One of the basic aims however was narrow vertical and lateral dispersion to suppress room reflection effects, and this has been tackled by putting bass units at each end of the enclosures, and relying on the mutual cancellation that results from listening off the centre line to reduce perceived volume. The same is done for the midband, but the units are closer to avoid audible phasiness (the wavelengths are much shorter). And there is just one tweeter at the equator. One other notable point about the *Penta* is that extensive





use is made of stainless steel in its construction.

Let's say at the outset that the speakers look stunning. The whole system did in fact; there is a unique elegance about B&O equipment. You're offered individuality and exclusivity too, and an understated view of technology that contrasts strongly with the more up-front charms of most other equipment. There is no mileage in looking at this system with an audiophile's ears, though there is some audiophile equipment around that could have benefited from some of the technology built in here. I found the system wholly satisfying.

### How It Sounds

Only the loudspeakers caused serious reservations, and even then I found them enjoyable for much of the time. In fact B&O have made significant recent changes to improve the balance of the system, but production samples of the new versions were not available in time for this review. Our earlier samples had some odd qualities, including an over-the-top presence in the bass that was often obtrusive. The top end was fairly sweet and clear, but the midband was particularly uneven and unpredictable.

Stereo image quality in the fairly long test room used on this occasion was a little distant, but quite coherent. I don't think these *Penta* speakers are all bad, but our pre-production review samples were only erratically good. Hope-

fully the recent changes have been successful in countering these criticisms, and we look forward to confirming this in due course.

In contrast, I was particularly happy with records and FM radio broadcasts (but AM radio sounded curiously wooden). Each source has a limpid, outgoing quality that is true to the spirit of good music making. Records in particular will prove a revelation to anyone reared on rack system turntables, and I would like to see the radio tuner design packaged separately for sale as a stand-alone hi-fi tuner.

The cassette deck and CD players were also very satisfactory. My only quibble with the CD player is a negative one: it doesn't outperform the other sources, and can at times sound a little sterile. It's an average to middling player by the standards of its peers.

The cassette deck was only slightly less good. It still gave a real feeling of life and vitality, but to a reduced degree compared to FM and records, and with a less firmly established stereo soundstage. Dolby B sounded better than Dolby C, but the difference was smaller than usual.

The other important item of electronics, the amplifier, worked unobtrusively enough, the only obvious trend in a system context (it's very difficult to consider on its own) being a trace of 'softness', a faintly damped quality that was more obvious at higher volume levels.

The latter was something of a system characteristic, and was responsible for making

the system sound at its least convincing with driving rock material, and at its best with the more elegiac late romantic period classical music — Brahms, Wagner, Bruckner. How's that for narrowing it down?

Finally, the control systems worked immaculately, though some hysteresis in the volume setting knob was noticeable if it was operated too quickly. The system definitely needs to be learned, but there is so much internal consistency that it won't take long.

Where an opportunity has been lost I feel is in the main display on the Master Control Panel. To save power, the LED status readouts (which are jumbled anyway) appear only for a few seconds at the time, usually when a status check is called for. Had LCD technology been used, the display could surely have been permanently lit, or at least left on for much more extended periods.

Whilst the system seems to fulfil at least the majority of its sonic briefs, in some respects not without a touch of distinction, there may be more of a problem reconciling the very high cost against performance, especially when the products are looked at individually. The loudspeakers as assessed cannot justify their price tag on performance grounds, but it is safe to assume the new versions will be rather more competitive — and anyway the system will work perfectly happily with any other good brand of loudspeakers. (All you lose is the *Penta's* unique visual attractions, not to mention the acres of stainless steel, and the status display of input and volume level etc, none of which should prove a hardship.)

But the real resolution of this dilemma is implicit in its statement. The components are expensive individually, but they're unique individuals. Although you can buy some of the components for use in other systems, you don't have much of a choice of foreign components if you want a system that does what the B&O does. It's perfectly true that Meridian are working on what will eventually be a similarly integrated system with broadly comparable features (but without turntable), but as a system it is still not yet quite a reality. The Bang & Olufsen 5500 is completely, absolutely, totally, wholly, entirely unique, and therefore essentially self-recommending. And it's here now (albeit heavily back-ordered — Ed).

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*Editor's Apology: Anxious to include the 5500 system, I talked B&O into supplying it against their better judgement with pre-production speakers, as the Pentas were not available. I then forgot to warn Alvin. My understanding is that the current versions have a much more even bass and midrange, giving a generally neutral balance, but you should judge this for yourself.*

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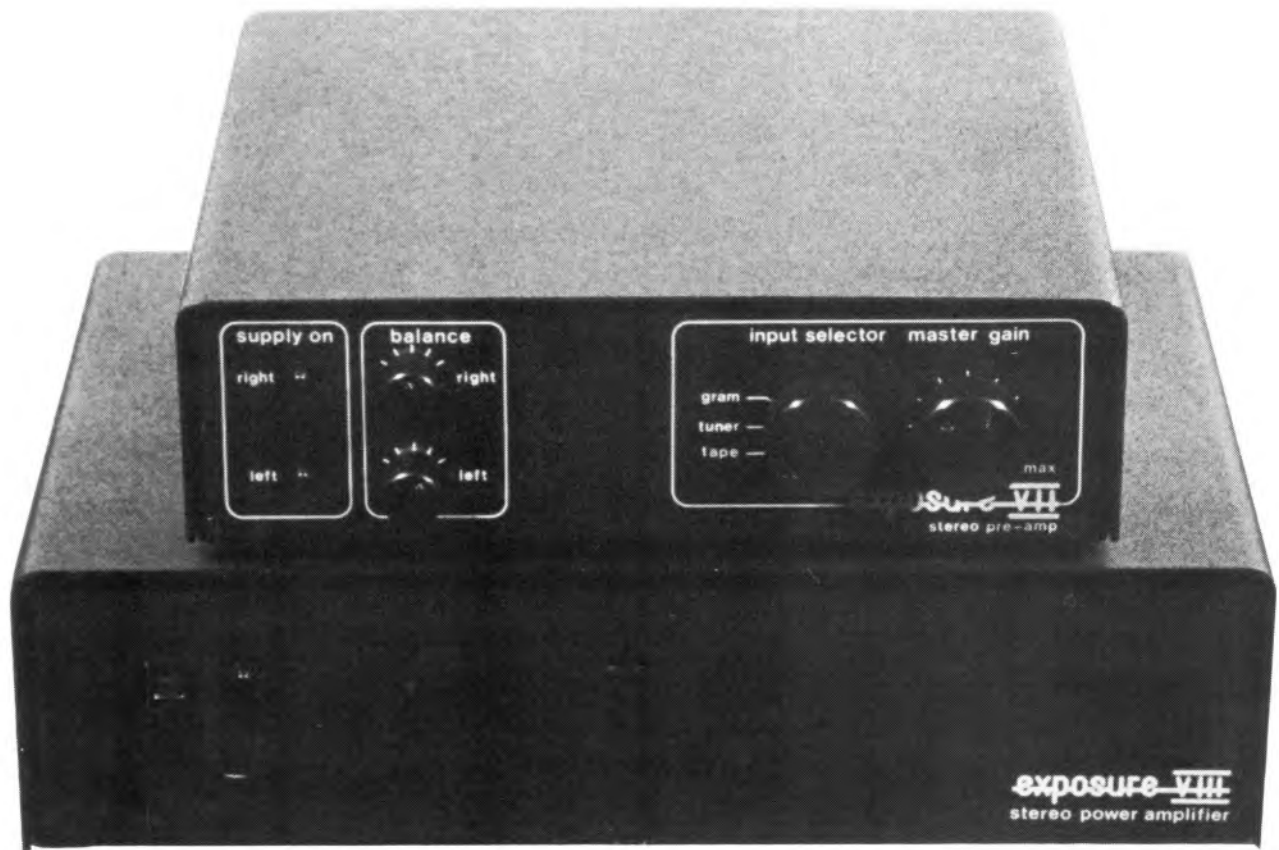
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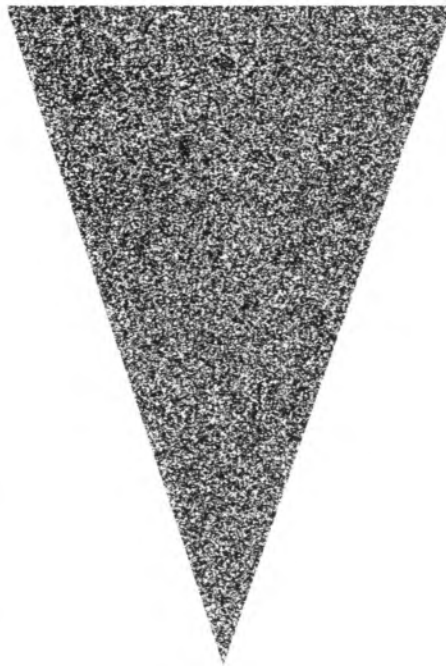
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# SONY COMPACT 91

SONY (UK) LTD, SONY HOUSE, SOUTH STREET, STAINES, MIDDLESEX TW18 4PF.

TEL: STAINES 61688



**V**tewed from any angle (except the sides) the Sony Compact 91 is an imposing and extremely complicated looking system. Unless you're Bang & Olufsen or a very few others, this tends to be regarded as a desirable property.

To use an expression that Sony themselves have used in the past, the system has an awful lot of spaghetti around the back. Each of the components has a main lead, most of which plug into the AC outlets of other components. Then there are the audio connecting leads, and finally a smattering of wiring to perform various message-passing tasks to make the automatic systems (such as they are) tick. Wiring up this rat's nest won't be a problem though, no matter how ham fisted you think you are. When a system costs as much as this you can insist that the dealer gets it working for you . . .

Around the front, the system really is well fitted. In every sense this is a full features product, and no attempt has been made to buffer that fact from the user. But there are automatic features too, the most useful of which is a common mains power switch which switches the entire system on and off if all the other components are left 'on'.

A number of options are available. One is the SEQ-910 9 band/channel graphic equaliser, which was included with the review system, but which can be omitted if desired — and should be if the decision is made strictly on audio grounds. Not only does it cost you an extra £119, it also helps spoil the sound, merely by its presence in the signal path.

What is supplied with the system as it stands, however, is a remote control for the CD player only, and this adds to the features of the player itself. Additionally, the turntable and loudspeakers are entirely optional, as are additional loudspeakers for the simple, surround sound role available with the amplifier.

The most elaborate system option is the £350 AVH910 audio/video control unit, though it was not available in time for the review. This uses SIRCS protocol to provide full system remote control, adds extra video and audio inputs surround sound capability, timer, and synchronisation of sources and cassette recorder.

All this flexibility makes the Sony a useful mix'n match product, that can be configured according to a range of requirements. You can even stack the equipment with Sony's 8mm video recorder, which itself can double as a digital audio recorder (albeit using a relatively low grade digital encoding system).

## PS-LX910 TURNTABLE

The deck itself is compact, has a parallel

tracking arm and is operable with the lid open or closed, but only by using the very slow acting powered shuttle keys. Fully automatic operation includes detecting whether a record is present, its size, and inferring its speed. Measured performance is right on the button.

## ST-V710L TIMER/TUNER

The tuner is surprisingly large in these days of slimline designs, but does double as a timer. In total, the ST-V710 will remember up to four sets of on and off times, and the tuner channels to go with them, over a seven day period (a sleep timer is included). The times may be one-offs or repeated weekly. As you'd expect the tuner also functions as a clock in its off duty hours, and also switches the other system components on and off. In the timer role, it would typically be used to rouse the cassette deck, which will then record a preselected radio programme in the owner's absence.

The tuner itself works on the usual three bands, FM, MW and LW, and will handle 20 presets, which can be allocated at random across the three bands. Sensitivity seemed low and noise levels abnormally high, but they varied as the aerial input wires were jiggled around because feeble spring clamps were fitted instead of a proper socket. LW wasn't too hot either, but MW was received well and sounded fine.

## TCV-710WR CASSETTE DECK

There are two decks, one for record/replay the other replay only, but both have auto-reverse. There is a choice of Dolby B or the more powerful Dolby C noise reduction systems, record level setting is thankfully manual, and some decent record level meters are provided for the purpose. Tape type selection is only automatic for the playback deck, being manual on the record capable deck. Dubbing is possible at normal and high speed, and so is something called RMS play and dubbing, which allows you to shuffle the pack — play back or dub tapes in the track order you specify, using a numeric keypad provided for the purpose. (The cassette being rec-

orded pauses whilst the other deck is finding its way between tracks.)

The lab bench tests have good results apart from a rising record/replay response with Type II tape. (Manufacturers often justify rising responses on the grounds that head wear will gradually put matters to rights.)

## CDP-103 CD PLAYER

This player is equipped with a 16-track programme memory, track/index skip, audible track scanning, a combined track/time/index display, and a remote control that provides direct track access using a numeric keypad, calculator style. The most impressive feature, however, is the amazingly fast and sure disc handling. Drawer movements are rapid, and track-find commands are as near instantaneous as any player available outside Sony's own separate CD player range. Disc tracking of this 2x oversampling player was exemplary — it is a very slick and accomplished performer.

## TA-V710 AMPLIFIER

The amplifier gives a very useful 70 watts/channel and is conventionally equipped, with a well rationalised and presented set of controls, not the least of which was a massive volume control. Sources catered for include an extra tape deck and one other item *via* the auxiliary socket. Two pairs of loudspeakers can be connected.

## APM-22ES LOUDSPEAKERS

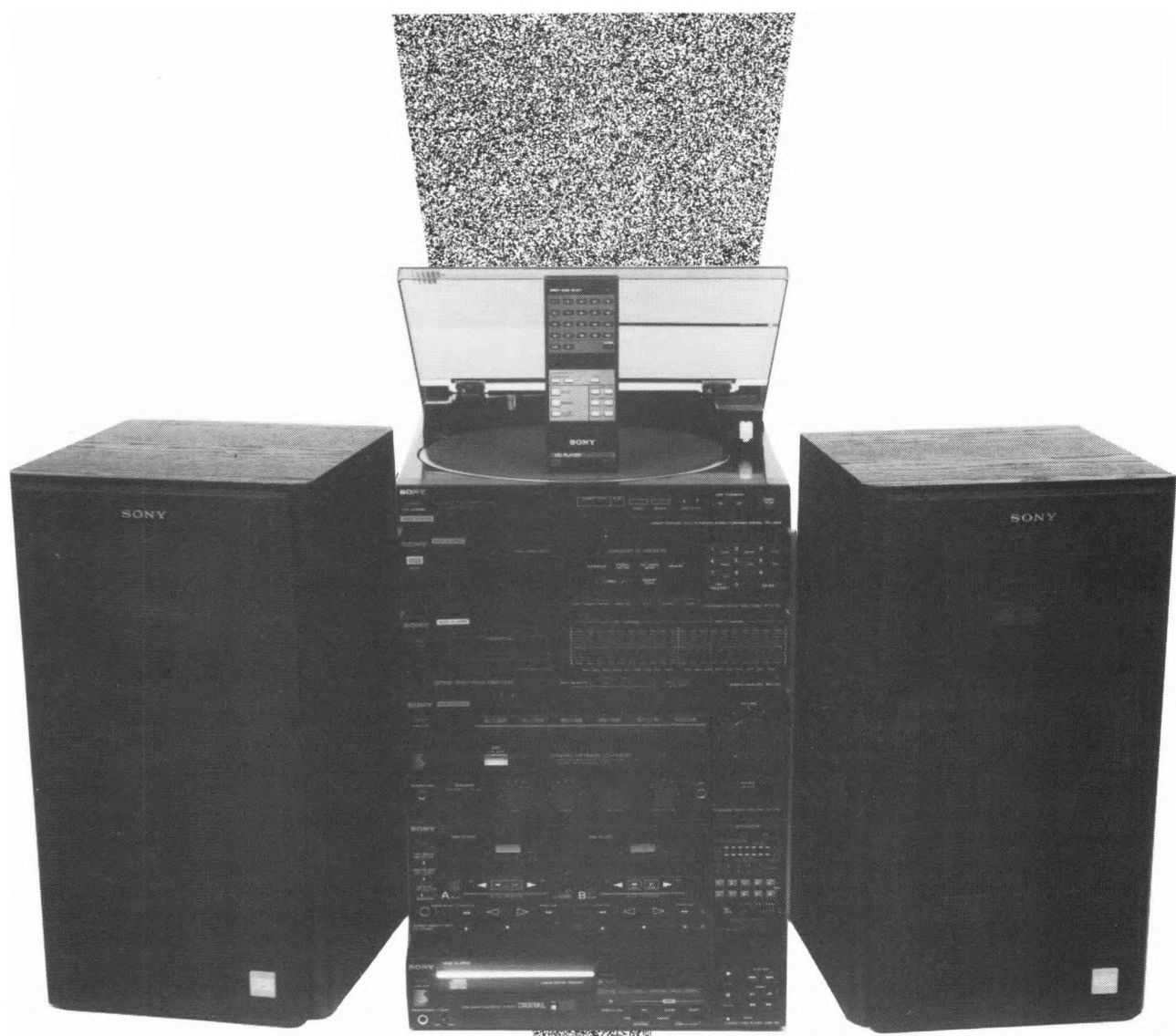
The loudspeakers, which as mentioned earlier are optional, were designed in the UK using the Japanese parts bin, and are built in a Sony-owned factory in Germany. Build quality is very high, featuring softly rounded edges on the very sturdily built reflex-loaded enclosures (note the size!), and two beautifully made high technology flat honeycomb drivers.

The APM-22ES is nothing less than a *tour de force* in the midi system arena. The frequency response is clearly one that belongs to a high performance loudspeaker.

## HOW IT SOUNDS

This system sounds very good, with well balanced abilities from all the main components, and considerable musical presence and panache into the bargain.

The loudspeakers are considerably better controlled and more neutral than early samples of this speaker, dating from about three years ago, though the B&W DM110s used as a reference in this project still beat the Sonys in certain areas, notably midrange punch and projection. The 22s suffer from a touch of reticence in the midband, but redress the balance with their con-



summate and explicit sense of detail. In the end my only complaint is a negative one: it seems that Sony have put a tremendous effort into an elaborate design that fails to improve convincingly on the cheaper, simpler and more conventional B&Ws. Quality of build and materials makes it a bargain; soundwise, it's only just good value. The optional APM20ES speakers offer comparable sound quality in a smaller less distinctively styled package, but at a significantly lower cost.

The rest of the system is solid in most departments, but as with other Sony systems the FM noise figure effectively sets the limit on what otherwise would have been a very fine sounding tuner.

It's difficult to get too enthusiastic about the turntable either. It seemed quite microphonic when touched gently, but got no worse when knocked quite heavily, indicating a level of mechanical damping that is probably quite substantial. That at any rate was the impression it made when playing music, but despite the lack of real aural interest, records were not badly catered for.

There are no such complaints about the cassette deck, CD player or the amplifier. The latter is hardly an outstanding success story, and there are quite modest high fidelity amplifiers around that sound considerably better. But the com-

bination of the amplifier and the excellent sounding CD player made for serious music making. I found a level of involvement and discovery with suitable discs that simply wasn't on offer from the majority of systems tested.

The cassette deck worked well too. It made some excellent recordings off records and CDs alike, with a standard of bass to treble resolution and even-tempered clarity at all recorded levels not usual with this medium.

At worst, the system tended to sound a little thin and bright, but the standards of clarity, depth and stereo focus achieved were impressive, and bass reproduction too was surprisingly potent and articulate.

**VERDICT**  
There are some annoying inconsistencies (like

the tuner), and the test system wasn't exactly fault free. But the Sony Compact 91 has considerable under-the-skin competence, and is unusually 'future-ready' in terms of extensive options which can link and automate audio and video together.

**TEST RESULTS**

Cost complete	£1500
Options? <input type="checkbox"/> loudspeakers, equaliser, turntable (all included above)	
A/V controller and 8mm audio/video recorder (extra)	
Size main unit - lid open, W/H/O projections	87 x 35.5 x 36cm (h x w x d)
Size loudspeakers	51.5 x 29 x 29cm (h x w x d)
<b>Turntable</b>	
Wow & flutter wrd	0.10%
Drift	good
Speed accuracy	correct
Arm/cartridge resonance	11Hz, OK
(<10kHz: too low, OK> 14Hz: too high)	
Cartridge channel balance	0.6dB
Cartridge channel separation	-26dB
Cartridge tracking ability	80µM
<b>Tuner</b>	
Sensitivity	fair
Signal/noise	poor
<b>Cassette Deck</b>	
Wow & flutter (wrd)	0.09%
Signal/noise ref 0dB Type II	55dB
Distortion 0dB Type II	3.0%
<b>Compact Disc Player</b>	
Signal/noise (measured at CD player out)	>107dB
(amplifier fault prevented normal test method)	
<b>Amplifier</b>	
Power output/channel (8ohms)	70 watts
(1kHz: both channels driven)	
<b>Loudspeakers</b>	
Efficiency	medium
First reviewed: 1986. Rating: Best Buy.	



## Follow The Leader

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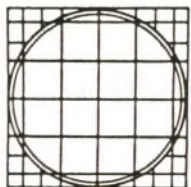
Such audiophile products are rare, because they combine the initial vision of a designer who can see beyond the state of the art; careful refinement and development; *then* the work and the cost and the experience which exists in Scotland to manufacture turntables and tonearms not *up to* a reference standard, but each a reference instrument itself.

This is the integrity which creates a legend, and explains why it is worth paying for the guarantee which is represented by such a "name." Reviews worldwide have already acknowledged the "Source" as "in a class of its own"<sup>1</sup> and the Odyssey arm as "the finest pivoted arm I have tested"<sup>2</sup>, to quote from just two.

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1. *New Hi-Fi Sound*, May 1984. 2. *Stereophile*, USA, Sept. 1985.



SOURCE-ODYSSEY LIMITED, 157 CURLE STREET, GLASGOW, SCOTLAND



# Turntables Tonearms & Cartridges

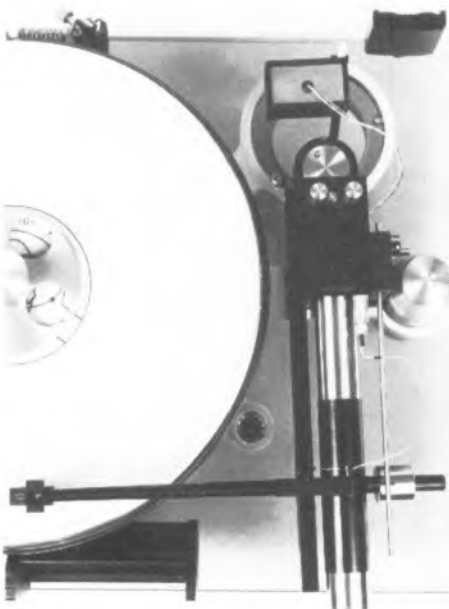
Accepting that vinyl discs are the prime source of home music automatically implies that the turntable, plus its arm and cartridge, are the most important components. The once-revolutionary Linn-inspired doctrine that you had to get as much information as possible off the disc in the first place because you couldn't hope to salvage the situation further down the chain, is now generally accepted. Where Linn led, many others have since followed, so that there are now a fair number of worthwhile turntables, all making their own particular contribution to the musical/acoustical experience. Chuck in a dozen or so arms and cartridges, and you could end up with an embarrassingly large number of possible permutations.

There are a number of peculiarities about record players. Unlike other music sources, the transducing element is connected directly to the pre-amp, which needs to be able to handle the signal properly in the first place, and also perform favourably as far as some of the more subtle interactions are concerned. Even the generalised high and low output cartridge designation conceals significant variations.

Arm/cartridge compatibility is also important. Based on the mechanical relationship of arm mass and cartridge compliance, this defines the low frequency rolloff point of the system. The resultant resonance needs to be at a high enough frequency to avoid interaction with record warps, and with the modes of the turntable's suspension — the latter a variable depending upon the turntable concerned.

Such complexities are a major reason why particular packages tend to sort themselves out in the marketplace, and dealers can help plan balanced combinations, either in isolation or preferably taking the rest of the system into account.

Most of our information for this section of *The Collection* is right up to date, having been reviewed or updated in our December 1986 *Turntables, Arms and Cartridges* edition. But a couple of important new cartridges have only just appeared, from Linn and Ortofon, and we've taken the opportunity to slip in a couple of extravagancies, a review on Clear Audio's *Pradikat* (Europe's new reference?), and a short summary on the Koetsu *Red Signature*. We've also sampled that legend amongst exotic turntables, the Goldmund *Studio*, which proved to be a memor-



able, if sadly all too brief experience.

## ❖ BEST BUY VALUE ❖

Three exceptional integrated turntables redefined mid-price performance in our recent series of tests. Each is a UK product, and each takes a distinctly different route in achieving its design objectives, so they provide something of a precedent for the even more distinct models further up the price scale. Partnership with one of the £60-70 cartridges can provide unexpectedly high sound quality for a reasonably modest budget, below £400.

## ❖ THE REAL THING ❖

A step up the price ladder brings in another trio of turntables and a quintet of likely tonearms, capable of doing justice to the various top quality high or low output cartridges. These fit into player prices from about £800 upwards, and are capable of at least rivalling even the most expensive alternatives. Even though all are naturally fitted with carefully considered suspension systems to provide environmental isolation superior to cheaper models, products in this group still demand cossetting if they are to give of their best. A proper shelf or table is mandatory, and attention to interconnect cabling may also be worthwhile.

## RATIONAL EXTRAVAGANCE

The very top price turntables arms and cartridges can undoubtedly add a degree of drama and scale, if properly matched, set up and installed. Disappointing experiences a number of years ago left the UK a little wary of the big 'heavyweights', but the trio covered here have shown themselves capable of really delivering the goods.

As can the top tonearms we have grouped together here, including two of the new generation air-bearing types. The term tonearm is particularly appropriate, because each gives a distinctly different 'flavour'. Air-bearing parallel trackers provide a refreshing alternative, but by no means replace the traditional pivoted types, each showing areas of strength and weakness that are difficult to compare.

Throughout turntable technology variety is the keynote, and no single principle or technique ensures superiority. The trick for the consumer is, as ever, to let his own ears do the choosing. And never underestimate the importance of the record player, or the subtle interactions between its constituents.

LINN AXIS

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**D**oubtless 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 receives 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.

Three new £300 integrated turntables stood out in our recent test programme. Not quite the 'high end' price-wise, the Linn Axis, Logic Tempo/Datum, and Manticore Mantra certainly represent 'real hi-fi' at an increasingly affordable price.

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

<b>Motor section</b>	
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, 33 $\frac{1}{3}$ /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
<b>Arm section</b>	
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
<b>System as a whole</b>	
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
First reviewed: 1986. Rating: Best Buy.	

**LOGIC TEMPO/ELECTRONIC/DATUM II**

LOGIC INTERNATIONAL LTD, 19 HURLBUTT ROAD, HEATHCOTE INDUSTRIAL ESTATE, WARWICK  
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**B**ack 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 within the tonearm section.

*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 was shown 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 improve 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**

<b>Motor section</b>	
Type	manual electronic belt, decoupled plinth
Platter mass/damping	1.5kg/good
finish/engineering	v good
Mains/connecting leads	2 core/phonos and earth
Speed options	variable, 33 $\frac{1}{3}$ /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
<b>Tonearm</b>	
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
<b>Whole system</b>	
Size (wxdxh)/lid at rear	46.5 x 36 x 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 <i>DH</i> , £299
First reviewed: 1986 Rating: Best Buy	



**MANTICORE MANTRA**

MANTICORE SYSTEMS ENGINEERING LTD, THE COURTYARD, 56c SHORTMEAD STREET,  
BIGGLESWADE, BEDFORDSHIRE SG18 0AP.  
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**M**anticore 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 effect-

ive 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 was very good indeed, while the vibration breakthrough was also good though it was possible to detect some spring harmonics of the main 3-5Hz subchassis modes. The mechanical disc impulse test showed 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**

<b>Motor section</b>	
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	33 1/3/45rpm
Wow and flutter (DIN peak wrd sigma 2)	0.05%
Wow and flutter (lin peak wrd 0.2-6Hz/6-300Hz)	0.16%/0.08%
Absolute speed error	-0.38%
Speed drift, 1 hour/load variation	-0.13%/-0.10%
Start-up time to audible stabilisation	5 secs
Rumble, DIN B wrd, L/R average (see spectrum)	-72/-76dB
<b>Arm section</b>	
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/wr decoupling
<b>System as a whole</b>	
Size (wxdxh)/clearance for lid rear	46x78x15cm/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
<i>First reviewed: 1986 Rating: Best Buy.</i>	

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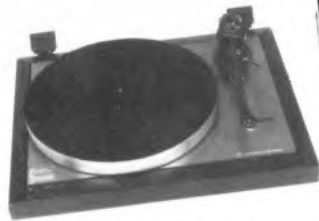
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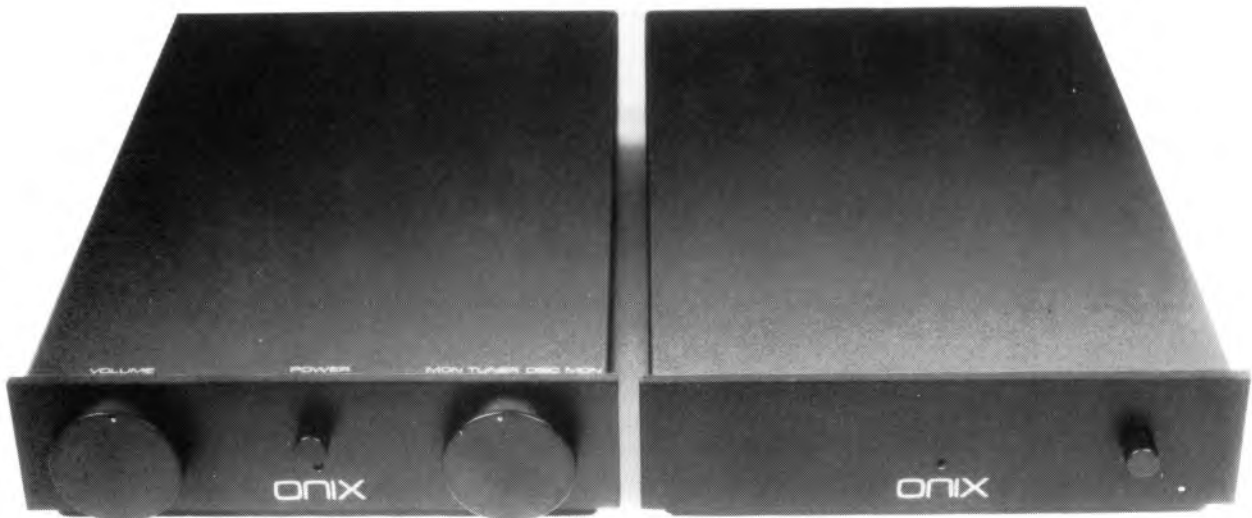
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**LINN SONDEK LP12**

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*Pink Triangle's PT TOO and  
 Roksan's Xerxes join Linn's established  
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 around the £500 mark.*



**N**ow 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 measure-

ments 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 riming, 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 marched 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 wrd sigma 2)	_____ 0.06%
Wow and flutter (LIN peak wrd 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 wrd, L/R average	_____ -80dB
Size (wxdxh)/clearance for lid rear	_____ 44.5 x 36 x 15cm/5.5cm
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/good
Estimated typical purchase price	_____ from/ostia, £450
	(other finishes: walnut, £462, black, £474, rosewood, £495)

First reviewed: 1986. Rating: Recommended

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**PINK TRIANGLE PT TOO**

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



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**H**aving 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 *Avtaigent* 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**

<b>Motor section</b>	
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	33 1/3/45rpm
Wow and flutter (DIN peak wtd sigma 2)	0.04%
Wow and flutter (lim 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 x d x h)/clearance for lid rear	45 x 39 x 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

First reviewed 1986, Rating Recommended



## ROKSAN XERXES

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



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**N**amed 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 (alternatives now available). 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 made up from four machined sections, with separate bearing shaft to improve concentricity, 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'.

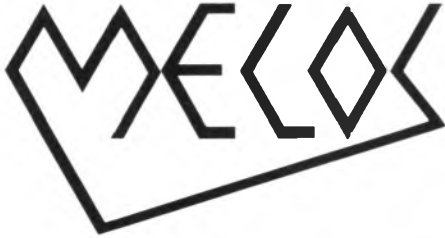
### CONCLUSIONS

While a few little details could be tightened up, Xerxes is the most creative and interesting turntable to emerge for some years. The overall sound is top drawer, while comparatively simple set up is an added bonus, ensuring recommendation.

### TEST RESULTS

<b>Motor section</b>	
Type	electronic, belt, 'solid subchassis'
Platter mass/damping	2kg/v good
Finish/engineering	v good
Mains/connecting leads	3 core remote
Speed options	variable, 33 $\frac{1}{3}$ , 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 (wxdxh)/lid at rear	48x 39x 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





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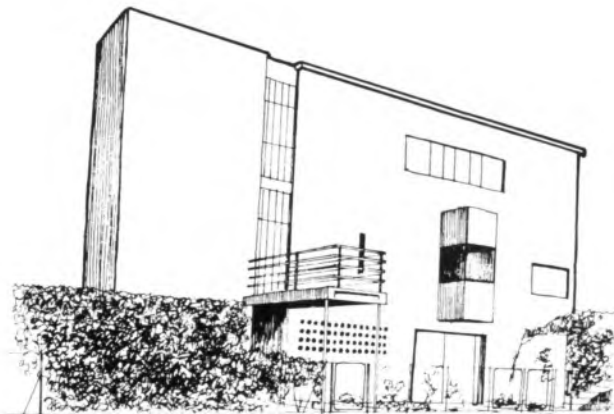
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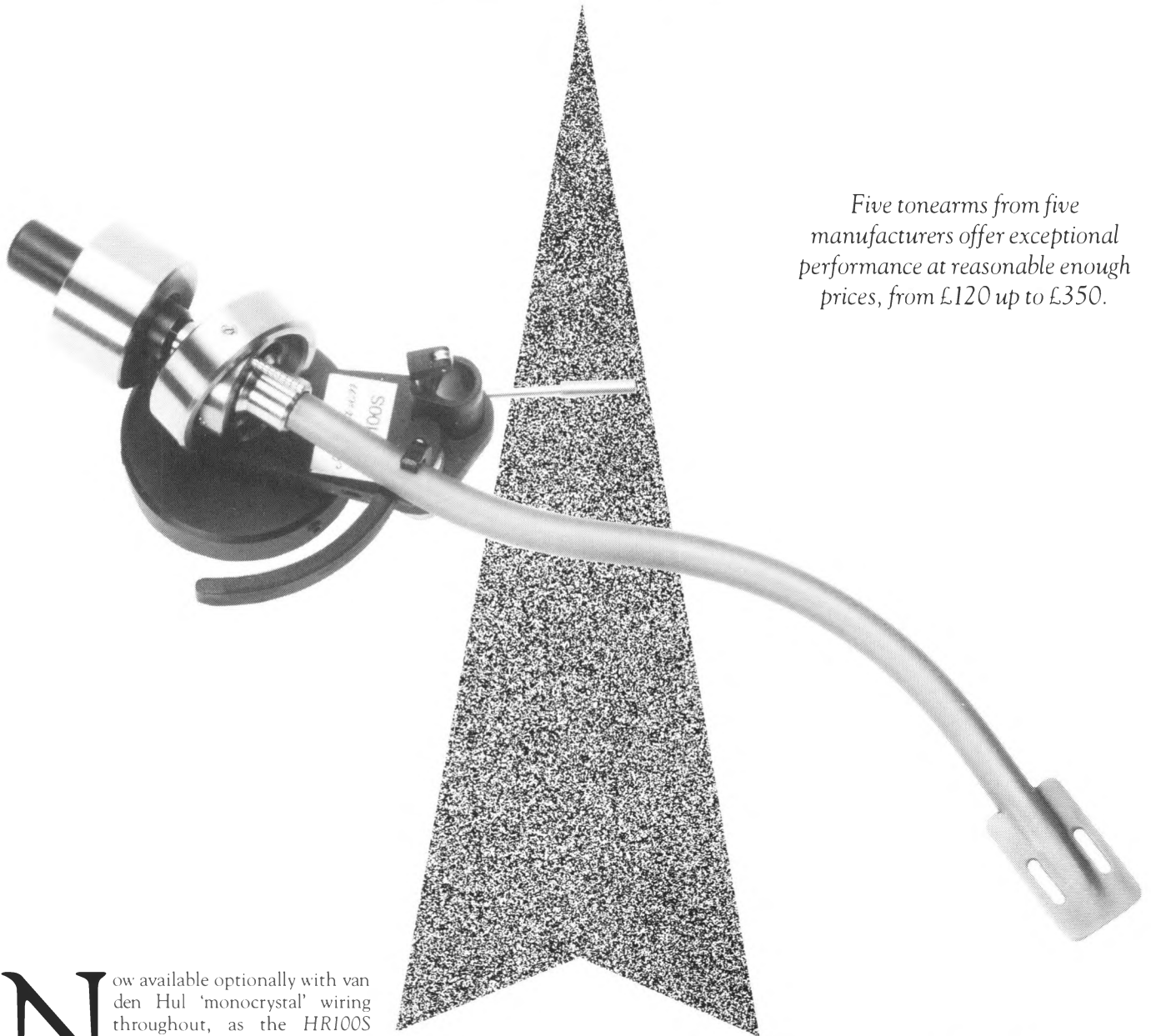
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**ALPHASON HR100S**

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**N**ow available optionally with vanden 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;

First reviewed: 1983 (retested 1984, 1985). Rating: Recommended

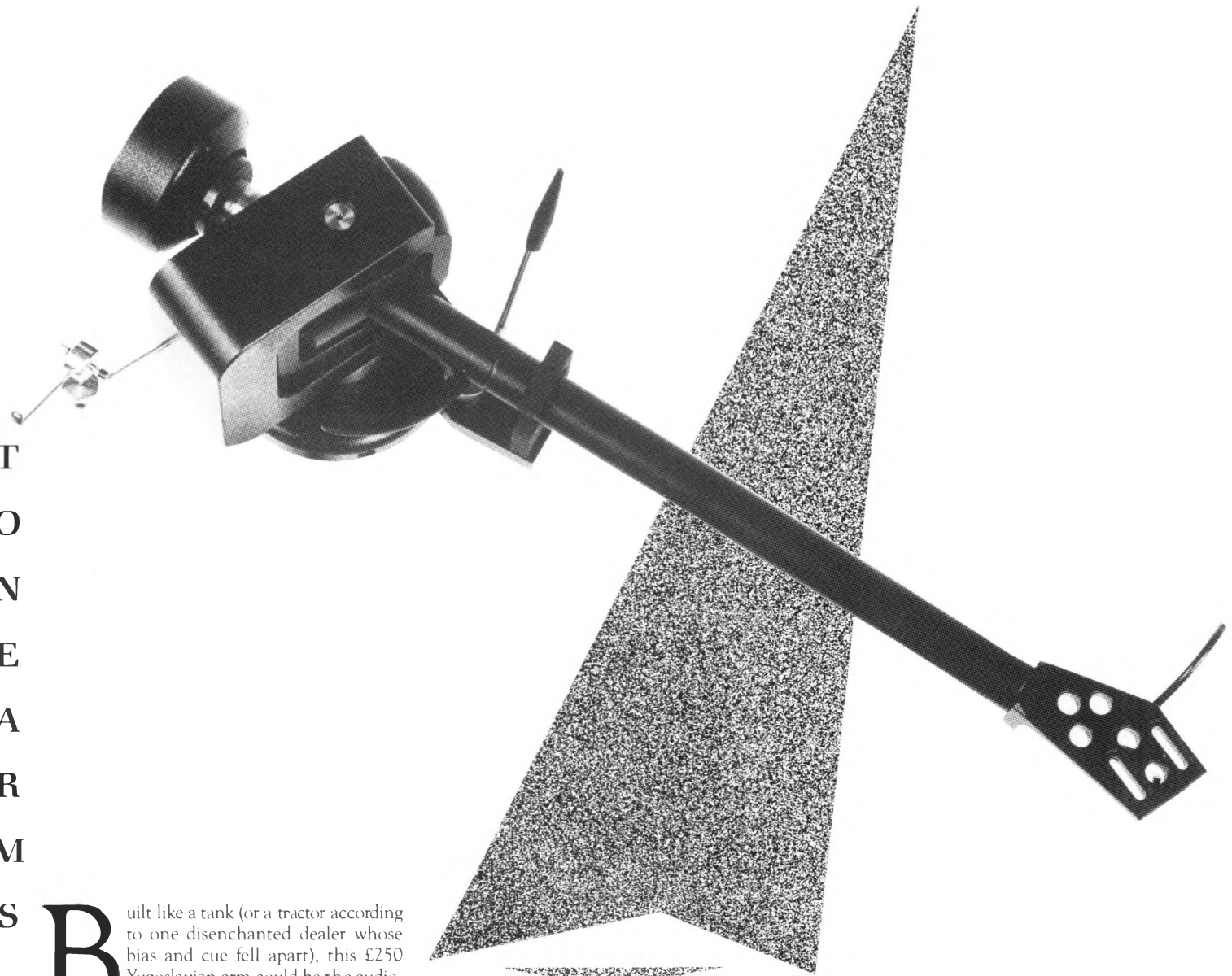


**KUZMA**

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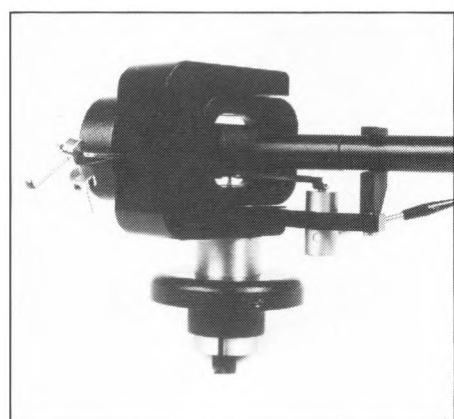
**B**uilt like a tank (or a tractor according to one disenchanted dealer whose bias and cue fell apart), this £250 Yugoslavian arm could be the audiophile bargain of 1987. Its macho build and stove-enamelled finish makes *Zeta* and the *Mechanic* look puny — not just in terms of the dimensions of the 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**

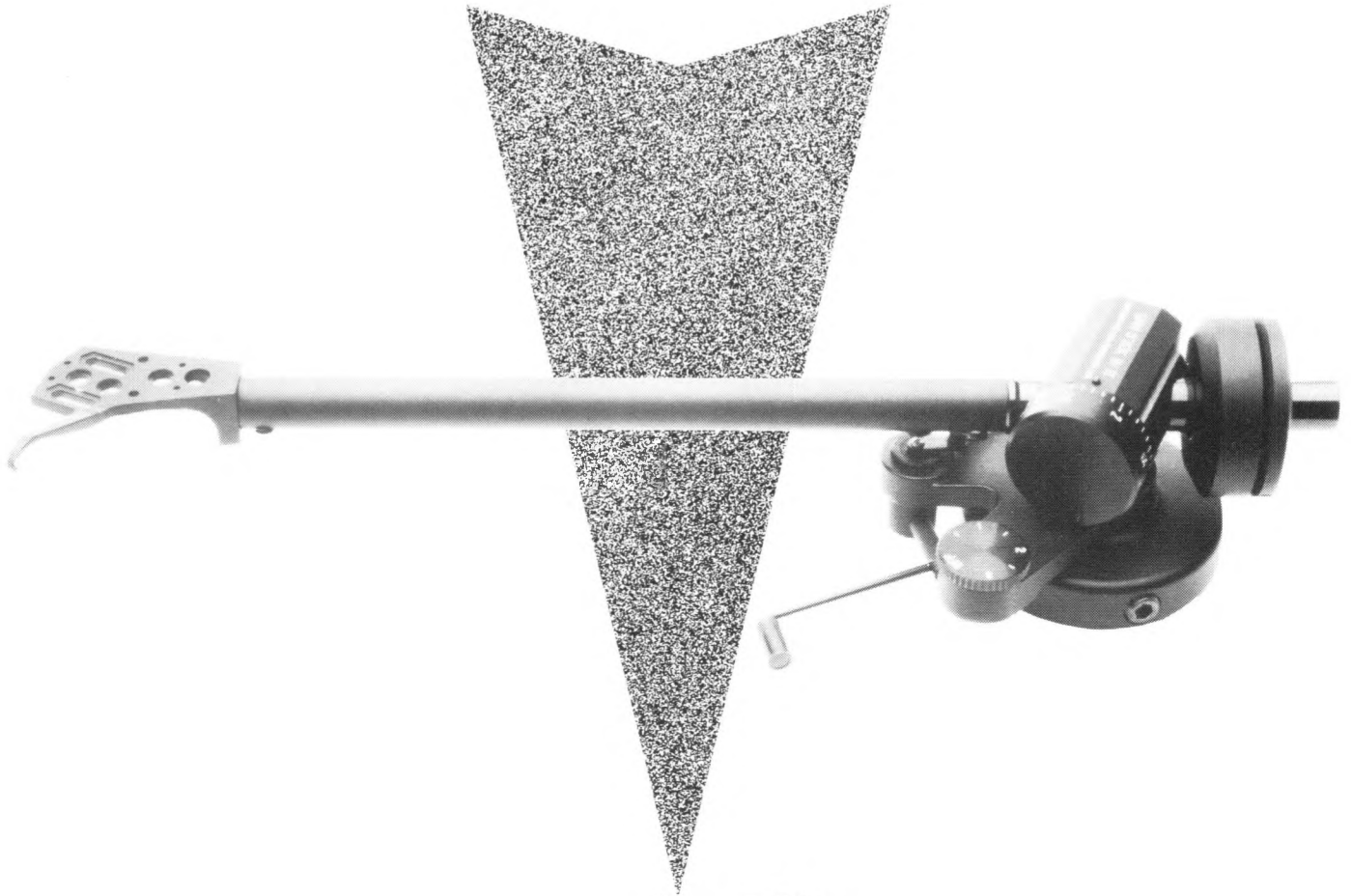
<b>Tonearm</b>	
Effective mass (approx)	14.5g
Type/mass headshell	fixed
Geometric accuracy	v good
Adjustments provided	height, overhang, lateral
Finish/engineering	good/average
Ease of set-up/use	/average
Friction (typical lat/vert)	60mg/10mg
Bias method	thread & lever
Bias force (rim/centre, 1.5gE)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

*First reviewed 1986. Rating: Recommended*



**LINN ITTOK LVII**

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



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**W**hen 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**

Approximate effective mass, inc screws, excel cartridge	_____ est. 13.5g	Tonearm
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	

First reviewed: 1980 (retested for all subsequent editions). Rating: Recommended.

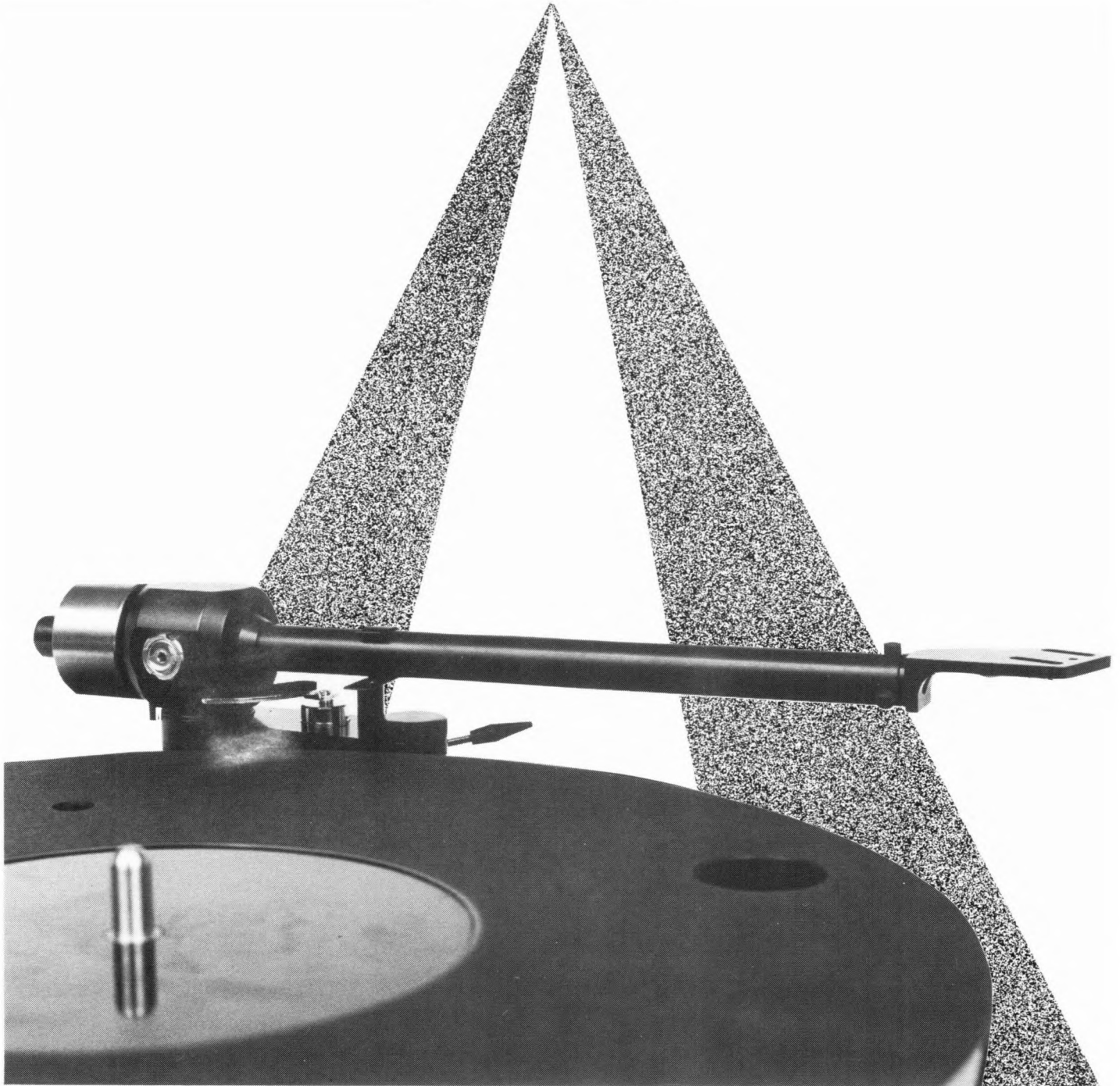


## LOGIC DATUM S

LOGIC INTERNATIONAL LTD, 19 HURLBUTT ROAD, HEATHCOTE INDUSTRIAL ESTATE, WARWICK  
CV34 6TD.

TEL: (0926) 20302

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The *Datum S* tonearm is a refinement of the cheaper *Datum II*, sharing the generous aluminium tube and bearing housing of *Datum II*, but with more tightly tolerated bearings, a tungsten counterweight and a 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.

### LAB REPORT

The arm measured very well on friction, and was generally well finished, with good, right

hearings and slightly high bias compensation settings. The resonance trend looks very good, with well-controlled breaks in the midband but a little extra 'liveliness' in the treble.

### 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.

### CONCLUSIONS

The *Datum S* is a clear recommendation,

joining a select handful that offer a very good sound quality at a nonetheless reasonable price, and attain sufficient quality to be fitted to turntables costing considerably more.

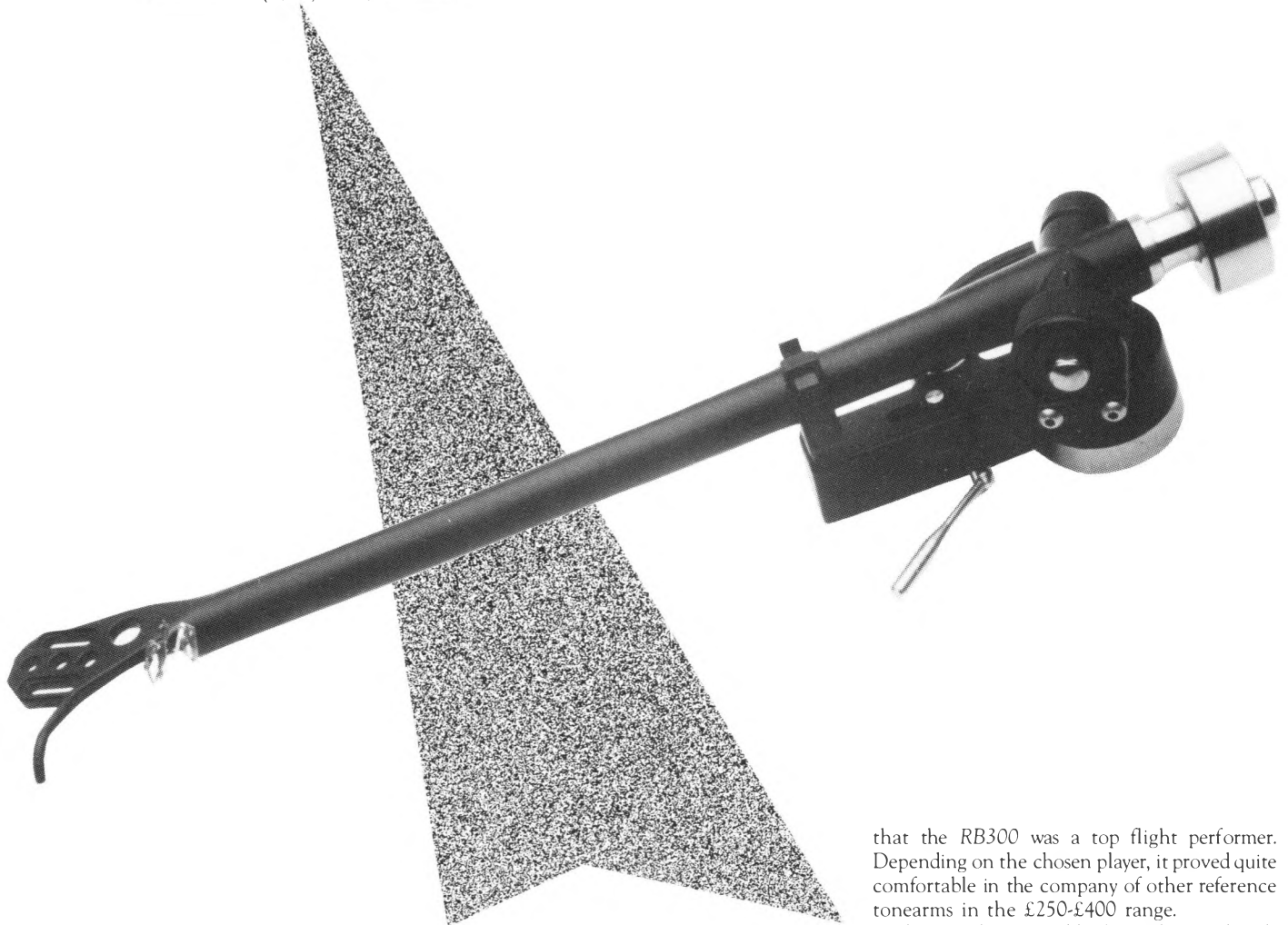
### TEST RESULTS

<b>Tonearm</b>	
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 sec/3 sec
Arm resonances	v good
Sound quality	v good
Arm damping	some cv
Typical price	£230

**REGA RB300**

REGA RESEARCH LTD, 119 PARK STREET, WESTCLIFFE-ON-SEA SS0 7PD.

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adjustment is only possible using various washers.

**LAB REPORT**

**T**his 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

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 elliptical)	_____	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

First reviewed: 1984. Rating: Best Buy.





# tempo/datum II

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*HiFi Choice 1985*

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*HiFi News April 1985*

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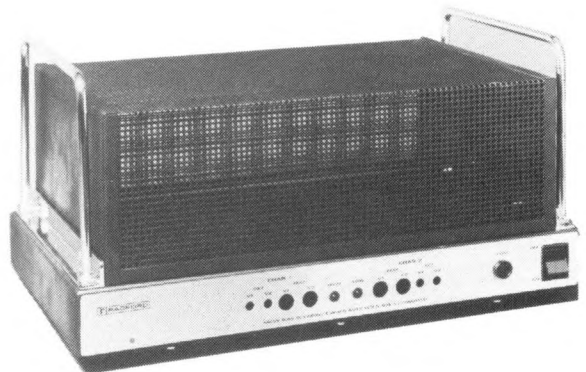
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*Two thousand pounds plus on a turntable takes some justification, but these true heavyweights go some way towards delivering.*



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**D**esigned 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 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 33 1/3 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 housing, while the DC brushless motor is itself supported on damped anti-vibration mounts and

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.

## 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 wrd sigma 2)	0.035%
Wow and flutter (LIN peak wrd 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 wrd, L/R average	-79/-81dB
Size (wxdxh)/clearance for lid rear	58x43x16cm/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

First reviewed: *The Collection* 1986 Rating: Recommended.



## GOLDMUND STUDIO/T3F

ABSOLUTE SOUNDS LTD, 42 PARKSIDE, LONDON SW19.

—TEL: 01-947 5047—

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Given that the complete Goldmund *Studio* turntable system costs in the region of £7,000, one might be tempted to believe it is the most expensive on the market. Not so. That honour is held by the Goldmund *Reference*, an entirely different design at nearly twice the price. However, the *Studio/T3F* is comfortably the most expensive combination *Choice* has ever covered. Though it has gathered an enviable reputation overseas, it is still a very rare bird indeed in the UK at present.

### RED SIGNATURE

Normally supplied as *Studio* turntable, *T3F* tonearm and Goldmund cartridge (the latter sourced from Clear Audio), the sample we managed to borrow was in fact fitted with an equally exotic Koetsu *Red Signature* cartridge for the formal listening sessions. An alternative sample was then obtained for subsequent lab work and further listening with alternative cartridges. The ensemble is quite bulky, and weighs a substantial 25kg. One would hesitate to call it beautiful in any way, but the unremitting black finish should ensure that it is reasonably discreet.

The Koetsu *Red Signature* is a development of the *Red* which is reviewed elsewhere in these pages. It offers further performance refinements for a substantially higher price, but with no other obvious distinguishing features. However the end result is a significant subjective improvement in scale, dynamics, resolution and imagery. One could make the analogy with VDH MC10/MCOne or Linn *Karma/Troika*, though the Koetsu price premium is even steeper. Those enamoured of the standard *Red*, already one of the best cartridges around, will

develop lust and craving for the *Red Signature*, which certainly makes one of the strongest claims for being the best there is.

### TURNTABLE

Unconventional in many respects, the turntable uses a heavy duty Papst direct drive motor with integral bearing, as also used by Revox. The platter is coupled to the motor on three brass studs, and decoupled from the motor shaft by a PTFE sleeve. A form of subchassis construction is adopted against vibration, the whole top plate, motor, platter, arm and armboard decoupled from the main plinth in a carefully controlled manner (3Hz). However, the springs are rather large and crude, of a type inclined to resonate in the midband. The armboard itself is not held as rigidly as one might expect.

Goldmund claim origination of the concept of using acrylic materials because of the mechanical similarity to vinyl, and most of the turntable is constructed in perspex, including plinth and platter — it looks solid black, but a strong light reveals a deep purple tinge of translucency. The platter mass is then increased to 3kg with 10 lead inserts around the periphery to ensure maximum inertia. The platter is slightly concave, with the intention that a clamping system is used.

### ONEARM

The *T3F* tonearm is a powered parallel tracking type, which in essence consists of a short but fairly straightforward high quality pivoted arm mounted on a carriage which is driven across a gantry under optical servo control. In fact a second fixed arm comes out from the carriage alongside the tonearm itself, and the end of this contains the optical sensors which monitor the movement of the headshell and instruct the ap-

propriate carriage movement.

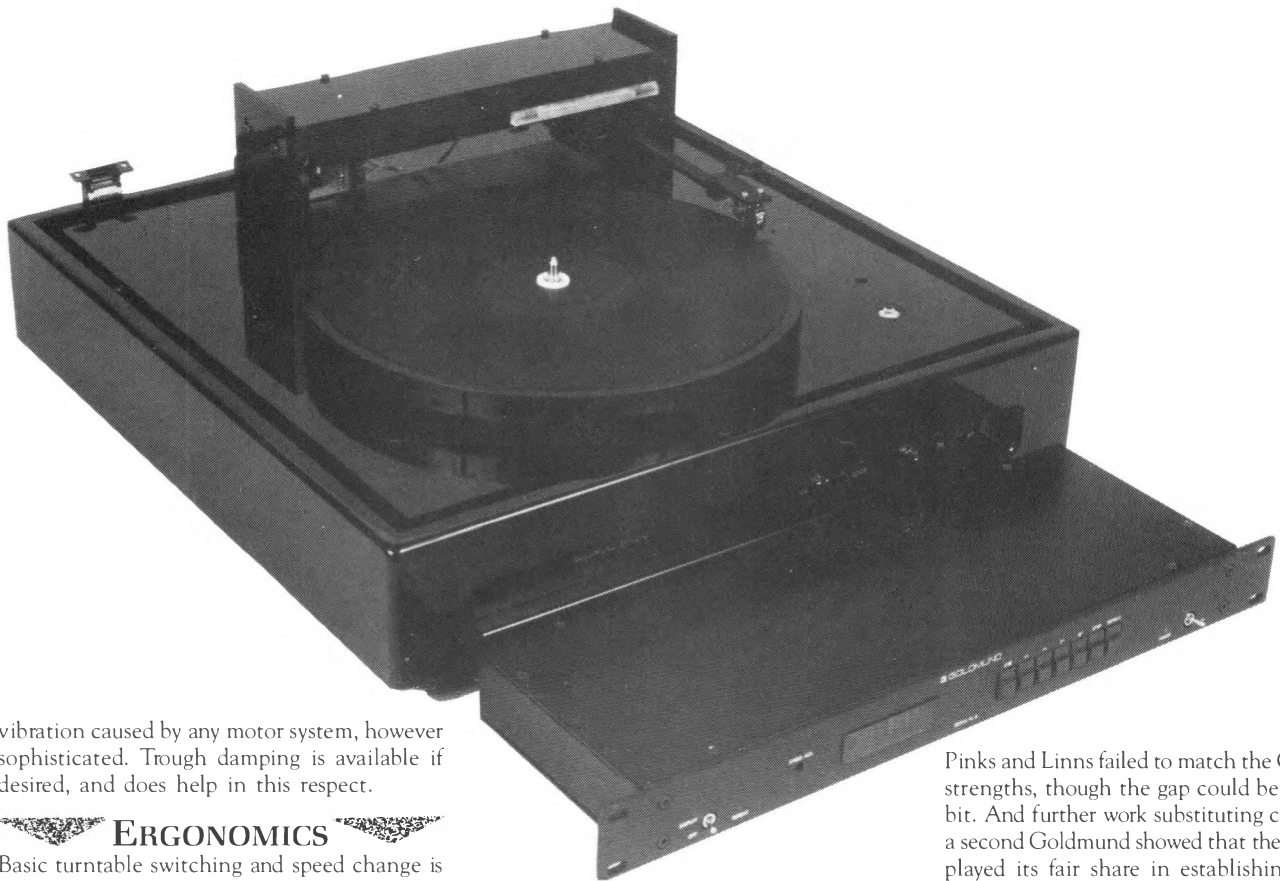
Lateral tracking error correction is claimed to be accurate within 0.1 degrees, though a minor disadvantage is that the servo drive only operates towards the centre of the record, so if the arm follows a 'swinger' (a disc with off centre hole) inwards, it will not move back out on the other part of the cycle.

Still, such errors are comparatively small in any case. The advantage of the parallel tracking arm is more to do with ensuring the stylus stays centred in the groove, having no modulation bias or the need to make a very crude approximation as is the case with conventional offset pivoted tonearms. And for those with an obsessive interest in adjusting vertical tracking angle, the *T3F* provides a direct readout scale on the front of the arm gantry.

This main gantry is milled to lathe bed precision from aluminium, supporting and constraining the carriage which runs on low friction PTFE rollers. All but one of the four gantry tracks has thin felt damping, presumably to avoid 'chatter'.

The shorter arm length permitted by the linear operation means that keeping the arm mass low is no longer a major priority, so rigid construction is easily accomplished and the luxury of a detachable headshell can also be used, providing it is properly designed, with the effective mass in the optimum 10-14g range depending on choice of counterweight — cartridges from 4-20g can be counterbalanced.

Because this is fundamentally a conventional arm on powered carriage drive, the undesirably high lateral inertia of passive linear tonearms is avoided. A corresponding disadvantage lies in the complexity required for powered drive — in the number of components that will be susceptible to vibration and in the inevitable



vibration caused by any motor system, however sophisticated. Trough damping is available if desired, and does help in this respect.

**ERGONOMICS**

Basic turntable switching and speed change is controlled from the inset section of the plinth front. All arm movements are controlled from a substantial and complex outboard 'servo control unit' which looks not unlike a slim pre-amp, equipped for standard width rack mounting. This can be sited wherever convenient — perhaps alongside the pre-amp. It has a cable interlink to the turntable, but full infra-red is a planned option. In addition to controlling cueing and arm drive, the controller automatically plays 12" or 7" discs and returns to rest after play, or repeats if instructed to do so.

Though it's hard to fault the overall logic behind the design, of necessity the arm must be servo controlled. And although the automatics are nice and convenient, there is no doubt such a system is in some ways less satisfactory than manual operation in a number of respects. It's much slower, for starters, and cueing individual tracks accurately takes a lot more practice than we had time for. Perhaps it's just a question of getting used to pushing which button when and for how long, but something a little more sophisticated like a slider representing an analogy of the arm position, tied in with auto-cueing, could be much more satisfactory.

As one might expect, set-up is a nightmare — but it comes with the price and is therefore not your nightmare but someone else's. Expect a skilled technician to spend half a day at least, mainly on aligning the high precision machined gantry sections within the carriage runs.

**LAB REPORT**

The tonearm is a fairly high mass device, partly due to 7g of headshell plate, but this is well suited to the low compliance cartridges like Koetsu and Clear Audio models it is likely to partner. The arm bearing felt encouragingly right, with plenty of mass to discourage carriage movement. Typical bearing friction values of 50/40mg are higher than pivoted and air-bearing types, but are still low enough to matter little. More serious, our analysis detected intermittent

subsonic noise caused by the parallel tracking drive — something of a pulse applied as the servo came into play. It is difficult to establish whether this was in any way audible, but this is clearly one limiting factor in the arm, and probably reason enough to think seriously about using a touch of damping in the trough.

Calibration and alignments were excellent throughout, and the arm resonance graph indicated a well balanced character with quite good control — not dissimilar to the air-bearing models but slightly less 'tidy' in the trebles. The 4 secs timed for cue descent is too long for convenience or optimum record care — those damned automatics again.

The turntable delivered a generally outstanding set of measured performance parameters, state of the art in terms of speed accuracy and stability. The full rumble spectrum showed no problems, and the disc impulse test showed exemplary platter damping and control. The one weakness proved to be vibration transmission through the rather crude 'bed springs' used for the main subchassis suspension. These showed significant shelf-borne breakthrough in the upper bass, 100-300Hz, which experience suggests may cause some mild audible coloration, depending on the shelf/support.

**SOUND QUALITY**

Great reputations tend to breed scepticism and result in disappointment, but this was not the case with the *Studio/T3F/Red Signature*. Introduced quite late in a long day's listening, the Goldmund combination forced an immediate re-appraisal of the capabilities of vinyl disc, providing a hitherto unexpected degree of bass weight, extension, authority and 'slam', plus extended image scale with a strikingly open and clear midband. The final octave seemed a trifle 'lazy' and detached, giving a slight 'lippy' bright 'edge', and a general slight 'untidiness' was also noted, but these were the only real criticisms.

Some frantic tweaking and substitution of

Pinks and Linns failed to match the Goldmund's strengths, though the gap could be narrowed a bit. And further work substituting cartridges on a second Goldmund showed that the Koetsu had played its fair share in establishing the high ranking — with a lesser model the Goldmund still couldn't be made to sound ordinary, but it was cut down to size a little.

**CONCLUSIONS**

The Goldmund *Studio/T3F* is a remarkable turntable, capable of creating an unsuspected degree of scale and drama, and revealing layers of hidden information in any vinyl collection. It is not perfect by any means, but even comparatively unpromising aspects like the motor driven parallel tracking tonearm have been painstakingly developed to minimise their difficulties and capitalise on their strengths, so that the right combination of cartridge and amplifier can create an ear-opening experience. It still looks expensive compared with a Golf GTi, but recommendation is mandatory.

**TEST RESULTS**

<b>Motor section</b>	<b>turntable and tonearm</b>
Type _____	direct drive, quartz, subchassis
Platter mass/damping _____	3.2kg/excellent
Finish and engineering _____	excellent
Type of mains connecting leads _____	2 core remote/lemo sockets
Speed options _____	33/45rpm
Wow and flutter (DIN peak wtd sigma 2) _____	0.03%
Wow and flutter (lin peak wtd 0.2-6Hz/6-300Hz) _____	0.1%/0.03%
Absolute speed error _____	0%
Speed drift, 1 hour/load variation _____	0%/0%
Start-up time to audible stabilisation _____	1.5 secs
Rumble, DIN B wtd, L/R average (see spectrum) _____	81dB
<b>Arm section</b>	
Approximate effective mass, inc screws, excl cartridge _____	16.5g
Type/mass of headshell _____	detachable plate
Geometric accuracy _____	excellent
Adjustments provided _____	height, overhang, tilt
Finish and engineering _____	excellent
Ease of assembly/set-up/use _____	difficult, good with practice
Friction, typical lateral vertical _____	50mg/40mg
Bias compensation method _____	none
Bias force, rim/centre (set to 1.5g elliptical) _____	n/a
Downforce calibration error, 1g/2g _____	n/a
Cue drift, 8mm ascent/descent _____	negligible
Arm resonances _____	very good
Subjective sound quality _____	very good
Arm damping _____	silicon trough
<b>System as a whole</b>	
Size (w x d x h)/clearance for lid rear _____	50.5 x 53 x 23/10cm
Ease of use _____	v good with practice
Typical acoustic breakthrough and resonances _____	excellent
Subjective sound quality of complete system _____	excellent
Hum level/acoustic feedback _____	excellent
Vibration sensitivity/shock resistance _____	good/excellent
Estimated typical purchase price _____	£2,350, £3,850

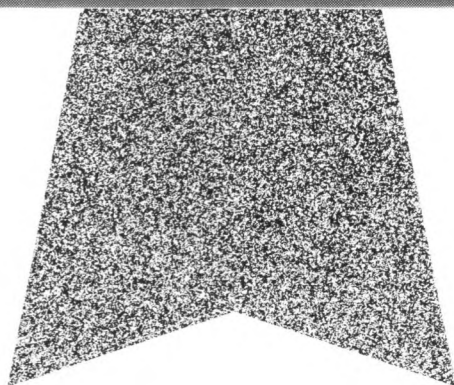
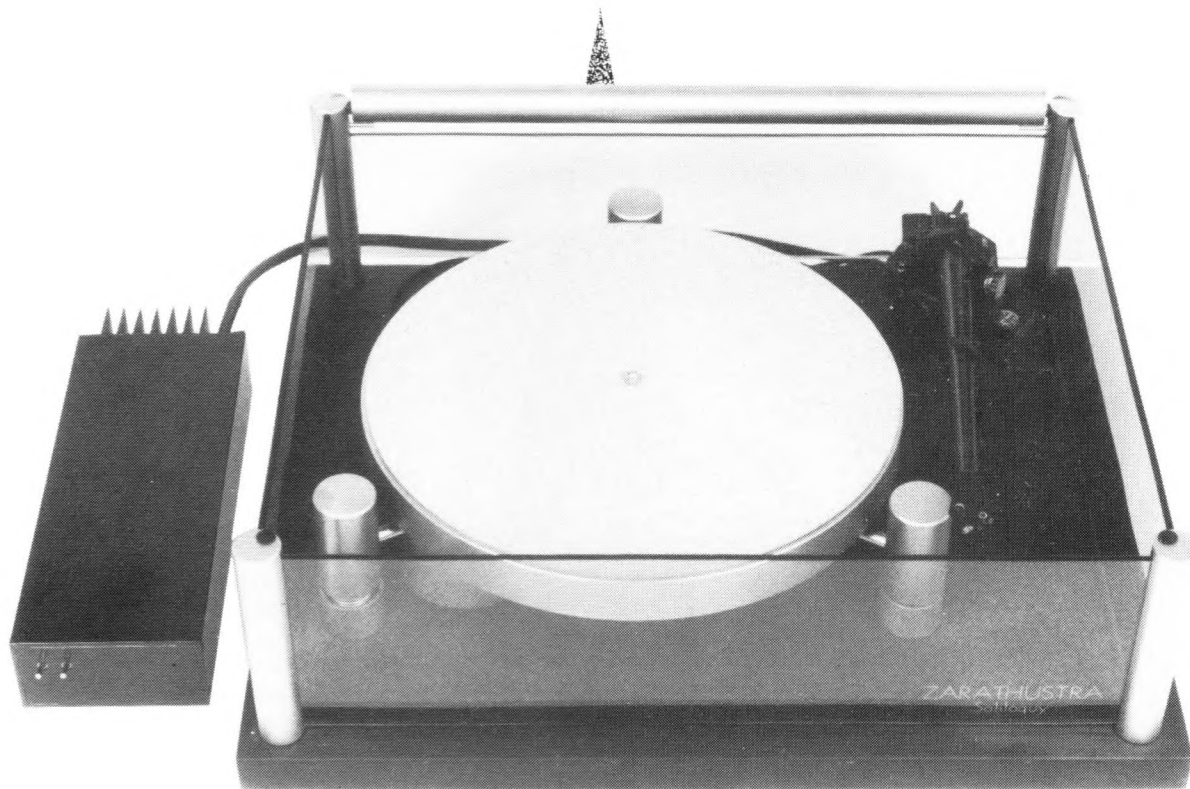
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**ZARATHUSTRA SOLOLOQUY**

AUTOMATION SCIENCES CO, 20 LITTLE GADDESSEN, BERKHAMSTED, HERTS HP4 1PA.

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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 craftsmanship, finish throughout is exceptional, enanced 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	33 1/3/45rpm
Wow & flutter (DIN pk wrd)	0.02%
Wow/flutter (lin pk wrd)	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 wrd)	-78/-82dB
Size (wxdxh)/clearance for lid rear	45x39cm/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

First reviewed. 1986. Rating: Recommended.

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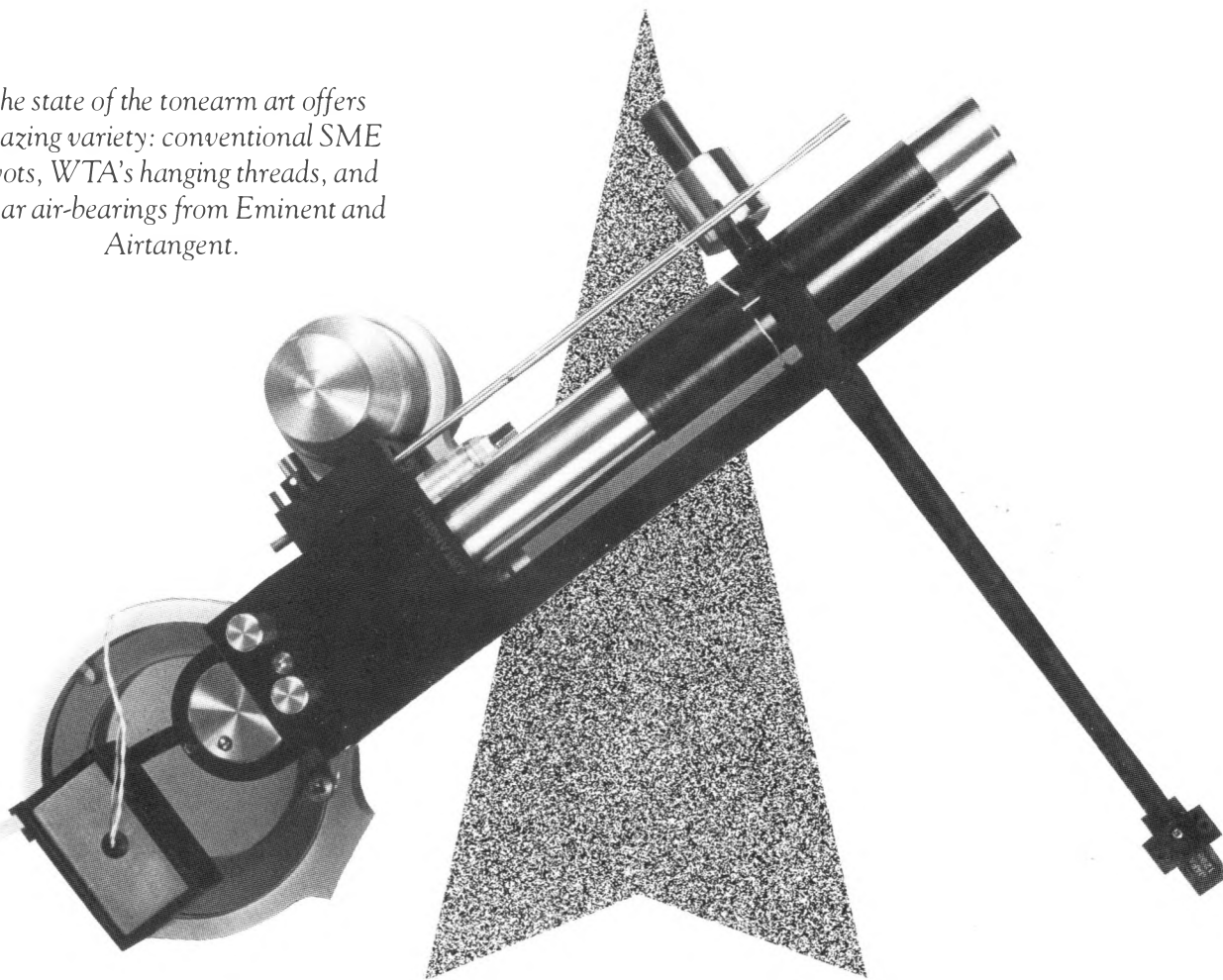


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The state of the tonearm art offers amazing variety: conventional SME pivots, WTA's hanging threads, and linear air-bearings from Eminent and Airtangent.



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 favours 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 arm's centre of mass shifts during play. Clearly, low mass subchassis turntables are not a good match.

Another inherent problem with passive parallel trackers is the difference between the vertical and horizontal effective masses, the former the usual pivoted value, but the latter the whole travelling 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 a soundproof box in the next room.

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.

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**

With 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.

**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 tonearm marks yet, by a small but comfortable margin. Midrange depth, focus and resolution were quite remarkable, coloration was very low indeed, and 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.

**CONCLUSIONS**

Given caveats of a set up nature, the Airtangent delivers the goods, so may be recommended regardless of its extravagant price.

**TEST RESULTS**

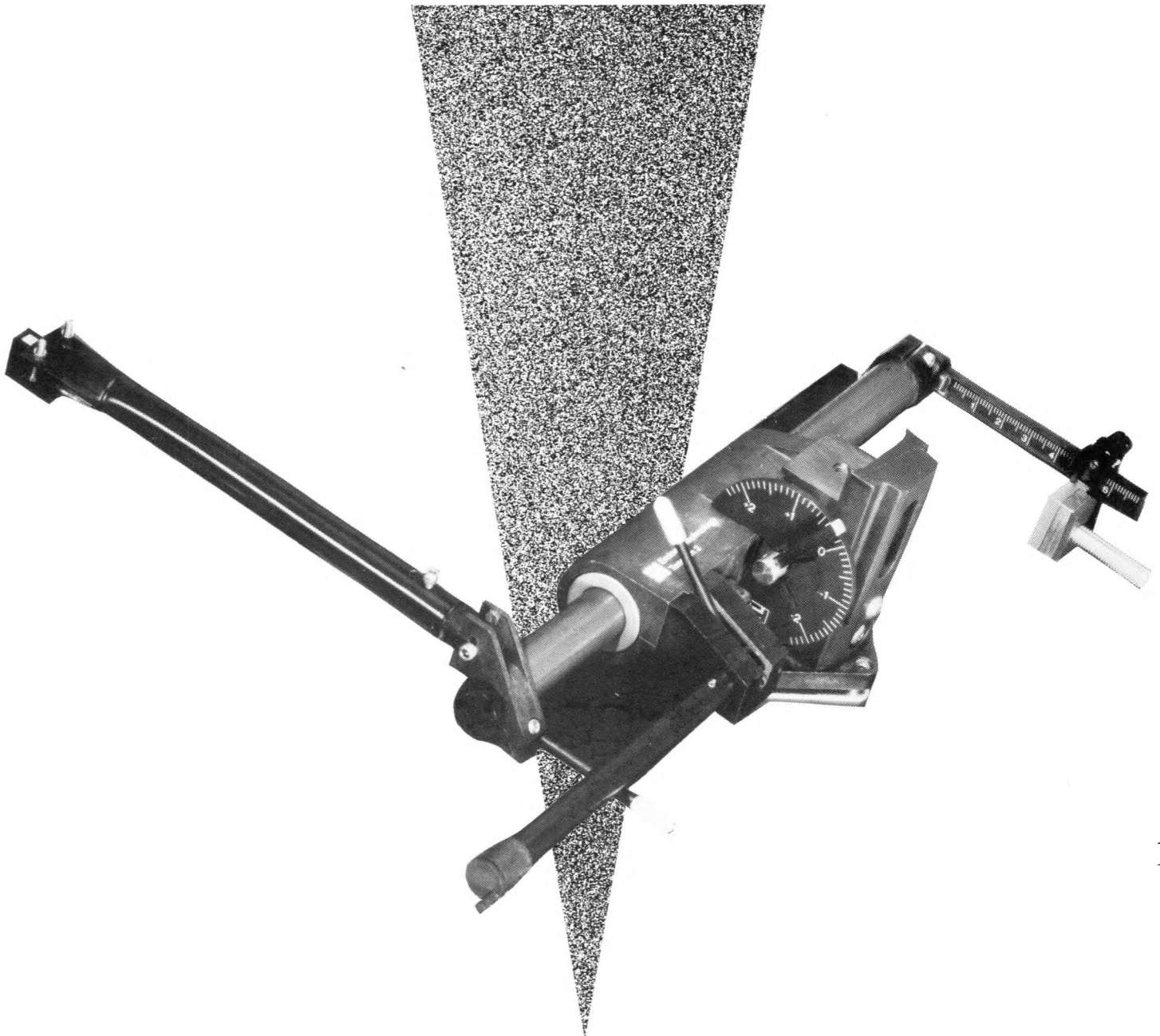
<b>Tonearm</b>	Airtangent
Effective mass (approx)	7.5g (V), 60g (I)
Type/mass headshell	fixed
Geometric accuracy	excellent
Adjustments provided	height, lateral
Finish and engineering	excellent
Ease of set-up/use	quite difficult
Friction (typical lat/vert)	unmeasurable (excess lead torque)
Bias method	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 sec/4 sec
Arm resonances	excellent
Sound quality	excellent
Arm damping	silicon though, cwt decoupling
Typical price	£1350

First reviewed: 1986. Rating: Recommended.



**EMINENT TECHNOLOGY**

AUTOMATION SCIENCES, CO 20 LITTLE GADDESSEN, BERKHAMSTED, HERTS, HP4 1PA.  
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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 (see introduction).

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 much higher lateral value suggests low compliance cartridges will work best. The cue

worked satisfactorily, but some means of siring 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**

<b>Tonearm</b>	
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

*First reviewed: 1986. Rating: Recommended.*



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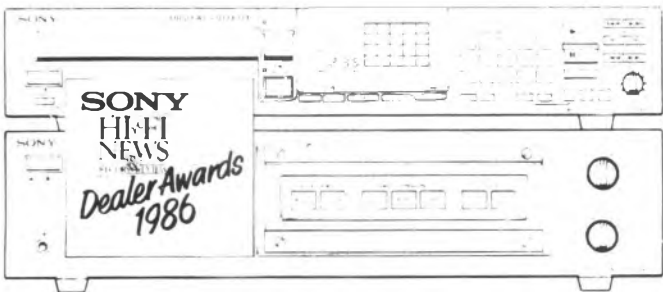
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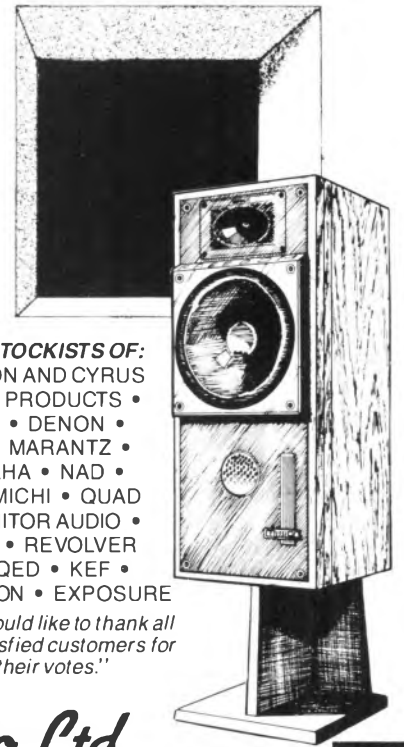
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*Steve Harris*  
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Frequency response range: 15-50,000Hz  
Output voltage: 0.35mV (1kHz, 5cm/sec)  
Channel separation: 27dB (1kHz)  
Channel balance: 1.5dB (1kHz)  
Tracking Force: 1.25-1.75g (1.5g standard)  
Coil impedance: 12ohms (1kHz)  
Coil inductance: 50µH (1kHz)  
Load resistance: 20ohms or more  
Load capacitance: 100-200pF  
Dynamic compliance: 9.0 x 10<sup>-6</sup> cm/dyne  
Static compliance: 35 x 10<sup>-6</sup> cm/dyne  
Stylus shape: 0.1 x 0.2 square shank diamond,  
0.2 x 0.7 mil elliptical tip  
Vertical tracking angle: 23°  
Weight: 5.0g

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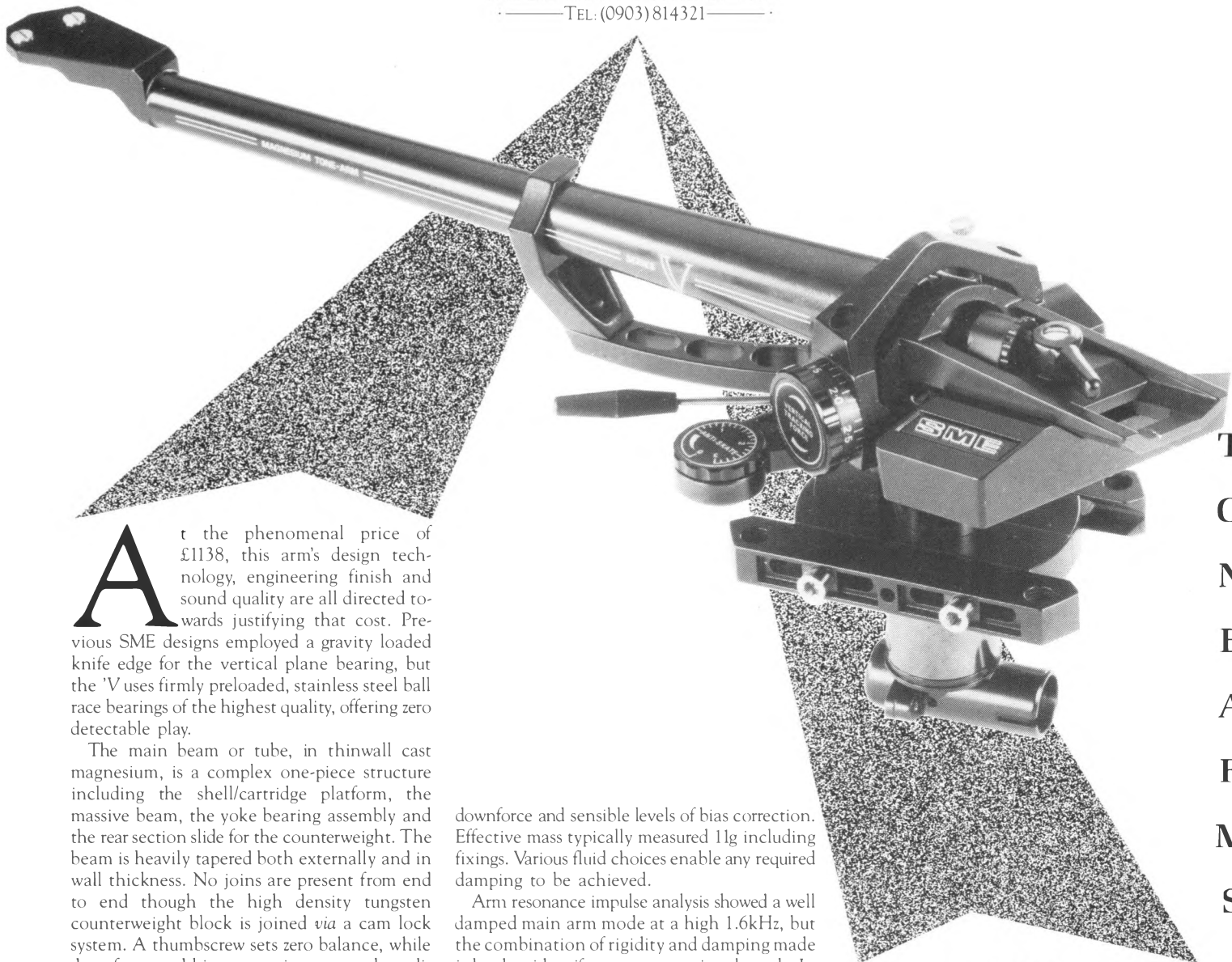
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**SME SERIES V**

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**A**t 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 joints 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

**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**

<b>Tonearm</b>	
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

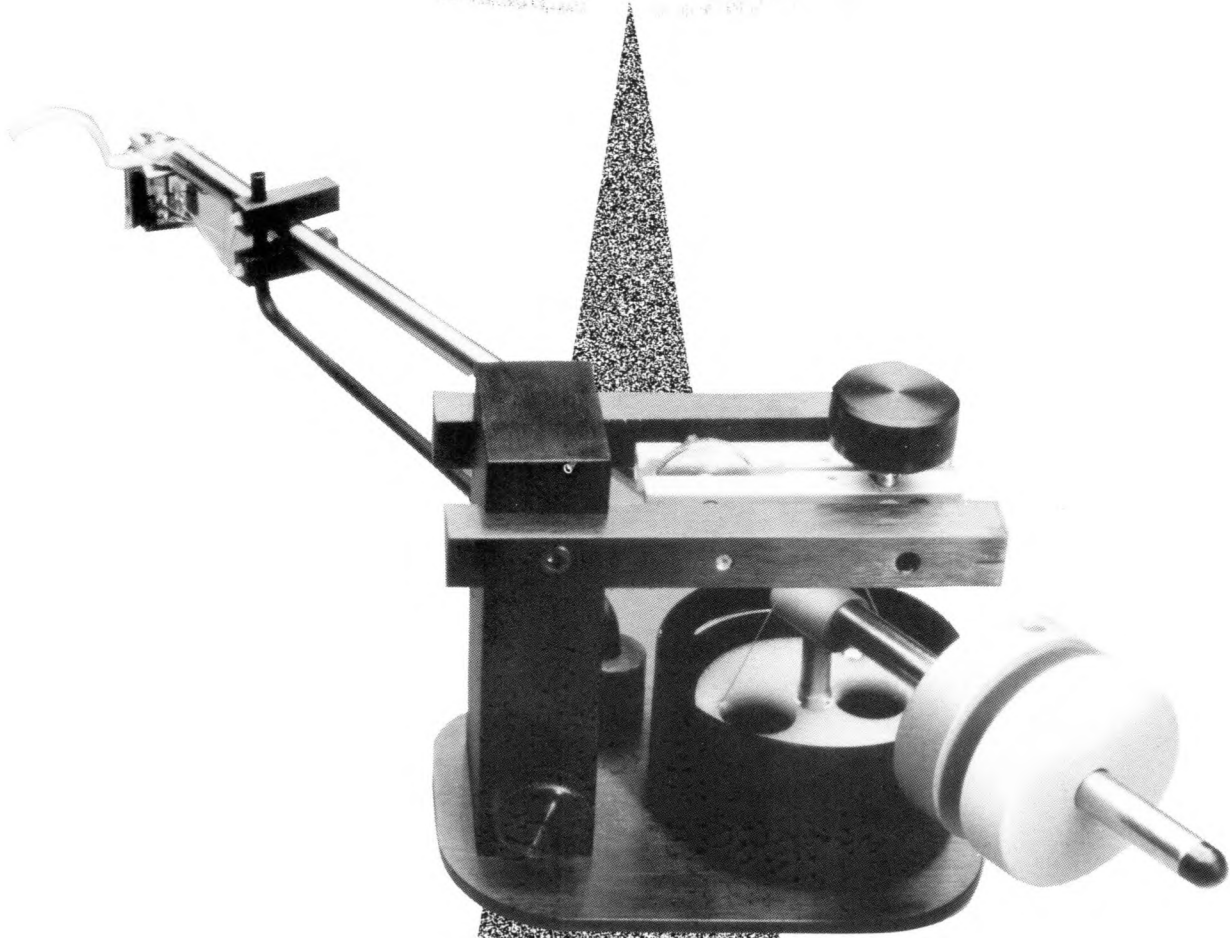
First reviewed: 1985. Rating: Recommended



## WELL TEMPERED ARM

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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 uni-pivot, 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 applying 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 thin 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

*First reviewed: 1985. Rating: Recommended*



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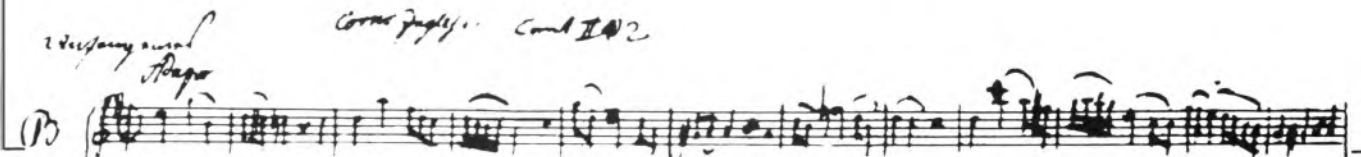
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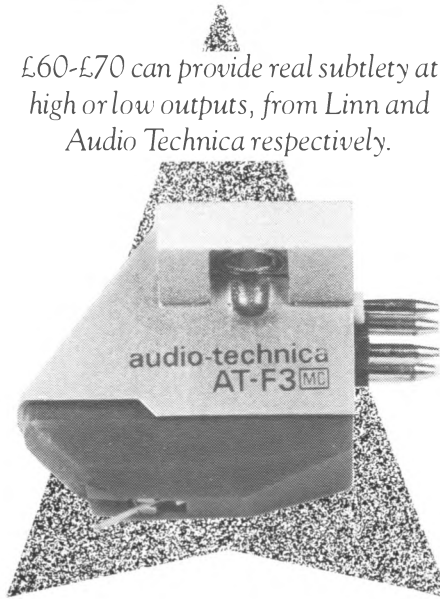
£60-£70 can provide real subtlety at high or low outputs, from Linn and Audio Technica respectively.

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 spurious 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 (0.2x0.7)
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	22µ
Recommended arm mass/damping	4-12g, none
LF resonance rise, 11g arm	14dB
Typical selling price	£70

First reviewed: 1986. Rating: 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.

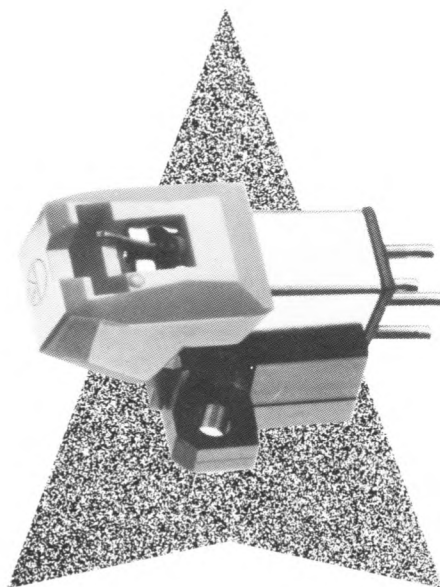
The mechanical improvements seem to be well founded, with plenty of headshell contact area, and inspection confirmed the presence of an advanced elliptical Vital tip. Compliance indicates that low- or medium-mass arms will match well.

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 im-



pressive, 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, 200µF
LF resonance frequency, 13.5g arm (vert, lat)	9, 8Hz
Estimated compliance (vert, lat)	16, 20µ
Recommended arm effective mass	6-15g
LF resonance rise, 13.5g arm (vert, lat)	12, 17dB
Typical selling price	£60

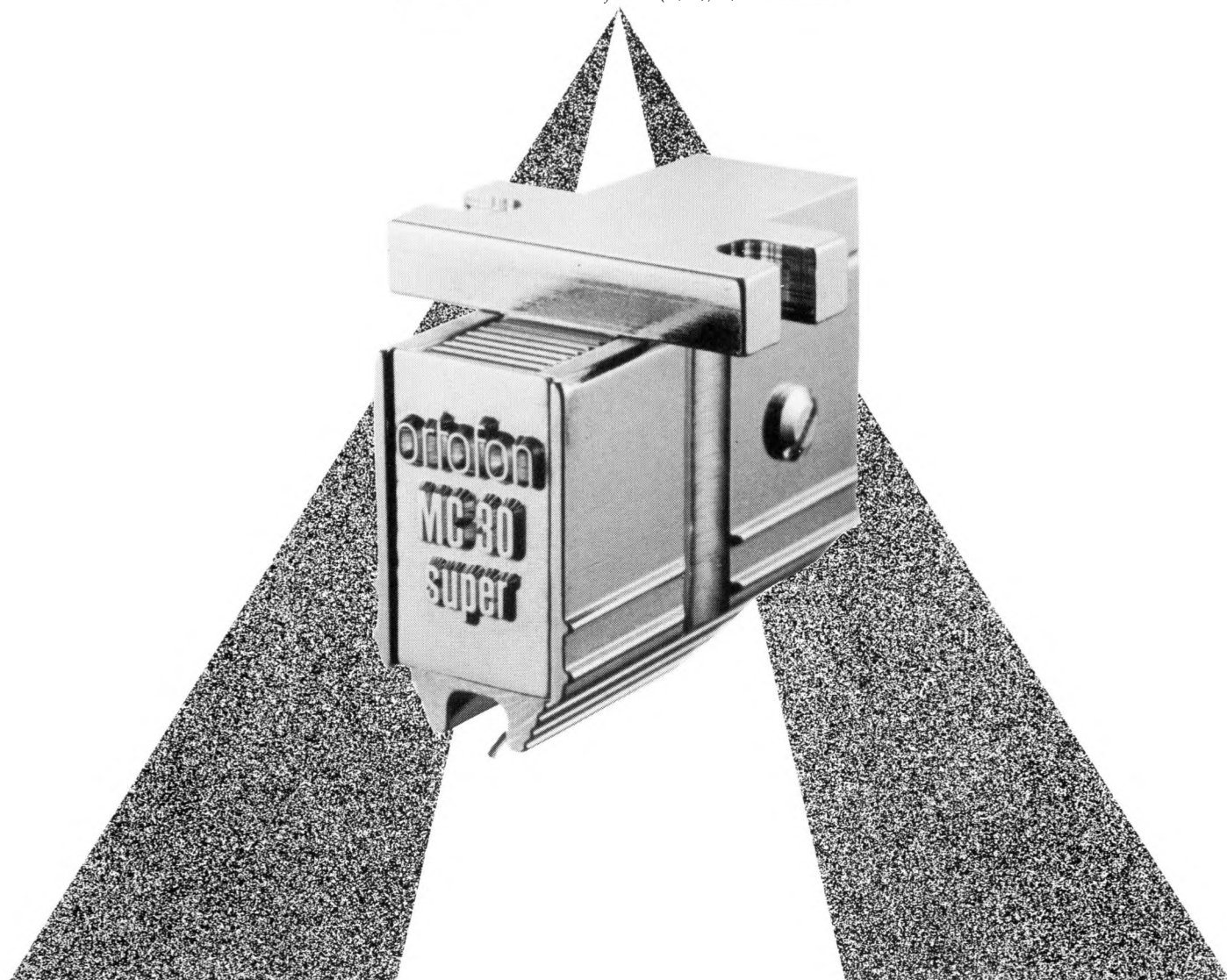
First reviewed: 1985. Rating: Best Buy.

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**ORTOFON MC30 SUPER**

ORTOFON UK LTD, DENMARK HOUSE, TAVISTOCK INDUSTRIAL ESTATE, RUSCOMBE, TWYFORD, BERKS RG10 9NJ. TEL: (0734) 343621

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The MC30 Super follows in the steps of the '10 Super and '20 Super models, and is essentially a development of the latter. It features a similarly rigid all-metal body (still lacking full circular mounting lugs unfortunately), but with £100 worth of extra technology, quality control and refinement. This Super series provides somewhat higher output than the older types of Ortofon moving-coil cartridges, and as a result these cartridges are now generally compatible with typical moving-coil amplifier inputs.

But the '30 also builds on the technology developed in the ultra-expensive MC1000, an exceedingly low output model which has been available for a couple of years now. The aluminium cantilever has a conical section, a mechanical damper is made from platinum, and the coil windings are all silver — all features introduced on the '1000. The stylus is a good quality, nude van den Hul I line contact type.

Though fortunately spared the need to use a transformer, which was the only way to handle the '1000 properly, this is still a pretty low output cartridge, needing the full step-up provided by a proper moving-coil stage, and not attempting to sneak in with a lesser gain device. Ortofon have sensibly kept the coils short and light, but

with the penalty that this is quite a heavy cartridge by today's standards. A modest enough compliance means that mechanical compatibility should be reasonably good, suiting a broad range of low and medium mass tonearms, but preferring the lower end of the range.

**LAB REPORT**

Tracking abilities were very good at a sensible 1.6g downforce, and separation measurements were exceptionally impressive especially at high frequencies. Distortion was low and channel balance close, while the frequency response showed a characteristic distinctly reminiscent of the MC1000 — holding tight overall limits but with a broad 1dB plateau centred on 11kHz.

**SOUND QUALITY**

The sound was immediately recognisable to those familiar with the '20 and '1000 models, essentially neutral with wide, deep stereo presentation and precise staging. Treble was a little emphasised above the midrange, focus could have been sharper and tighter, and there was some 'softening' of dynamics and 'attack', but detail and clarity were both very good. The sound was described by one panelist as 'MCOne on the cheap', and certainly the MC30 does show some of the character of the considerably

more expensive vdH designs, albeit lacking some of their refinement.

**CONCLUSIONS**

This is a beautifully engineered and essentially well balanced cartridge which behaved impeccably in the lab tests. It should be generally compatible mechanically and electrically, while still needing a full step-up and preferring lower mass arms. Clearly recommended, in some cases it perhaps tries a little too hard to be all things to all men, and some might consider it a little bland — but that is perhaps part of the price to pay for avoiding any 'rough edges'.

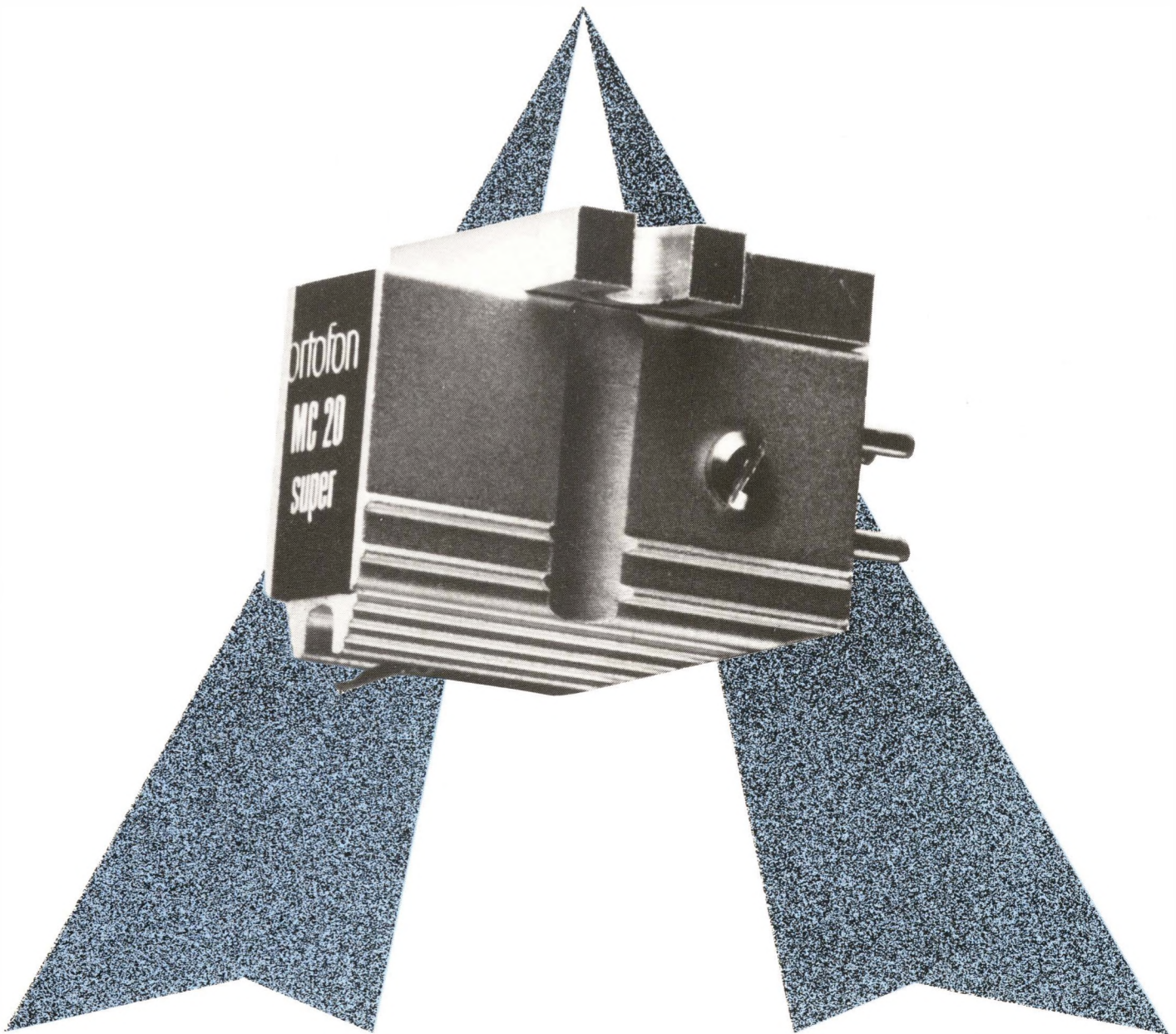
**TEST RESULTS**

Type, mass	low output moving coil, 9g
Stylus type	vdH type I
Stylus tip geometry	4.5×80µm line contact
Stylus finish/alignment	very good
Output Level (1kHz, 5cm/s)	0.28mV
Relative output (0dB = 1mV/cm/s)	-25dB
Tracking ability (L,R)	>80µm
Distortion 300Hz (lat+9dB, vert+6dB)	-49/-32dB
Frequency response limits 100Hz-5Hz	+1.1, -0.1dB
Frequency response limits 30Hz-20kHz	+1.2, -0.1dB
Stereo Separation 100Hz, 3kHz, 10kHz	28, 39, 32dB
Channel difference 1kHz, 10kHz	0.05, 0dB
Test tracking weight, loading	1.8g, n/a
LF resonance frequency, 11g arm	9Hz
Estimated compliance	16cu
Recommended arm mass/damping	5-14, moderate
LF resonance rise, 11g arm	15dB
Typical selling price	£259



**ORTOFON MC20 SUPER**

ORTOFON (UK) LTD, DENMARK HOUSE, TAVISTOCK INDUSTRIAL ESTATE, RUNSCOMBE, TWYFORD,  
 ———BERKS RG10 9NJ. TEL: (0734) 343621———



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**O**rtofon, 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 (LR)	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, 16cc
Recommended arm effective mass	6-15g
LF resonance rise, 13.5g arm (vert, lat)	15, 15dB
Typical selling price	£165

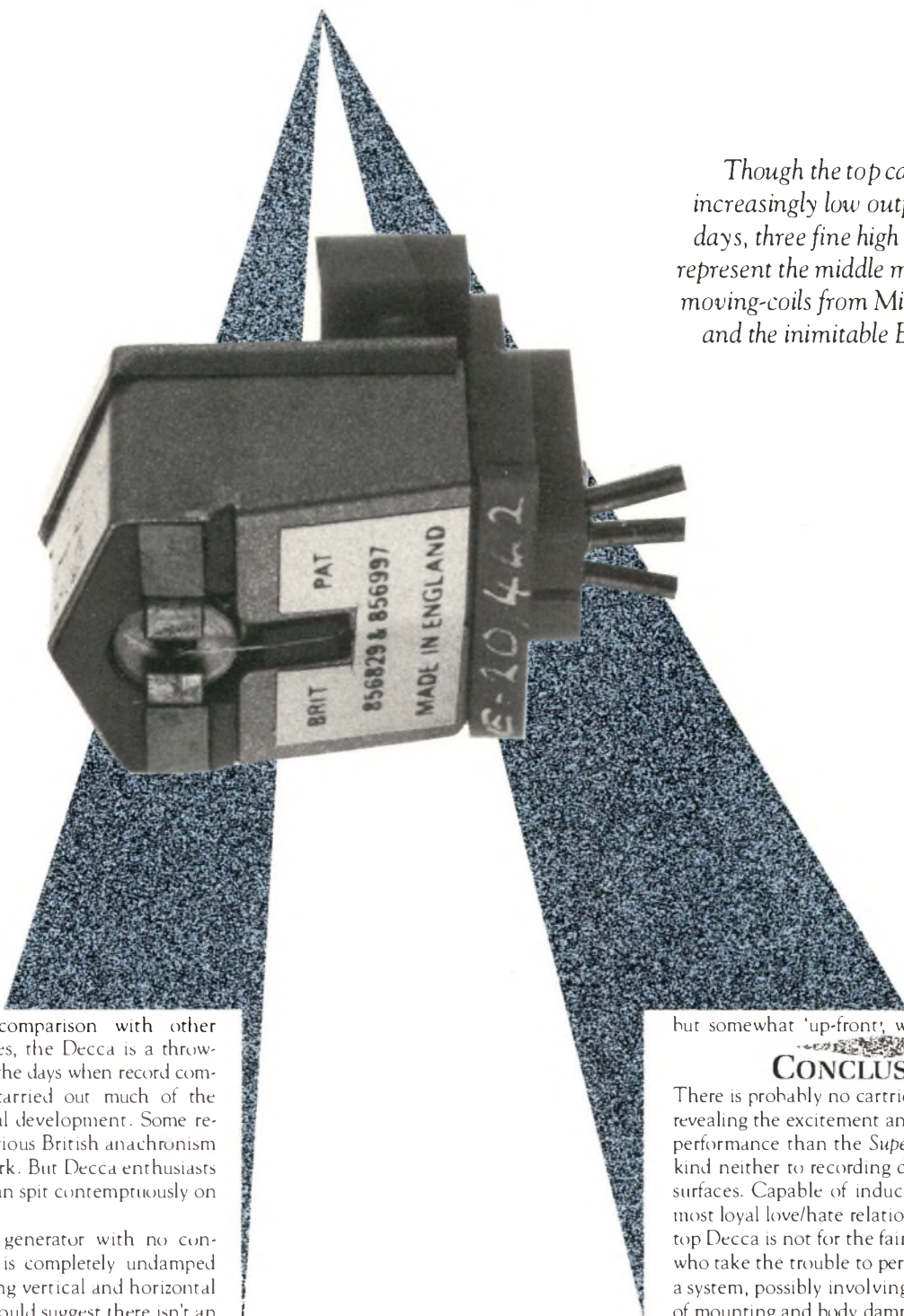
First reviewed: 1986. Rating: Recommended.



DECCA SUPER GOLD

PRESENCE AUDIO, EASTLAND HOUSE, PLUMMERS PLAIN, HORSHAM, WEST SUSSEX RH13 6NY.  
TEL: (044 485) 333

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Though the top cartridges are increasingly low output types these days, three fine high output models represent the middle market, Japanese moving-coils from Miltek and Supex, and the inimitable British Decca.

Defying comparison with other cartridges, the Decca is a throw-back 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	27, 25, 21dB
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, 5g arm (vert, lat)	14, 19dB
Typical selling price	£248

First reviewed: 1983. Rating: 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.

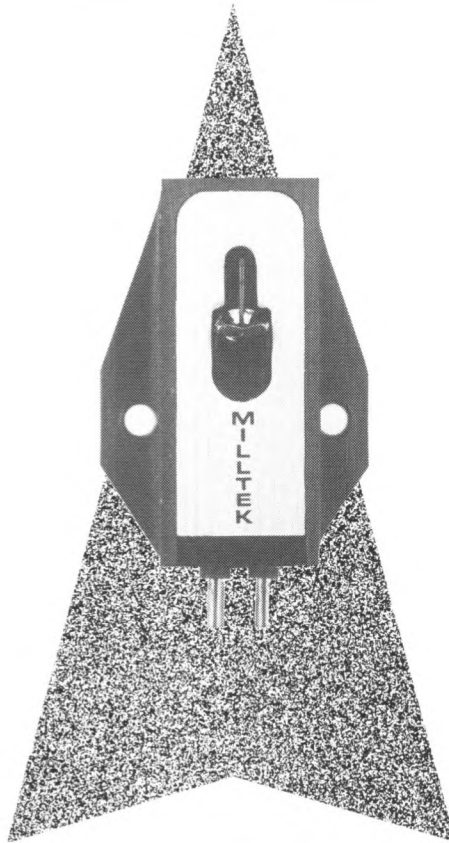
Compliance is quite stiff, so the very lowest mass arms should be avoided, and most of the heavyweights should work well, perhaps aided by moderate damping. Stylus inspection was encouraging, the low mass naked diamond tip having been well aligned and polished, albeit with a little excess glue.

### 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 (QdB = 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

## SUPEX SD900 IV AND SD901 IV

RUSS ANDREWS TURNTABLE ACCESSORIES, EDGE BANK HOUSE, SKELSMERGH, KENDAL,

CUMBRIA, LA89AS. TEL: (053 983) 247

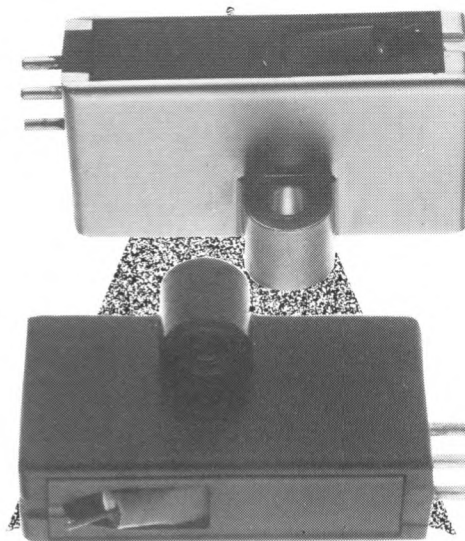
Very much old favourites, the Supex 900 and 901 are now in MkIV versions, the former low output and the latter high output moving-coil models.

### 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



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 (QdB = 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	8-18g
LF resonance rise, 12.5g arm (vert, lat)	18, 18dB
Typical selling price	£302

First reviewed: 1985 Rating: Recommended.

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

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**C**ello 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 sep-

aration results. The frequency response looked nice and smooth and was 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**

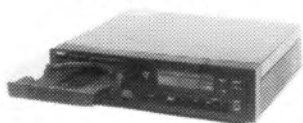
Type, mass	low o/p m/c, 13g
Stylus type	naked, small splint, fixed
Stylus tip geometry/finish/alignment	true swept elliptical
Stylus inspection result	clean excellent/slight skew
Output Level (1kHz, 5cm/s)	0.25mV
Relative output (0dB = 1mV/cm/s)	-26dB
Tracking ability (L,R)	>80, >80um
Distortion 300Hz (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)	23cc
Recommended arm mass/clamping	4-10g, helpful
LF resonance rise, (11g arm)	14dB
Typical selling price	£690

First reviewed: 1986 Rating Recommended

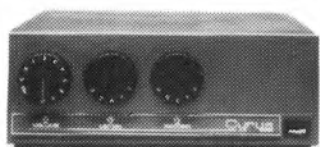
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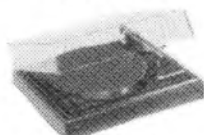


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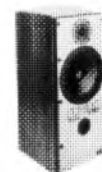
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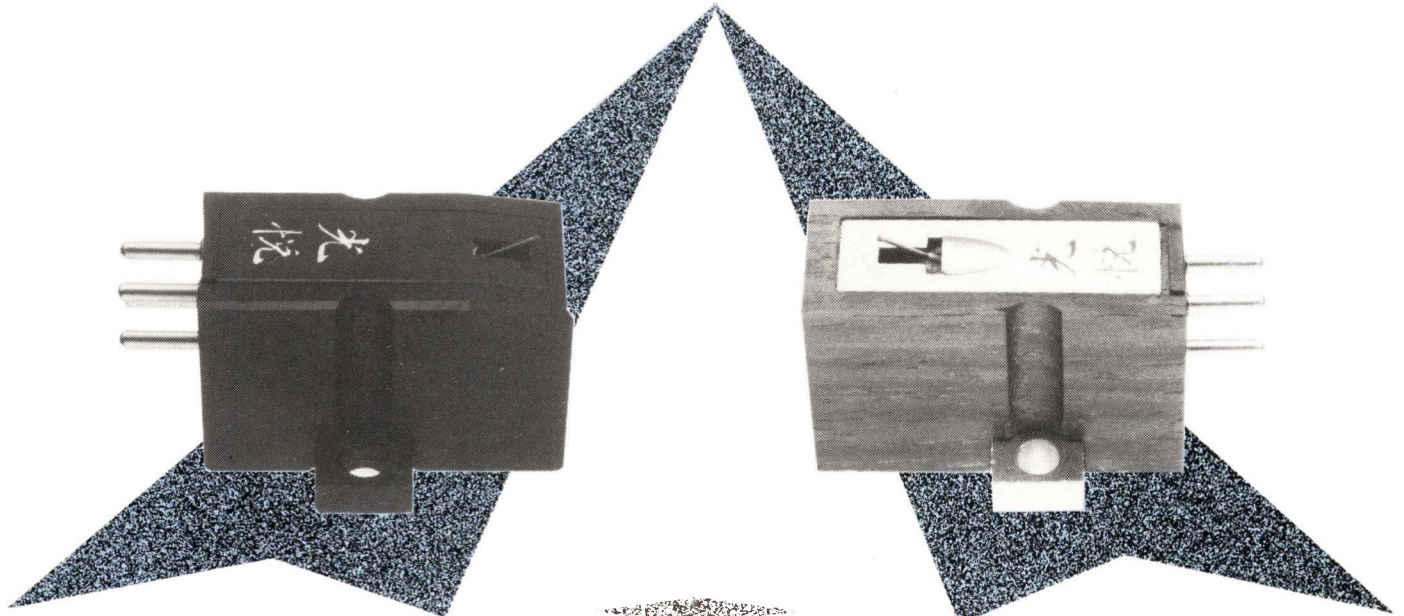
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**KOETSU BLACK K/RED**

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**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  $\pm 1$ dB 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	6-18g
LF resonance rise, 13.5g arm (vert, lat)	15, 17dB
Typical selling price	£550

First reviewed: 1985 Rating: Recommended

**KOETSU RED**

**L**ast 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 cliché. 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 once in their home will be reluctant to take it out again.

**TEST RESULTS**

Type, mass	low c/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

First reviewed: 1985 Rating: Recommended

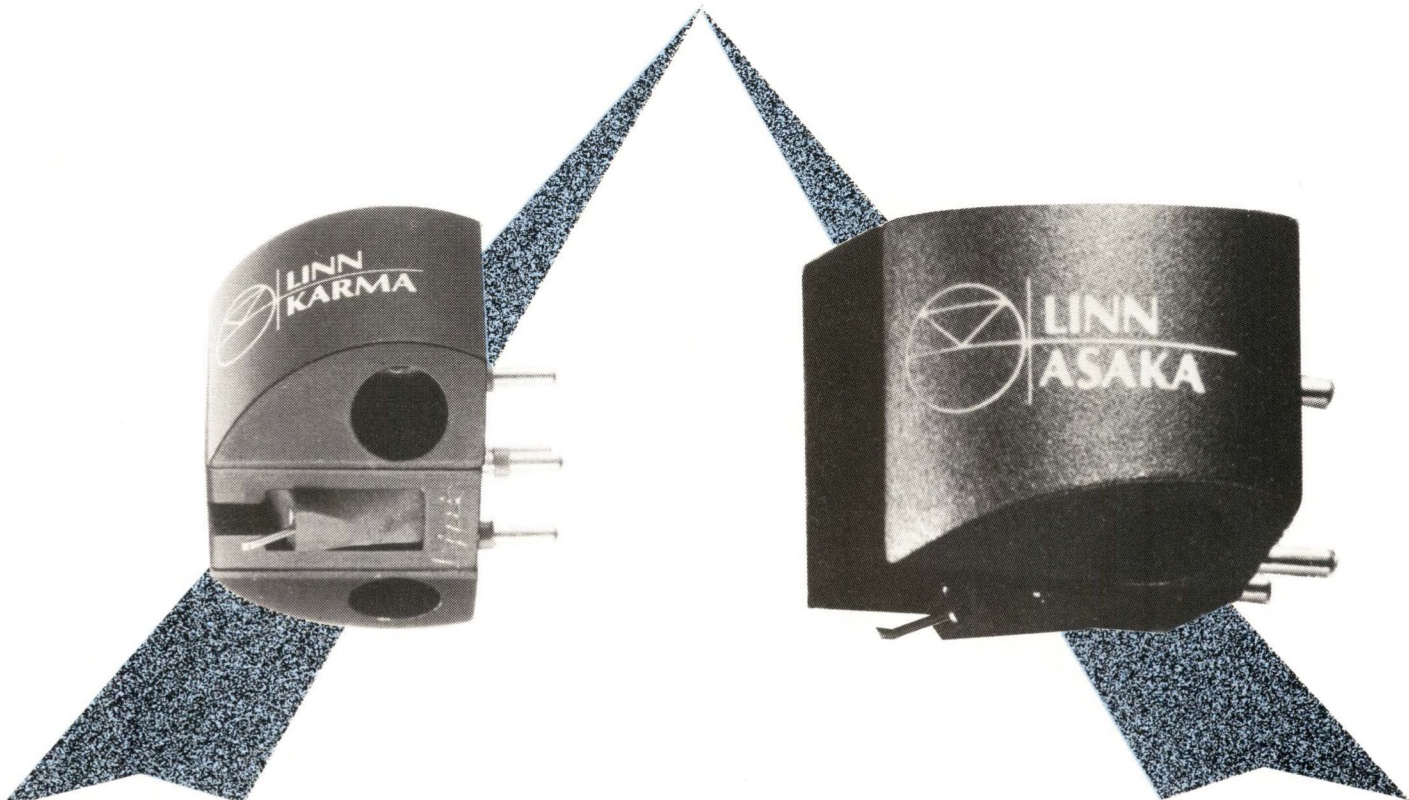
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**K**arma's body is a small strong alloy casting. The (short) aluminium alloy cantilever carries a swept elliptical (Vital) tip, which was a tiny well-aligned rectangular section nude stone.

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**

**R**eplacing Linn's longstanding and successful *Asak*, this £249 model incorporates the rigid metal body-work 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**

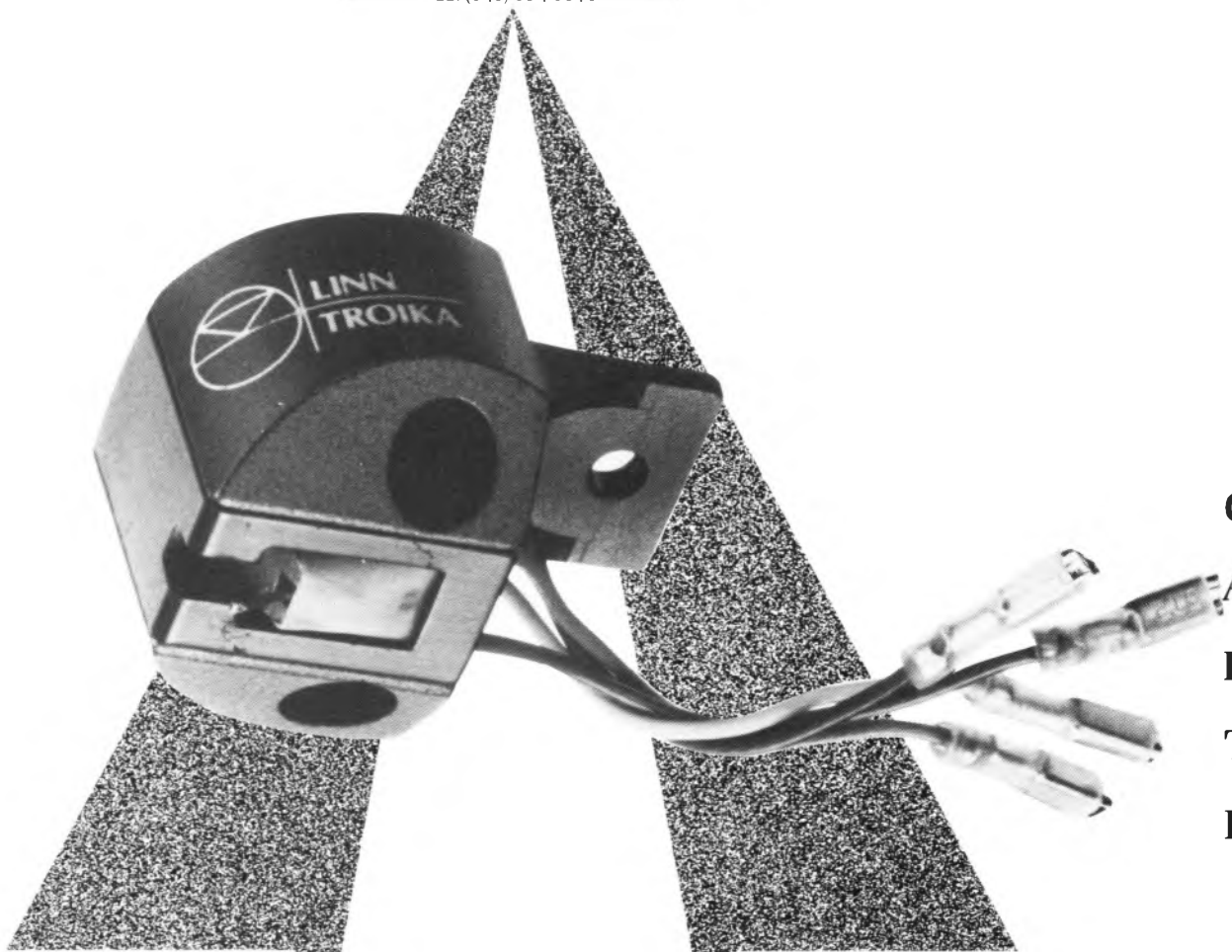
Type, mass	low output moving coil, 6.2g
Stylus type	Vital superelliptical
Stylus inspection result	confirmed, fine small stone, accurately set
Output Level (1kHz, 5cm/s)	0.2mV
Relative output (0dB=1mV/cm/s)	-26dB
Channel balance	0.25dB
Channel separation (L,R)	30, 30dB
Tracking ability (L,R)	80, 76µm
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: <i>Karma</i> , 1985; <i>Asaka</i> , 1986; ( <i>Asak</i> 1980, retested 1982, 1984). Rating: Recommended	

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This three-legged cartridge is christened after a three-horse Russian sleigh, though perhaps a milking stool is a closer visual analogy. The basic *Karma/Asaka* solid metal body has been modified by incorporating a central webbed outrigger platform at the rear, and the top (mounting) plate is no longer flat — each of the three screw holes is surrounded by a raised section the size of a small washer. The lead-out cables are now integrated with the cartridge, so there are no terminal pins and an additional signal path break is eliminated; at the same time there is some apprehension at the prospect of resoldering a broken tag, should it be necessary. And *Troika's* bright red metalflake finish is a bit of an eyeful after the smart black *Karma*.

The three-point fixing is a break with the accepted world standard of half-inch fixing centres, so *Troika* is far from a universal cartridge — most arms don't have a headshell capable of accepting the third screw hole. But there are an awful lot of Linn *Ittok* tonearms in use, and this model has a pilot hole in the right place which is quite easily reamed out sufficiently to accommodate the extra screw. This procedure is far less alarming in practice than it sounds, needing merely the arm to be demounted, the bearings held by a rubber band, and a Black and Decker applied appropriately. Care needs to be taken that the cartridge alignment is correct when first tightening the screws, as this makes indentations in the headshell making subsequent re-alignment difficult.

The tripod arrangement may sacrifice compatibility, but it also reduces the degrees of mechanical freedom at the headshell which ought to be a good thing. There are interesting parallels with the Audionote cartridges which also have leadout wires that eliminate cartridge terminals and offer a four-screw fixing system for slotted headshells. Linn's tripod with its extension washers should be the more precise solution mechanically, but Audionote do not have the large stock of easily adaptable arms out there.

The compatibility factor prevented lab measurements in this instance, though the basic construction of the cartridge is the same as the *Karma/Asaka* model apart from the mechanical and mounting refinements. Still, it would have been nice to have found out whether there was any measured improvement in high frequency stereo separation, in view of the listening test findings. As expected, mechanical compatibility remains optimum with the *Ittok* arm.

**SOUND QUALITY**

Not surprisingly, *Troika* shows a strong re-

semblance to its *Karma* antecedent, but the mechanical changes have brought a substantial improvement in detail resolution and control, particularly at high frequencies. Instrumental information that was previously only half-discernible comes into sharp relief, stereo images are more precisely placed and focused, and the soundstage is 'widened'. Subjective speed and integration maintain *Karma's* high standards, while tracking problems were rare but not unknown (particularly when the temperature was low).

The main listening was undertaken on a non-standard Linn, which is bound to have an influence on the overall results. The characteristic sound of a Linn moving-coil cartridge is retained, and if anything exaggerated somewhat. The balance is 'up front' to a degree that is both exciting and dramatic, but which can also sound uncomfortably 'forward' on some discs, while depth and 'air' seem somewhat muted or suppressed.

**CONCLUSIONS**

Unlike most cartridges the *Troika* is effectively a dedicated match for a specific tonearm, the *Ittok LVII*, and is clearly optimised for balance in that combination with *Sondek LP12*. In that context it extends the capabilities of the system to a degree which fully justifies the increase in price over the *Karma*. Prior listening is certainly strongly recommended, but ex-*Karma* users have been seen with glazed expressions indicating smug self-indulgence the morning after fitting a *Troika*.

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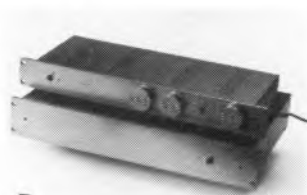
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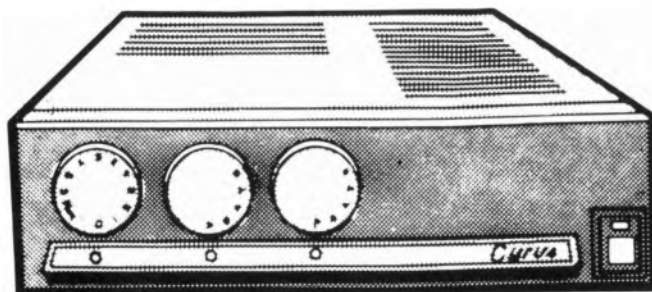
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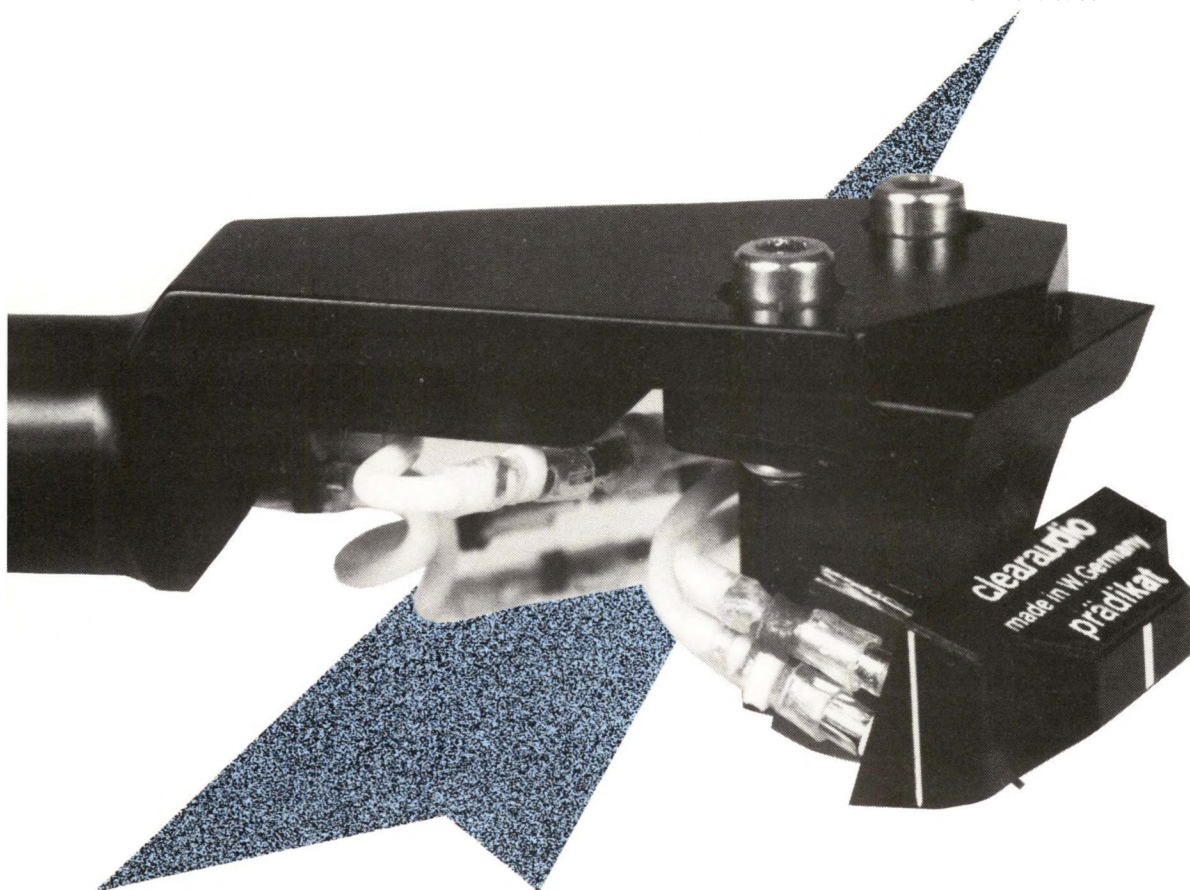
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Clear Audio are a small West German operation little known in the UK. They produce a range of five models, in which the £1225 Pradikat sits beneath the Accurate, but above the Pso, Delta, and Gamma. The specification sheet indicates that all share common bodies, styli and generators, differing basically in the channel balance and separation.

They also manufacture an extraordinary 'headshell amplifier' known as Harmony which equalises and boosts cartridge output to line level for pre- or power amplifier connection. This naturally uses outboard power supplies, but still weighs 7g, which is more than the cartridge though not beyond contemplation — it will be a trade-off between the mechanical stability of the system and the advantages gained in eliminating interconnect cables for low level signals, which should prove a tricky conundrum.

A major claim to fame is that selected Pradikats were fitted as the Goldmund cartridge in that redoubtable Studio turntable system. It is understood that this arrangement is under revision at present, and Goldmund will be using their own exclusive model built by Clear Audio.

The cartridge is quite unconventional in appearance. Though bulky at the stylus end, the body itself is almost skeletal, with a curiously asymmetric magnet system. Indeed the stylus area resembles a moving magnet stylus assembly, but is built that way to accommodate the lead-out terminals — as a result longer than usual headshell wires are needed to reach the arm contacts. The body as a whole looks rigid enough, and can be firmly mounted without difficulty.

Despite the encouragingly low coil impedance

and modest total mass there is plenty of output here, for dedicated moving-coil inputs or 'half-way houses'. Mechanically this is a low compliance cartridge, but the low mass means Pradikat can be used with all rigid medium and high mass arms, though the vibration energy generated will probably lay bare any weaknesses in the tonearm concerned.

**LAB REPORT**

Tracking abilities proved fine, though that is only to be expected at a tracking weight of 2.2g. The stylus is a line contact type with a fairly 'sharp' contact footprint; later experience led us to question whether this might be a little too sharp for the downforce used, for fear of disc damage. That said, the tip was beautifully finished and aligned.

Distortion measured well, though better horizontally than vertically, and separation in the midband was good enough to meet the 30dB spec, showing good channel symmetry with some variation in level. The frequency response measured very flat, dropping about 1dB through the treble region with a slight rise above 10kHz on one channel. Channel balance also met specification, but 0.3/0.4dB is grounds for some censure in a product offered at this exalted price.

**SOUND QUALITY**

We first encountered Pradikat permanently mounted in a Souther tonearm, the combination giving results rather better than we had anticipated from some of the findings on the arm. Much was explained when we got hold of a 'universal' model and fitted it into our known reference system.

The Pradikat sounded absolutely glorious, enough first to make those assembled sit up and take renewed interest at the end of a long day (and start mentally checking their bank balances against the likely trade price). With rare enthusiasm, the panel described it variously as a potential Koetus Red Signature rival and as a 'moving-coil' Decca. The degree of dynamic realism and liveliness was most impressive, creating a full sense of scale and a large well-focused soundstage, and providing excellent bass, an explicit midrange and a detailed if slightly bright and forward treble. There was a slight touch of 'untidiness' about the sound, as if in compensation for the fine dynamics.

**CONCLUSIONS**

The only fly in the Pradikat ointment would seem to be our caution regarding record wear, which may be enough to put off the paranoid. But if sound quality is the first criterion, it must be warmly recommended despite an exasperatingly high price.

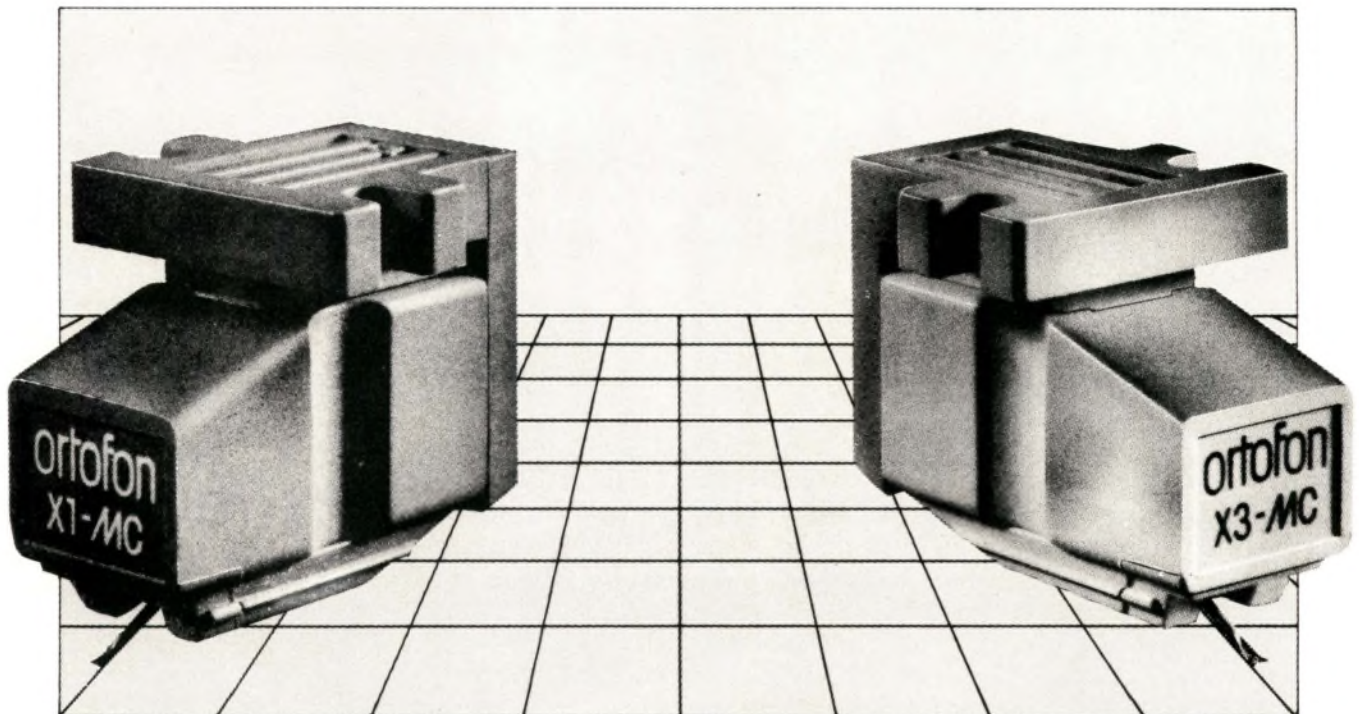
**TEST RESULTS**

Type, mass	low output moving coil, 5g
Stylus type	line contact
Stylus tip geometry	5 x 35µm
Stylus finish/alignment	excellent
Output Level (1kHz, 5cm/s)	0.45mV
Relative output (0dB = 1mV/cm/s)	-19.5dB
Tracking ability (L/R)	>80µm
Distortion 300Hz (lat+9dB, vert+6dB)	-48dB, -28dB
Frequency response limits 100Hz-5Hz	+0.3, -0.7dB
Frequency response limits 30Hz-20kHz	+0.7, -0.8dB
Stereo Separation 100Hz, 3kHz, 10kHz	25, 33, 24dB
Channel difference 1kHz, 10kHz	0.3, 0.4dB
Test tracking weight, loading	2.2g, n/a
LF resonance frequency, 11g arm	11Hz
Estimated compliance	12cu
Recommended arm mass/damping	8-18g, if available
LF resonance rise, 11g arm	15dB
Typical selling price	£1225



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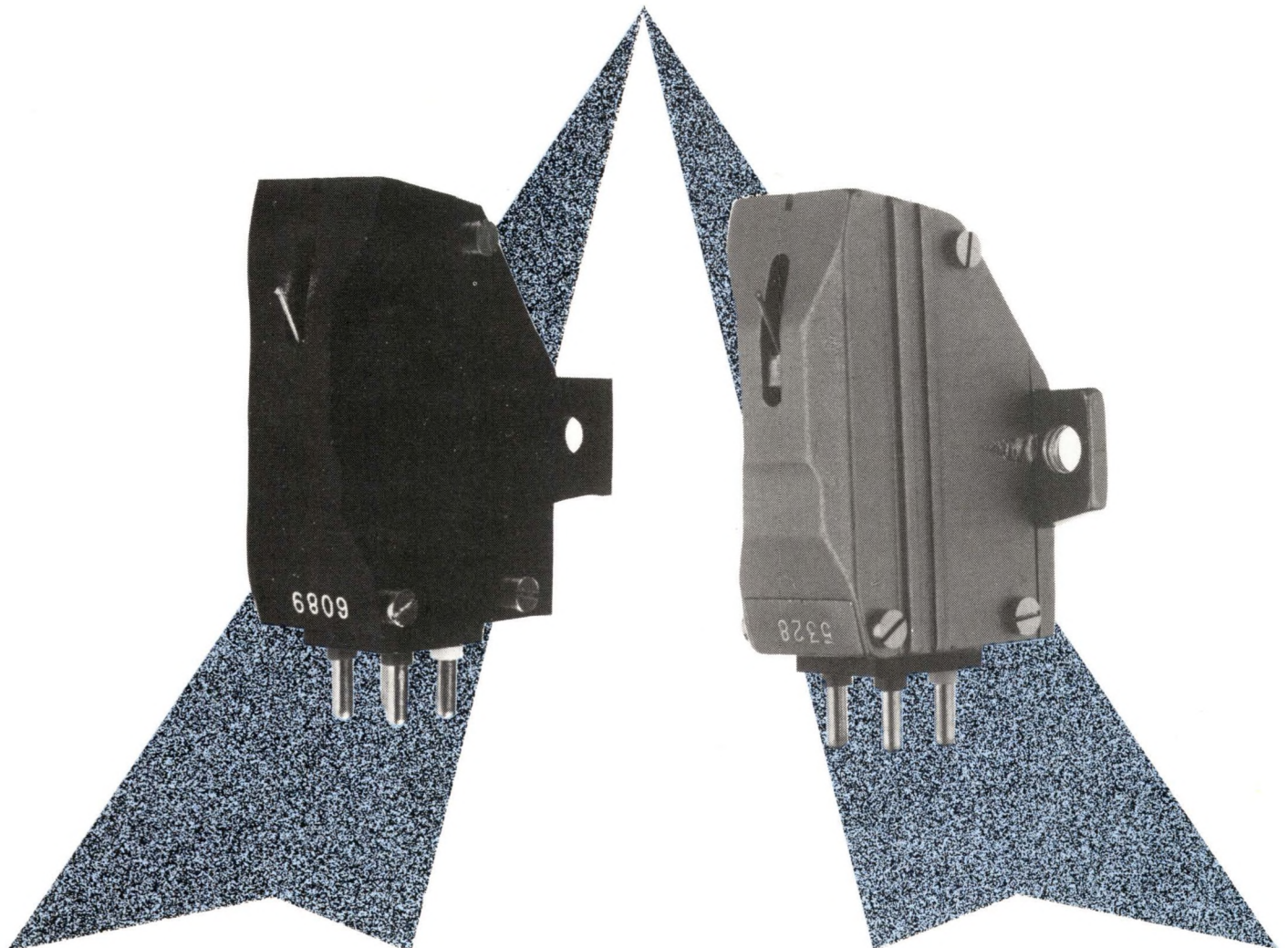
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**VAN DEN HUL MC ONE/MC10**

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**T**he arrival of the original MC10 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 MC1000 besides), so the reviews of the two vdH's are combined.

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.

**TEST RESULTS**

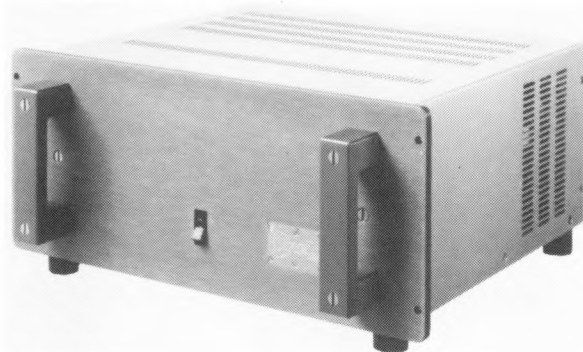
(MC10 in brackets)	
Type, mass	low o/p m-c 7.5g
Stylus type	raked, fixed
Stylus tip geometry	vdH line contact
Stylus finish/alignment	excellent (good)
Output Level (1kHz, 5cm/s)	0.43 (0.45)mV
Relative output (0dB = 1mV/cm/s)	-22.5 (-19.5)dB
Tracking ability (L/R)	80, 75 (71, 68) $\mu$ m
Distortion 300Hz (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, 1lg arm	8 (7.3)Hz
Estimated compliance	18 (24)cu
Recommended arm mass/damping	6-12 (5-10)g, none
LF resonance rise, 1lg arm	13dB
Typical selling price	£799, £599
First reviewed: MC10. 1985. MC One. 1986. Rating: Recommended	



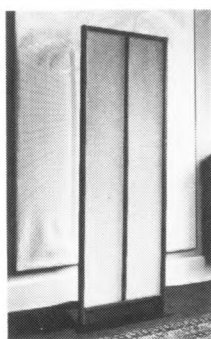
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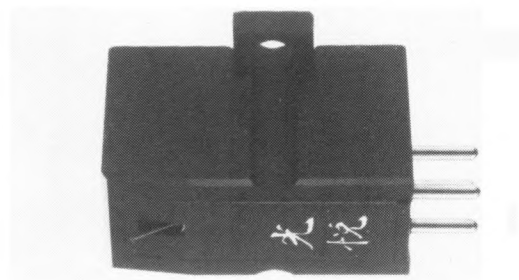
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# Amplifiers

**A**mplifiers are typically described as the heart of the hi-fi system, the amplifier controls and coordinates the various sources and then provides the muscle power to drive the loudspeakers. The simplest models integrate pre- and power functions (and their respective power supplies) within a single box. But as one moves further into the specialist sector and towards the 'high end', greater freedom and imagination creates diverse packages of increasing flexibility, encompassing a variety of alternative approaches — separating pre- and power amplifiers and power supplies according to preference.

The following collection of amplifiers are arranged in convenient groups that represent their origins or market positions. In our considered opinion, based on extensive lab and listening tests on the majority of serious hi-fi amplifiers on the UK market, they represent the Cream of the Crop — at any and every price level. That said, there will be system contexts where alternatives are as or more appropriate, and where the enthusiast should follow his own instincts and preferences rather than simply taking our word for it. And of course there are a few models we haven't got around to yet — you're on your own there!

Reflecting strong market trends away from 'bells and whistles' facilities in favour of simple signal paths, our prime criterion is sound quality. We consider amplifier sound quality is vitally important, but freely accept that one man's meat may not tickle the palate of another. We have also carried out extensive testbench measurements: the results are useful and interesting, helping define the power and speaker-driving capabilities of the amplifiers. These provide a check that nothing is wrong, confirm the system can handle normal input signals, and suggest how it will react with different loudspeakers. But long experience has shown that the results are not necessarily closely related to perceived sound quality.

## POWER RATINGS

The power ratings given in the reviews avoid the familiar but widely abused 'watts per channel' rating in favour of a more meaningful 'dB/W' figure which conveys some idea of the relative loudness capabilities. For those interested, to generate 20dB/W an amplifier has to be able to sustain 56 volts across the load: for an 8ohm load this corresponds to 100 Watts (RMS), but a 4ohm load will draw 200W and a 2ohm load 400W, so most amplifiers show some reduction in their relative rating when driving lower impedances.

(Conveniently, lower impedance loudspeakers



tend to be correspondingly more sensitive, helping to compensate this effect.)

## SMALL IS BEAUTIFUL

Small companies may lack the tooling and bulk purchasing advantages of larger rivals, but they are also less hidebound, either by convention or the need to satisfy the dictates of production techniques or marketing.

Consequently their products are often the most unusual and interesting — besides having the knack of producing some of the sweetest sounds around, often at reasonably affordable prices. On the negative side such companies often have little track record to ensure longevity and after sales service.

Most of the models here are already proven performance-wise, but given the tendency of such manufacturers to 'tweak' their products, we have recently carried out listening test updates on the majority. New and unknown quantities include the Nuance pre-/power combination (from France but with some UK design input), the return of US company PS Audio, plus the dramatic new Deltac power amplifier.

## THE MAIN LINE

More conventional in appearance and usually placing greater emphasis on external design and finish, this broad group of integrated and separate models are all of UK origin, offer fine value for money, and are generally quite widely available. All have been recently re-assessed for sound quality, and the new '270 power amplifier from Musical Fidelity is covered for the first time. Naim amplifiers are discussed in the Systems section of this Collection.

## MONEY NO OBJECT

The sky has always been the price limit for exotic amplifiers, and here we start at around £3,000 for a stereo set, extending up to £10,000 or more. Inevitably most of the models come from the US, but to keep a sense of balance and perspective we have included a new Sansui combination which is an unknown quantity. Other new entries include Audio Research's SP11 replacing the SP10, Conrad Johnson's 'lower cost' Motif 7 pre-amp, the extravagant but remarkable Cello Audio Suite, and Krell's KMA100 monoblock power house.

## A LOAD OF HOT AIR

Many of the best sounding amplifiers around are Class A, either valve or transistor, and as a result run hot. They are designed to handle this of course, but the results, particularly as all quality amplifiers need to achieve stable warmed up temperatures prior to use, can be inconvenient in overheating the listening room in summer, or unbalancing the house heating in winter. Some also have inbuilt fans which can be annoyingly noisy when the system is used at low levels.

## THE ACTIVE/BI-WIRE CONUNDRUM

If you're a nutcase like me who regards £5,000-£10,000 as an acceptable budget for a high quality record playing system, amplifiers present some awkward choices. Having spent a grand or two each on the turntable system and loudspeakers, there are several options for amplification.

You either opt for a conventional passive pair of loudspeakers with crossovers, and drive them with the best two channels of power amplification you can afford. Or you can double or treble up with cheaper power amplifiers that are then directly connected to each drive unit, the crossover function being handled electronically between pre- and power amplifiers. And there is now an increasingly popular intermediate 'bi- (or tri-) wire' alternative, where each drive unit has its own passive crossover and is driven by its own power amplifier channel.

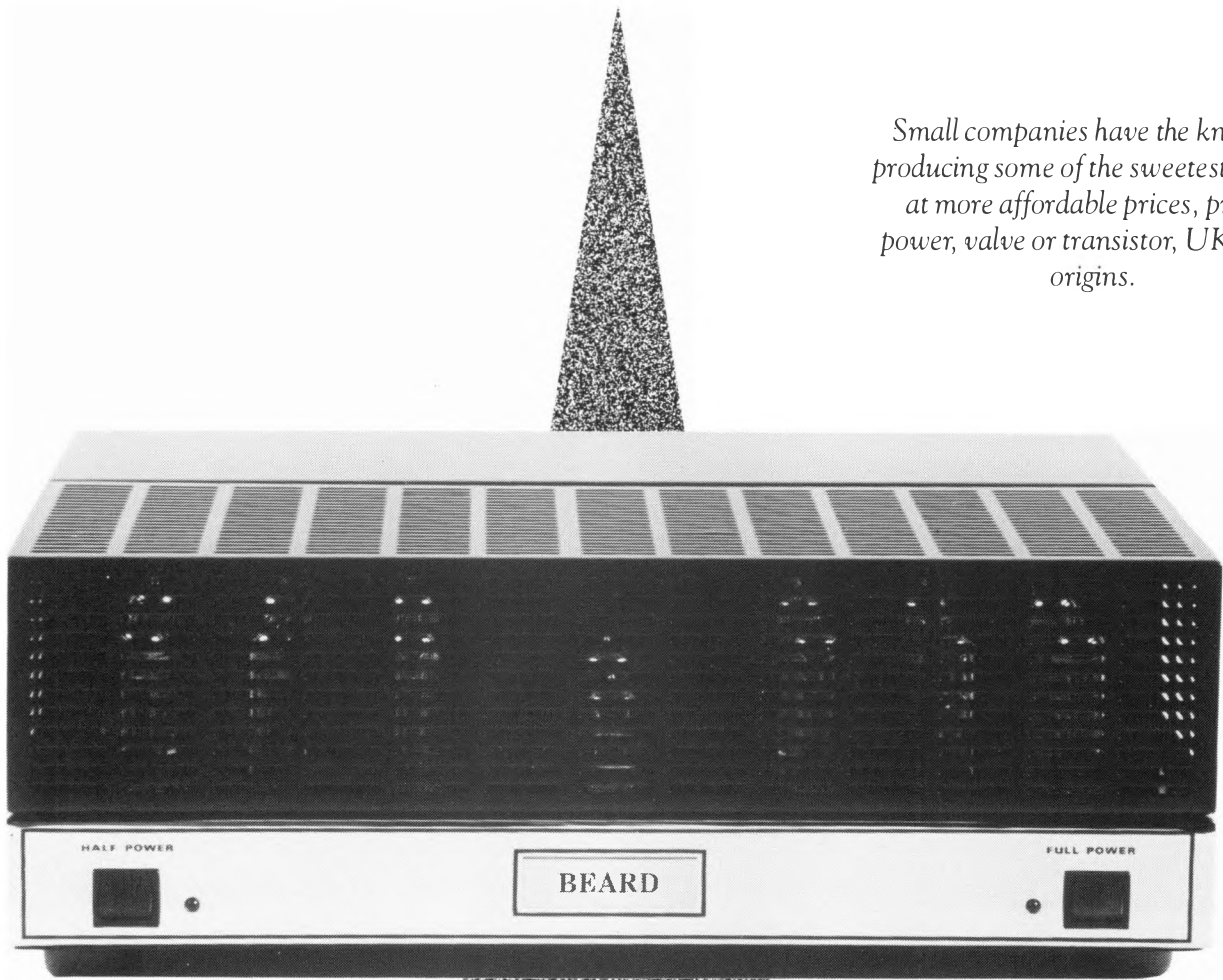
Making definitive rules about these options is next to impossible. For example, full active drive gives the tightest 'grip' on the drive units but suffers some loss in transparency due to the additional electronic filter circuitry needed. Each presents a somewhat different 'flavour' and offers different prospects for future upgrading, but to some extent the different cost/quality equations do tend to cancel out.

Who says amplifiers are easy ...

**BEARD P35 POWER AMPLIFIER**

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*Small companies have the knack of producing some of the sweetest sounds at more affordable prices, pre- or power, valve or transistor, UK or US origins.*



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**B**uilt superbly, on a massive chrome chassis, this Beard power amplifier uses a simple straightforward circuit design, with high quality components, plus a substantial reservoir capacity. EL84 output valves 'per channel give a 35W rating in ultralinear configuration.

A large central toroidal transformer supplies the two channels, which have independent rectification and storage. 'Floating' biasing simplifies the construction, though each valve needs to be individually set in production after 'burn in' at the factory. An alternative standby mode may be used providing half power with a vastly increased valve operating life. Speaker connection is via Michell gold plated binding posts which take cable or plugs up to 4mm.

**SOUND QUALITY**

Beard's best yet, this amplifier proved capable of higher sound levels than its rating suggested, and could reach 102dBa on the 8ohm load. Mild transformer hum suggests it should preferably be sited away from the listener.

Reaconditioned for 1987 in the light of certain detail modifications, the high rating established the year before was fully maintained. Stereotypically valve in sound, it was sweet and

slightly 'soft', a little on the 'rich' side but engagingly rhythmic and 'bouncy'. Lacking some of the low frequency scale and dynamic drama of other designs, string tone and orchestral perspectives were both very convincing.

**LAB REPORT**

Our clipping limit of 1% distortion was relaxed to 3% to accommodate the high frequency harmonic distortion of this model: At rated power, the 20kHz harmonic distortion approached 3% but improved at lower power levels. Conversely, the more important high frequency intermodulation result was pretty good, and better still at lower powers.

Stereo separation was predictably excellent, due to the virtual double-mono construction. Rated as satisfactory for load tolerance, this low

feedback design gave a consistent output impedance of 1ohm, which would slightly modify the perceived tonal balance of some speakers.

**CONCLUSIONS**

While this amplifier will need some care in matching it to a given system, it offered a genuinely high sound quality, with that distinctive and valued transparency associated with better valve designs. Considering the high build quality it is competitively priced, and continues to be confidently recommended.

**TEST RESULTS**

Rated power into 8ohms, maker's spec	_____	35W(=15dBW)
Power output	_____	20Hz: 1kHz: 20kHz:
One channel, 8ohm load	_____	16.3dBW 16.5dBW 15.7dBW
One channel, 4ohm load	_____	11.7dBW 11.8dBW 7.7dBW
One channel, 2ohms, pulsed	_____	-JWB 12.4dBW -JWB
Instantaneous peak current	_____	+6.5A -6.5A
Total harmonic distortion,	_____	20Hz: 1kHz: 20kHz:
at rated power, aux input	_____	-57.1dB -58.2dB -33.3dB
Intermodulation, 19/20kHz, rated power, aux input	_____	-60.4dB

**NOISE**

Aux/CD input (IHF, CCIR weighted)	_____	-86.0dB
Residual, unweighted (volume control at min)	_____	-70.0dB
Output impedance (damping)	_____	0.88ohm 0.88ohm 0.84ohm
Input data	_____	socket type sensitivity loading
Power amp	_____	Phono 160mV 650kohms 320pF
Size (width, height, depth)	_____	44.5 x 15 x 33.5cm
Typical price inc VAT	_____	£695

First reviewed: 1986 Rating: Recommended.

COUNTERPOINT SA7/SA12

ABSOLUTE SOUNDS, 42 PARKSIDE, LONDON SW19.

TEL: 01-947 5047



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The SA-7 is an elegantly simple valve pre-amp from California, offering unusually high gain on what is nominally a moving-magnet disc input. The disc input sensitivity is just under 0.2mV, which in practice will be sufficient for a number of moving-coil cartridges. The all triode circuitry uses no feedback throughout, the high impedance tape output should be disconnected, even from an interconnect cable, when not in use.

Rated conservatively by the manufacturers at 100W (20dBW) per channel, the SA-12 power amplifier is a low-feedback hybrid design, with valve drivers and MOSFET output devices.

SOUND QUALITY

Properly interfaced, the SA-7 pre-amplifier provided a sound quality well beyond its price class, comparable with models costing £1000 plus. It sounded alive and open, with an involving, dynamic quality. Good articulation and detail were both maintained over the whole frequency range, while stereo width and depth were presented well. Essentially musical, in tonal terms it nonetheless showed a hint of upper mid 'thinness', while the upper treble sounded a little 'careless' — not fully focused or precise.

The impressive SA-12 power amplifier delivered high sound levels in an exciting dynamic manner. Like the SA-7, it showed very fine mid transparency, but was a trifle untidy

at band extremes. The overall standard was high, a little better than the SA-7, with clear stereo of decent depth and focus.

LAB REPORT

The power amp delivered around 200W programme, confirming its generous dynamics. With an average peak current of 40A, it was beefy and load tolerant too (giving 800W true peak per channel into 2ohms). Distortion was just satisfactory at 0.5%, midband, with the output resistance a moderate 0.33ohms. The high frequency intermodulation result was rather disappointing, and was perhaps associated with the moderate treble 'grain' we heard.

The pre-amplifier intermod result was little better and is only really acceptable when used as a moving-coil input. Moving-magnet signal levels tended to overload it, but background noise was quite low.

CONCLUSIONS

The SA-7 continues to maintain its competitive

position and it offers an inspiring transparency for the price, plus a feeling of involvement. The SA-12 is a real power-house, our subjective ratings indicating that it is amongst the finest available in its power/price grouping. Magneplanar speakers spring to mind in this connection — here is an economical MGIII-driver, louder even than the Krell KSA-100! Both these Counterpoint models are comfortably recommended.

TEST RESULTS

Pre- and power amplifier	
Rated power into 8ohms, maker's spec	100W (=20dBW)
Power output	20Hz: 1kHz: 20kHz:
One channel, 8ohm load	21.1dBW 22.7dBW 17.8dBW
Both channels, 4ohm load	17.9dBW 18.2dBW 17.1dBW
One channel, 2ohms, pulsed	-1dBW 23.0dBW -1dBW
Instantaneous peak current	+46A -35A
Total harmonic distortion	20Hz: 1kHz: 20kHz:
at rated power, aux input	-44.4dB -46.3dB -46.7dB
NOISE	
Disc (mini) input (IHF, CCIR weighted)	-72dB
Disc (mic) input (IHF, CCIR weighted)	-58dB
Aux/CD input (IHF, CCIR weighted)	-72.7dB
Input overload	20Hz: 1kHz: 20kHz:
Disc (mini) input (IHF)	-2dB 12dB 11dB
Disc (mic) input (IHF)*	18dB 32dB 37dB
Aux/CD input (IHF)	>20dB >20dB >20dB
Input data	socket type: sensitivity: loading:
Disc (mini) input	Phono 0.17mV 45kohms 300pF
Disc (mic) input*	0.17mV 45kohms 300pF
Aux input	Phono 31mV 28kohms 110pF
Power amp	Phono 105mV 89kohms -pF
Output, pre-amp (tape)	>15V max. 860ohms
Disc equalisation error, 30Hz-15kHz	+0.1dB -0.3dB
Size (width, height, depth)	48 x 12 x 34cm
Typical price inc VAT	1,747, 1,1250

\*Same input used for moving-coil. First reviewed: SA7, 1985 (reassessed 1986); SA12, 1986. Rating: Recommended



**CROFT MICRO/SUPER MICRO**

CROFT ACOUSTICS, 15 HARRISON ROAD, ERDINGTON, BIRMINGHAM B24 9AB.

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The Micro is Croft Acoustics' least expensive product, and perhaps rates as the world's most value-conscious valve pre-amplifier. Drawing on Croft's experience in designing and manufacturing upmarket products, the only compromise involved in the Micro's construction appears to be in the case. And for those who prefer a less utilitarian appearance, plus rather better performance through the use of valve regulated power supplies, Croft now have the Super Micro, at £100 extra.

These pre-amps offer a single moving-magnet disc input (just adequate for the higher output moving-coil cartridges provided the power amp sensitivity is healthy enough), plus CD, tuner and tape. No balance or tone controls are included but the Super Micro has two separate volume controls by virtue of its 'double mono' construction, enabling balance to be adjusted. A separate head amp is also available for full moving-coil compatibility.

Inside, the hardwired construction (using single strand wire) is to a high standard throughout, with all power supplies fully regulated, while audiophile-grade capacitors are used in the RIAA disc equalisation and coupling networks. Each disc input uses a double triode, with shunt feedback equalisation, and the line stage has unity gain, comprising a simple cathode-follower buffer. With some sources, the auxiliary input gain may be too low and the intending purchaser should therefore check compatibility with other equipment. Compact Disc will be fine but some tuners or cassette decks may prove too quiet in the

context of a given system combination.

**LAB REPORT**

Measured performance was to textbook standards, with negligible distortion and satisfactory overload margins, although the latter deteriorated at high frequencies. Channel separation was fine, while signal-to-noise ratios were particularly good. Output impedance was satisfactorily low, and sufficient for selected cable runs of up to five metres.

The RIAA equalisation was commendably accurate at  $\pm 0.2$  dB from 30Hz to 15kHz, rising a little at ultrasonic frequencies, to +2.1dB at 100kHz. Note that the rated input sensitivities were for a nominal 0.5V IHF output level.

**SOUND QUALITY**

Both disc and auxiliary inputs set a very high standard. On disc, the sound was lively and dynamic, transparent and basically well balanced. No specific weaknesses were observed, though the best results will be obtained with the 'tape out' sockets left disconnected.

A similar result was obtained via auxiliary (CD). The bass showed drive and extension,

with the treble just a little 'fuzzy'. Detail and depth effects were fine and stereo images well-focused. The sound proved notably unfatiguing, with a stable, coherent quality. Background noise was also satisfactorily low when used with moving-coil cartridges of decent output such as the van den Hul MC10 Super.

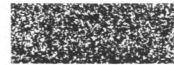
**CONCLUSIONS**

We really liked these modest pre-amps. If carefully interfaced to a selected system, the sound quality competed with some of the best pre-amplifiers costing two or three times the price, and for the valve enthusiast, the Micros are a godsend. These exceptional products can be strongly recommended.

**TEST RESULTS**

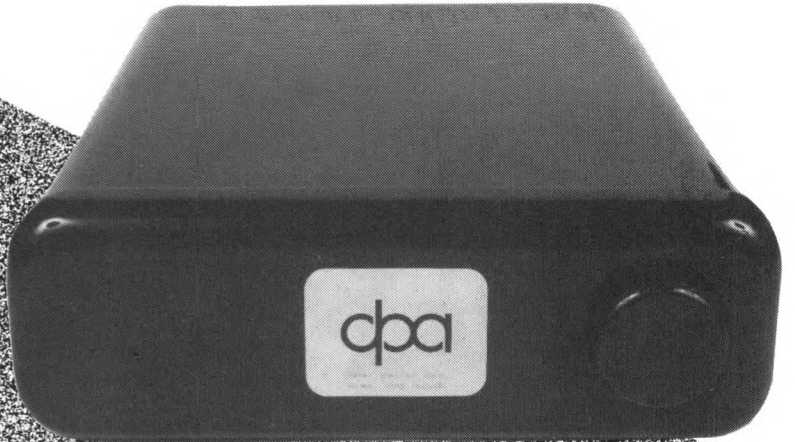
<b>Distortion</b>			
Total harmonic distortion, _____	20Hz	1kHz	20kHz
at rated power, aux input _____	-76.0dB	-78.3dB	-76.5dB
Intermodulation, 19/20kHz, rated power, aux input _____	-93.1dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm) _____	-41.0dB		
<b>Noise</b>			
Disc (mm) input (IHF, CCIR weighted) _____	-73.5dB		
Aux/CD input (IHF, CCIR weighted) _____	-92.0dB		
Residual, unweighted (volume control at min) _____	-86.5dB		
DC output offset _____	left 0mV, right 0mV		
<b>Input overload</b>			
Disc (mm) input (IHF) _____	20Hz	1kHz	20kHz
Aux/CD input (IHF) _____	22.8dB	24.0dB	5.9dB
Aux/CD input (IHF) _____	>20dB	>20dB	>20dB
<b>Stereo separation</b>			
Disc input (mm) _____	61.2dB	62.8dB	36.0dB
Aux input _____	101.3dB	82.0dB	57.3dB
Channel balance, disc, at 1kHz _____			0.37dB
<b>Volume/balance tracking</b>			
Aux input _____	0dB	-20dB	-60dB
Aux input _____	0.02dB	0.19dB	6.20dB
<b>Input data</b>			
Disc (mm) input _____	socket type	sensitivity	loading
Aux input _____	Phono	2mV	47kohms
Aux input _____	Phono	550mV	480kohms
Output, pre-amp (tape) _____		11.1V max.	500ohms
Disc equalisation error, 30Hz-15kHz _____		+0.26dB	-0.16dB
Size (width, height, depth) _____		25.5 x 7 x 18.5cm	
Typical price inc VAT _____		£150, £250	

First reviewed: 1985 Rating: Recommended



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**T**hough Deltec are still a tiny operation, one would not have guessed it from the quality of construction and finish evident in this new high performance power amplifier, which costs nearly £2,000 for a modest 80W/channel rating. It is a slim unit, though very deep and heavy enough to need a substantial shelf. The front panel is diecast and the sides rounded off in a generally successful attempt at styling, while the battleship grey finish lends a further distinctive touch.

Internal constructional details are to the highest standards, with no expense spared on components. The substantial pricetag is to some extent justified by the high frequency grade printed circuit boards, heavy RF power supply filtering, and nice touches like the Vishay bulk foil resistors which define the feedback performance.

Regulated power supplies are driven from a single large toroid. Star grounding is adopted and close coupling maintained to the complementary bi-polar output stage, which includes extra devices that impart a 'pseudo class A' characteristic, keeping the transistors permanently on, but with the heat dissipation of a normal class A/B design.

The input is balanced to reduce ground noise, and very heavy special loudspeaker cables are used. Cannon sockets are used in non-standard configurations. An interesting design 'wrinkle' is a 'four-wire' loudspeaker connection which extends the feedback loop around the loudspeaker cables, so neutralising their influence. The unit was supplied with made up leads which

tightly packed the four conductors, and our suspicions were aroused by certain oddities in the sound quality as to whether the main signal in the wire could be directly inducing signals within the feedback wire resulting in misleading error correction. Deltec checked this and confirmed this finding, so the feedback wires have now been separated from the other two.

### LAB REPORT

The power output met specifications precisely, and showed that delivery was very well maintained into lower impedances, the unit delivering 19A peak current symmetrically. The fact that it was impossible to draw additional 'burst' power is merely evidence of the heavy power supply regulation, rendering further protection circuitry unnecessary. All the distortion, noise, channel separation and balance measurements were fine. Supply modulation and distortion residuals were both very low, though there was a slight hum from the transformer and the DC offset showed a mild drift of around  $\pm 10\text{mV}$ . Absolute phase is inverted when signal is passed through the amplifier, a factor that can influence subjective comparisons.

### SOUND QUALITY

Despite the 'odd' quality encountered during the initial listening sessions due to the above-mentioned feedback/wire induction problems, the Deltec still managed to rate 'very good' overall, and the sound was further improved after the loudspeaker wires were changed. The sound gave the typical characteristics of a top quality

transistor power amp — essentially 'fast', with tight 'dry' bass and excellent midrange transient resolution, dynamics and focus. Extreme treble was very sweet and unexaggerated, but the overall balance was considered a touch 'clinical'. Control was exceptional — perhaps too much so for some palates.

### CONCLUSIONS

Once the four-wire configuration had been sorted out, the Deltec came through as an exceptionally fast, clean-sounding amplifier — distinctly solid state in character but fundamentally accurate and quite transparent. Engineering and construction quality is truly exceptional throughout, but this is inevitably reflected in a price which is on the high side, bearing in mind the unexceptional power rating. Nevertheless the subjective rating alone deserves recommendation.

### TEST RESULTS

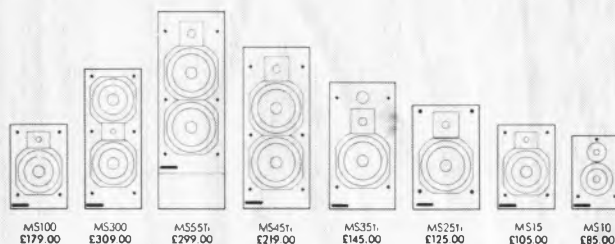
Power output	Integrated amplifier		
Rated power into 8ohms, maker's spec	80W(18.5dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	18.5dBW	18.5dBW	18.4dBW
Both channels, 4ohm load	18.3dBW	18.3dBW	18.2dBW
One channel, 2ohms, pulsed	-dBW	16.7dBW	-dBW
Instantaneous peak current	$\pm 19\text{A}$		
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	-96dB	-96dB	-84dB
Intermodulation, 19/20kHz, rated power, aux input	-94dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm)	-94dB		
Noise 'A' wtd.	-87dB(0dBW), -105dB(full output)		
DC output offset	left <90mV, right <70mV		
Output impedance (damping)	0.003ohm	0.003ohm	0.03ohm
Channel balance, disc, at 1kHz	0.02dB		
Input	common	150mV	9.8kohm 0.8nF
Size (width, height, depth)	34x12x46cm		
Typical price inc VAT	£1900		

For the music-lover seeking to re-create the experience of an exhilarating performance, the choice of high-fidelity loudspeakers can be formidable.

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**D**NM is a small British company founded by Dennis Morecroft, a designer dedicated to sound quality and specialising in pre-amplifiers. The range is founded on a basic chassis/motherboard providing signal and power supply interconnection. The various circuit boards plug into this chassis and allow expansion of input and output facilities; linking plugs may also be removed from the back to allow connection of additional power supplies.

Thus the least expensive pre-amp, the *Primus*, supplied with a single power supply unit, forms the heart of the system, and may be expanded internally as well as via additional supplies. The various *Series 3* models are now built in Switzerland and fitted with an opaque acrylic case. The DNM is equipped with a choice of mm or mc disc input, plus an auxiliary or direct CD input and line output amplifiers. Extra input cards may also be fitted plus tape buffer output cards.

**SOUND QUALITY**

Although the *Primus* version is the cheapest in the series there was no doubt concerning its high audio quality. It sounded confident and

clear via the CD input, with a fine exposition of detail throughout the frequency range. Stereo depth and width were well presented. The sound was of similar quality *via mc*: the mid register was pleasantly accurate in tonal balance, rivaling the finest semiconductor pre-amps in this respect. Only in the treble did we note some imprecision, where a touch of fizz was heard but not judged serious.

The addition of more power supplies provided an all-round improvement. Still more power supplies progressively improved the analogue disc input performance, the sound showing more control and confidence, with dimensional enhancement; the treble also showed improvement.

**LAB REPORT**

Up to 4 volts output was available from a low source resistance, which is enough for any power amplifier. The total harmonic distortion and high frequency intermodulation results were very fine, and were associated with good input overload margins. Channel separation was also very good and (given the dual volume controls) channel balance was also good. Noise levels were fine — sufficiently low for all but the

least sensitive moving-coil cartridge.

**CONCLUSIONS**

From the *Primus* upwards these units deserve recommendation, providing a neutral sound with fine ambience and exceptional clarity. However, since moving production to Switzerland the *DNMs* have become a little expensive.

**TEST RESULTS**

Preamplifier			
Total harmonic distortion, _____	20Hz:	1kHz:	20kHz:
Aux/CD input (IHF, CCIR weighted) _____	-78dB	-87dB	-76dB
Intermodulation, 19/20kHz, aux input _____			-100dB
Intermodulation, 19/20kHz, at 0dBW, disc(mm) _____			-95dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc) _____			-95dB
NOISE			
Disc (mc) input (IHF, CCIR weighted) _____			-64dB
Aux/CD input (IHF, CCIR weighted) _____			-88dB
Residual, unweighted (volume control at min) _____			> -90dB
Input overload _____	20Hz:	1kHz:	20kHz:
Disc (mm) input (IHF)* _____	26dB	27.5dB	29dB
Aux/CD input (IHF) _____	>20dB	>20dB	>20dB
Disc input _____	89dB	80dB	67dB
Aux input _____	95dB	90dB	60dB
Channel balance, disc, at 1kHz: _____			0.03dB
Input data _____	socket type	sensitivity	loading
Disc (mc) input* _____		0.1mV	47ohms
Aux input _____	Phono	85mV	13kohms
Output, pre-amp _____		4V max,	33ohms
Disc equalisation error, 30Hz-15kHz: _____		+0dB,	-1.8dB
Size (width, height, depth) _____		22 x 11.5 x	13.5cm
Typical price inc VAT _____		Series 3 from	£1000

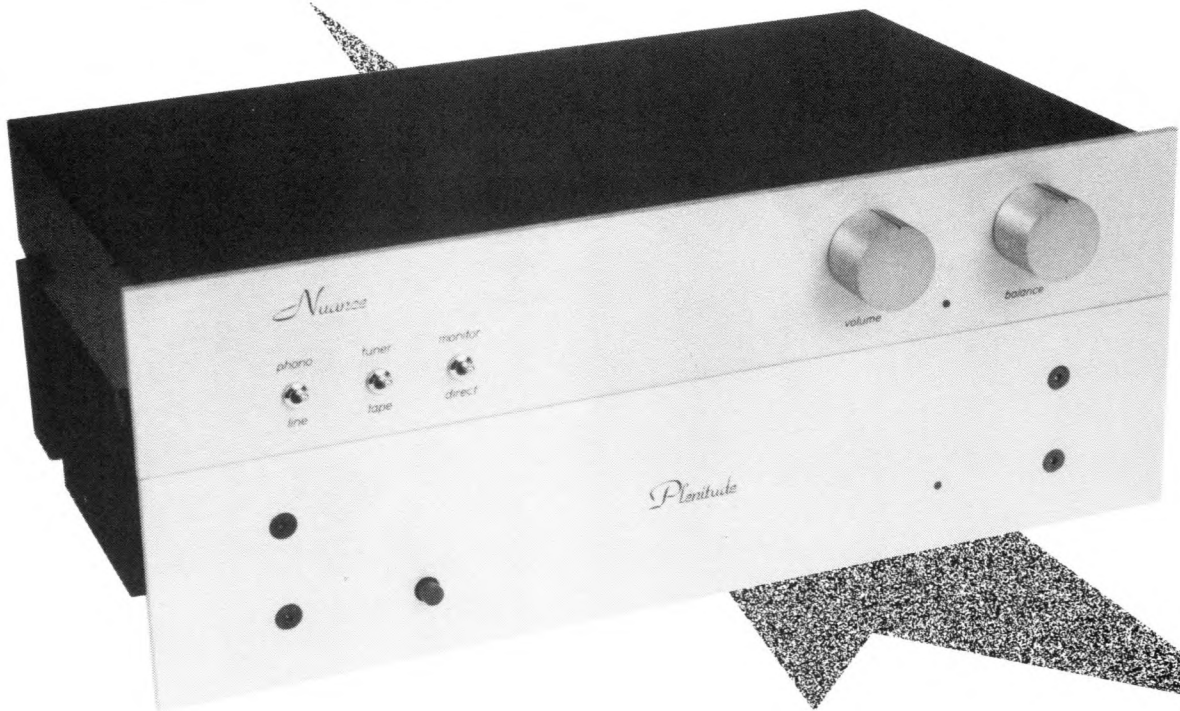
First reviewed: *Series 3*, 1986. Rating: Recommended

# SMALL IS BEAUTIFUL

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The Nuance/Plenitude pre-power amplifier combination is the result of that strangest of events, Anglo/French cooperation. The manufacturing is done in France, as was the original format layout, but there has also been considerable additional input from Malcolm Hawksford, particularly on the pre-amp. This redoubtable academic leads a research group down at Essex University, and has some unusual — not to say somewhat abstruse — ideas of hi-fi and circuit design, including a concept of 'fuzzy distortion' related to small errors in feedback control. The French contribution has also extended to the careful comparative subjective assessment of the components used within the signal paths for optimum end results.

Manufactured by Famco of Paris, these transistor amplifiers are invariably known by their romantic French pet names, are distributed in the UK by Presence Audio, and are available in shiny 'champagne' and now black. The pre-amp reviewed here is the moving coil model; a cheaper moving magnet Nuance will be available shortly. Finish is first class, giving a solid feel and expectations of a long life.

Nuance is a very simple design, with just two knobs and three switches, covering volume and balance plus input selection. Additional internal adjustments are available for switching in a rumble filter if desired, and for changing the line stage gain in order to accommodate different cartridge and power amplifier sensitivities comfortably. The power supply is outboard, similarly finished in its own compact case. The high quality componentry includes extensive LC wire, Roederstein Resistas, and a Noble volume control.

Plenitude is no more complicated, the designers believing in keeping things as simple as possible. Rated at 80W/ch, this is a conventional complementary bi-polar design with a single power supply, carrying doubled output terminals to assist in bi-wiring. Now fuse protected, signal

path components have been carefully selected and Hawksford has again had a hand in the circuit development.

### LAB REPORT

Nuance behaved well in the lab, giving no real concern on the various tests. The frequency responses showed sensible bandlimiting at the frequency extremes, though the low frequency rolloff began at a high enough frequency to affect accuracy marginally; the rumble filter is sensibly shaped with a gradual rolloff and no peaking. There was some increase in IM distortion at high frequencies on disc input, but overload margins were fine.

Plenitude's 18dBW (80W) power rating was comfortably exceeded under most conditions, though distortion rose a little at high frequencies when heavy current was demanded. Midband power was very well maintained into low impedances, reflecting the generous  $\pm 25A$  peak current, and also indicating a 'firm' power supply. Distortion results were rather ordinary, but should be adequate nonetheless, and there was no cause for concern on other measured parameters. A slight mechanical hum could be heard.

### SOUND QUALITY

Nuance was quite well received, sounding basically polite and comfortable, albeit lacking the resolution of some alternatives. There was some treble 'sheen' with surface noise mildly exaggerated, a mild 'softening' of dynamics and focus, plus a little loss of low frequency scale and weight. The overall staging was nicely controlled and tidy, showing slight veiling and a mildly 'muted' effect.

Having recently benefited from an upgrade, Plenitude rated slightly above its sister, while showing much of the same 'nice' character. There were no serious adverse comments, and the sound showed good transparency, depth, space and focus. There was some loss of scale

and the treble was a trifle lacking in grace, but the sound was well under control and quite 'tight'.

### CONCLUSIONS

This is a nicely balanced combination that shows fine build quality and close attention to detail. Lab performance and sound quality were both on the ball, the latter having a distinctly 'soft' and attractive character, not unlike some valve models. The price is sufficiently competitive to suggest cautious recommendation subject to personal audition.

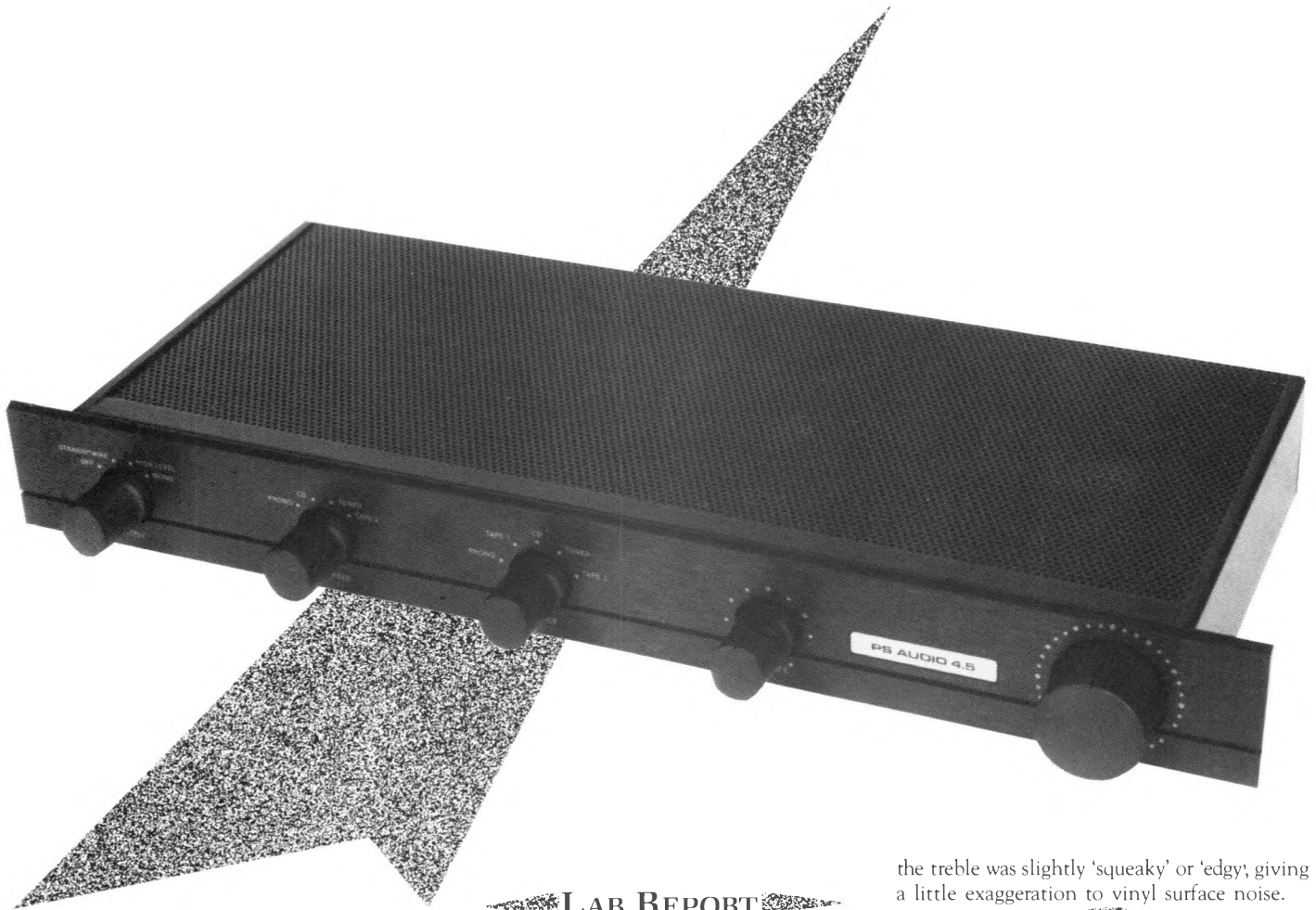
### TEST RESULTS

<b>Power output</b>			
Rated power into 8ohms, maker's spec	80W (18dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load 20.6dBW	20.4dBW	19.9dBW	19.9dBW
Both channels, 4ohm load	18.9dBW	18.8dBW	15.9dBW
One channel, 2ohms, pulsed	19.7dBW		
Instantaneous peak current	$\pm 25A$		
<b>Distortion</b>			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	-80dB	-80dB	-78dB
Intermodulation, 19/20kHz, rated power, aux input	-83dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mc)	-48dB		
<b>Noise</b>			
Disc (mc) input (IHF, CCIR weighted)	-63dB		
Aux/CD input (IHF, CCIR weighted)	-77dB		
Residual, unweighted (volume control at min)	-89dB		
DC output offset	-3mV	-1mV	
DC offset, pre-amp	0mV		
<b>Input overload</b>	20Hz	1kHz	20kHz
Disc (mc) input (IHF)*	30.1mV	29.7dB	29.3dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
<b>Stereo separation</b>			
Disc input (mc)	66dB	70dB	50dB
Aux/CD input	74dB	48dB	
<b>Common impedance (damping)</b>	1ohm	0.1ohm	
Channel balance, disc, at 1kHz	0.01dB		
Volume/balance tracking	0dB(0dB) @ 16dB(-20dB) @ 16dB(-60dB)		
<b>Input data</b>	socket type	sensitivity	loading
Disc (mc) input*	phono	38.5µV	14chms
Aux input	phono	66mV	35kchms
Power amp	phono	104mV	30kchms
Output, pre-amp (tape)		15.9V	470ohms
Disc equalisation error, 30Hz-15kHz	+0.04dB, -0.55dB		
Size (width, height, depth)	(41 x 22.5 x 6.6) + (11 x 17.5 x 6.6) + (41 x 28 x 8.8)cm		
Typical price inc VAT	£695 + £695		

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**LAB REPORT**

**P**S Audio first appeared in *Hi-Fi Choice* a number of years ago with a curiously shaped and rather primitively finished pre-/power combination that sounded rather nice. At the time, the initials stood for co-proprietors Paul and Stan. In the interim the then UK distributor ceased operating, and PS themselves went quiet for a time in the States. Now the company is back, this time with only one of its original principals, and the UK distribution of this quite reasonably priced (by high end standards) pre-amp is being undertaken by Absolute Sounds.

Gone is the idiosyncratic styling of those earlier models, replaced by a sleek, full-width, jet black unit of smart finish if rather conventional appearance. A see-through fine mesh lid adds a touch of 'high tech', while lettering is a discreet gold, leaving the potentiometers uncalibrated. A quite small power supply transformer is sited along the mains lead, at a distance from the pre-amp proper, though there was still a gentle mechanical hum. This may be a function of our 50Hz mains, different from the US, or a simple idiosyncrasy — either way it is soluble.

Facilities are minimal and sound quality oriented — simply volume and balance (using Noble pots), straightwire/high gain and mm/mc switched options, plus input and output selection switching. The 'straightwire' option here permits bypass of the line stage for greater transparency when the sensitivities of inputs are sufficient to permit its use.

The disc response was generally smooth and even, showing a gentle downtilt through the treble amounting to less than 1dB at 20kHz. Harmonic distortion was fine, and 14dB better than the published figure at low frequencies in the 'straightwire' position. The same general improvement was noted on a number of other parameters — which at least confirms things are working in the right direction!

However intermodulation via the m-c cartridge input was somewhat unsatisfactory, and this is reflected in the high frequency overload measurement which is a little too marginal for comfort. In other respects the measured performance was fine, and it can be seen from the bracketed figures included in the accompanying data that the 'straightwire' sensitivities should be quite sufficient for many sources (though this won't help any HF m-c overload problems).

**SOUND QUALITY**

Used in the 'straightwire' mode with highish output mm-c cartridges, the PS turned in a cracking performance for its price, providing a level of integration, transparency, scale and dynamism normally associated with significantly more expensive devices. And even with the line stage in operation, the sound was still very good indeed, just knocked back a couple of pegs on the ratings.

The sound was powerful, quick and lively, with good space and depth (though wider than deep). However, a point of criticism was that

the treble was slightly 'squeaky' or 'edgy', giving a little exaggeration to vinyl surface noise.

**CONCLUSIONS**

Sonically the best in its class under our listening conditions, assisted by the intelligent 'straightwire' option, this is a strongly recommended pre-amplifier which represents fine value for money. There remains a touch of doubt over the high frequency overload on the m-c input, which suggests that prospective purchasers should try it out with the intended front end to ensure that results are to taste.

**TEST RESULTS**

Distortion			
	20Hz	1kHz	20kHz
Total harmonic distortion at rated output, CD input	-77dB	-82dB	-81dB
Intermodulation, 19/20kHz, rated power, aux input	-79dB	-78dB	-72dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)	-72dB	-72dB	-20dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)	-72dB	-72dB	-20dB
Noise			
Disc (mm) input (IHF, CCIR weighted)	-66dB	-66dB	-66dB
Disc (mc) input (IHF, CCIR weighted)	-63dB	-63dB	-63dB
Aux/CD input (IHF, CCIR weighted)	-78dB	-78dB	-78dB
Residual, unweighted (volume control at min)	-84dB	-84dB	-84dB
DC offset, pre-amp	0mV	0mV	0mV
Input overload			
	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	30.8dB	30.3dB	25.1dB
Disc (mc) input (IHF)*	26dB	25.4dB	13dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	54dB	65dB	45dB
Aux input	85dB	70dB	48dB
Channel balance, disc, at 1kHz	-0.18dB	-0.18dB	-0.18dB
Volume/balance tracking			
	0.02dB(0dB)	0.2dB(-20dB)	0.9dB(-60dB)
Aux input			
Input data			
	socket type	sensitivity	loading
Disc (mm) input	phono	1.1(5.2)mV	43kohms
Disc (mc) input	phono	0.06(0.3)mV	50kohms
Aux input	phono	149(725)mV	6.8kohms
Output, pre-amp (tape)		18.5V	21K(14)ohms
Disc equalisation error, 30Hz-15kHz		+0dB	-0.32dB
Size (width, height, depth)		48x5.5x26+(12.5x9x16)	ps/cm
Typical price in VAT			£695



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These utterly traditional US built mono valve power amplifiers even use valve rectifiers and no regulation. Fixed bias have 8417 output valves at 63mA, each give a comfortable enriched Class 'A' rating. Large (for a valve amp that is) 320µF reservoir capacitors are used in a CLC smoothing circuit incorporating a choke, the latter section feeding the low level stages. The simple signal paths are coupled with quality polypropylene capacitors, the input is direct coupled, while the output is transformer coupled, push-pull ultra-linear. At the (feedback coupled) secondary, tapings for 8, 4 and 1ohm operation are provided, the last for direct connection to ribbon drivers. The single pole mains switch is unshrouded — I would like to see an improvement here!

### SOUND QUALITY

Well, good amplifiers do exist after all, even if they appear to have been designed back in 1955! The Quicksilver scored 'excellent' on the listening tests, mainly by virtue of top class transparency. With that quality properly established, the rest fell neatly into place. It proved to be powerful, producing quite substantial sound levels. Bass was highly rated for 'speed' and articulation, but with a hint of richness and overhang. Slightly mellow, the treble remained airy and open with clear, articulate detail. The mid was considered neutral while the stereo focus, width and depth were all extremely good. Finally, it was also dynamic, lively and full of interest as well as possessing a low 'fatigue factor'.

### LAB REPORT

On programmed peaks it reached 102dBa,

based on a peak level of 18.5dBW (around 75W). A good power bandwidth was shown at rated power, indicative of a high-quality output transformer. Another surprise was the remarkable load tolerance, with a peak current of 13.5A. On the 4ohm tap it would even handle 2ohm loads!

Low feedback is a feature of this design and resulted in rather high distortion of 1% mid-hand, and nearer 3% at the frequency extremes. Better intermodulation results were observed, while distortion improved greatly at lower powers. Noise levels were fine, though some transformer hum was present on our samples. The output impedance was a rather high 1ohm, which will be sufficient to change the sound of many speakers to some small degree.

### CONCLUSIONS

This amazing amplifier demonstrated just how poor the lab results can be while at the same time delivering a top class sonic performance. High load tolerance was a surprising asset, and

the sound quality was heading towards the £2,500 level. Offering its own unique strengths, transparency was its trump card, and it may be warmly recommended, but check the transformer hum and overall system compatibility carefully.

### TEST RESULTS

Rated power into 8ohms, maker's spec	60W (= 17.5dBW)
Power output	20Hz: 1kHz: 20kHz:
One channel, 8ohm load	17.5dBW 17.6dBW 16.9dBW
One channel, 4ohm load	15.6dBW 15.3dBW 14.4dBW
One channel, 2ohms, pulsed	-dBW 15.0dBW -dBW
Instantaneous peak current	+14.0A -13.0A
Total harmonic distortion, at rated power, aux input	20Hz: 1kHz: 20kHz: -30.0dB -41.5dB -34.6dB

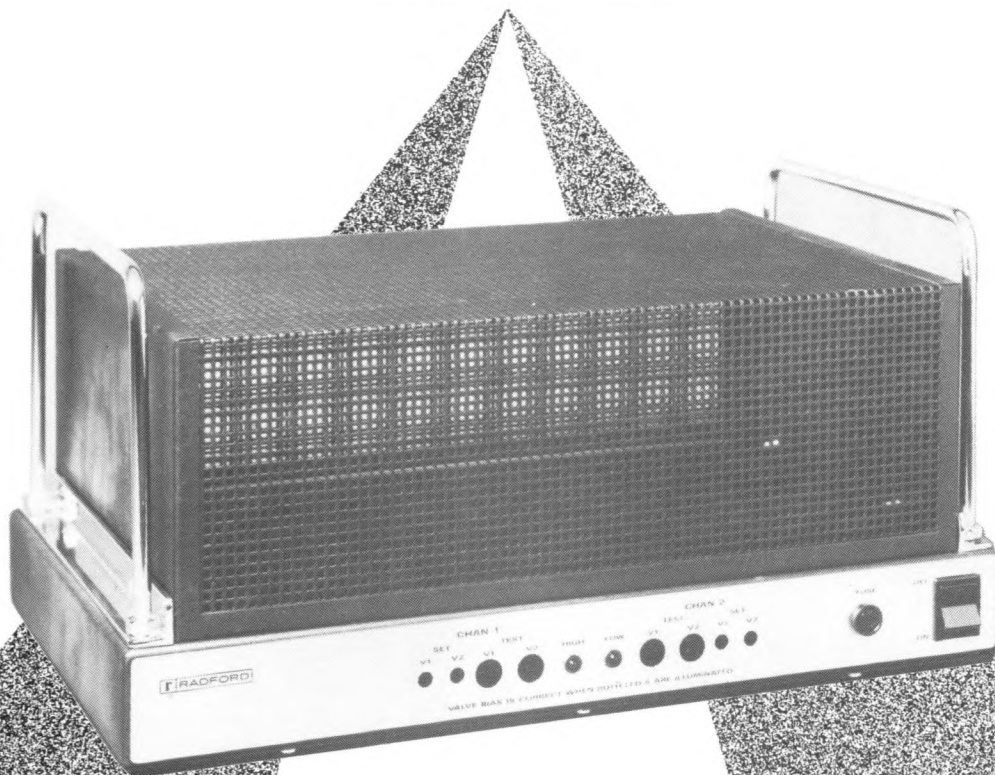
#### NOISE

Aux/CD input (HF, CCIR weighted)	-91.0dB
Residual, unweighted (volume control at min)	-79.0dB
Output Impedance (damping)	1.0ohm 1.0ohm 1.1ohm
Input data	socket type sensitivity loading
Power amp	Phono 120mV 100kohms -pF
Size (width, height, depth)	23.5 x 15 x 36cm
Typical price inc VAT	£1775 (pair)
First reviewed 1986 Rating: Recommended	

# RADFORD STA25 RENAISSANCE

WOODSIDE ELECTRONICS, KIMBERLEY ROAD, CLEVEDON, AVON BS21 6QJ.

TEL: (0272) 877611



From the golden age of valve amplifiers, before the transistor types swept the market in the late 'sixties, a handful of British power amplifiers stand out as classics. For many the greatest of all were the Radfords. Enthusiasts rate the rare '15s the best sounding (especially the monoblocks), while the '60 and '100 offered plenty of power. But the real classic has to be the STA25, which seemed to provide just the right combination of quality and power, in a package that remains purposefully elegant by any standards today.

Good examples continue to hold their value on the secondhand market, and there has already been an 'anniversary' commercial revival of the original design in replica form a few years ago. Now some of the design team have got back together to create the Renaissance. This is manufactured under license by Woodside Electronics, carrying the blessing and identity of Arthur Radford. Staying close to the spirit of the original, it is in fact a full update using the latest components and twenty years of accumulated experience.

The appearance differs somewhat from the original — aesthetically for the poorer, as the valves are now hidden beneath the cover and no longer make a shining, glowing tribute, such is the evolution of safety standards. Still, at least they've kept the chrome handrails. The chassis itself is wider, with the major component layout more reminiscent of the 60/100 models if memory serves right, and the number of changes are quite extensive throughout. Finish is excellent, and the various greys and silvers give an attractive appearance.

LED indicators are now provided to keep valve biases correctly set, though these are now fed

from regulated supplies. The radiometal-core transformers look much as before, but the output taps are now fixed at 5ohms to match most current loudspeakers, and there has been a vast increase in reservoir capacity. The main EL34 output valve has been replaced by a US type 6550: this is really closer to a KT88, and is a type widely used by Audio Research and others. The input is now a cascode instead of pentode configuration, while star earthing is adopted. Much hardwiring is used in the construction, with high quality components such as polypropylene coupling capacitors.

## LAB REPORT

Despite the many changes, this new STA25 reveals its vintage roots in a range of performance measurements that are generally undistinguished. Power output is still only modest, typically 40W midband but showing some distortion increase when pressed at the bandwidth extremes (particularly the bass); however,  $\pm 7.5A$  current capability is quite generous for this type of amplifier. The bandwidth is reasonably well constrained,  $-3dB$  points being at 3Hz and 48.5kHz. Though distortion measurements were fairly mediocre, this is no particular cause for concern, and factors like power supply modulation and distortion residuals were well under control while stereo separation is superb.

## SOUND QUALITY

The limited measured performance bore little if any relation to a handsome sound quality which could approach the sweetness and dynamics of expensive references in the vital midband. Initial listening was conducted on a

prototype, but a full production sample was re-auditioned before finalising the review. This final sample further enhanced transparency and subjective bass power over the earlier Renaissance — and gives a big improvement in every respect over the original STA25's capabilities. The sound does lack a little effort and 'slam' at low frequencies, and the treble adds a touch of 'lispiness', but the STA25 generates a generous and precise soundstage with genuine audiophile standards of imagery and dynamics.

## CONCLUSION

Nostalgia and sentiment may play a part in recommending this fine valve amplifier, but the latest enhancements have uprated the sound quality to a degree where it is fully competitive, albeit at a highish price. Its strength is subtlety rather than 'slam', but for those who appreciate the value of a delightful midrange it represents a fine proposition.

## TEST RESULTS

Power output	Integrated amplifier		
Rated power into 8ohms, maker's spec	25W(=14dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	9.3dBW	15.7dBW	15.1dBW
Both channels, 4ohm load	5.6dBW	12.9dBW	7dBW
One channel, 2ohms, pulsed	-dBW	11.6dBW	-dBW
Instantaneous peak current	=7.5A		
<b>Distortion</b>			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power	-36dB(10W)	-59dB	-41dB
Intermodulation, 19/20kHz, rated power	-43dB		
Intermodulation, 19/20kHz, at 0dBW	-54dB		
Noise *A wtd	-79dB(0dBW), -94dB(full output)		
DC output offset	0mV		
Stereo separation	95dB	109dB	108dB
Output impedance (damping)	0.69ohm	0.6ohm	1.15ohm
Channel balance	0.16dB		
Input	phono	105mV	100kohms
Size (width, height, depth)	42x23x25cm		
Typical price inc VAT	£977		

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Ilford Essex IG2 6LL  
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**AUDIOLAB 8000A**

CAMBRIDGE SYSTEMS TECHNOLOGY LTD, 26 ROMAN WAY, GODMANCHESTER, HUNTINGDON,  
CAMBS PE18 9LN. TEL: (0480) 52521



**N**ow a well established model, the 8000A has undergone extensive sound quality revisions for 1987, through subtle development and refinement. It is conservatively rated at 50W per channel.

In contrast to much UK equipment today, which is of 'straight line' design, the Audiolab does have tone controls; however these are said to be specifically designed to have a negligible effect on sound quality. Comprehensively equipped, the input facilities are all phono, and include disc (mm and mc), tape 1 and 2, plus tuner and CD/aux. A proper 'record out' selector matches the input selector. A headphone socket is provided, which mutes the two sets of speaker outputs via a high-quality relay. A small dealer modification provides for separate pre/power amp use if this is required by the user, but in this mode the circuitry which prevents switch-on thumps will not operate.

As well engineered internally as it is finished externally, the amplifier uses a large 250VA toroidal transformer specially mounted to reduce mechanical hum. The output stages are high-current, direct-coupled complementary, with a DC servo to rolloff the extreme subsonic response without need for the usual decoupling capacitor in the feedback loop. Full electronic protection is designed to allow adverse load drive. All discrete circuitry is employed. The mc headamp is a particularly careful design, and; in fact many of the design features are more commonly associated with more costly models.

**LAB REPORT**

Specified at 50W (17dBW) the amplifier demonstrated a fine power bandwidth at 19dBW into 8ohms. The 4ohm continuous delivery was also pretty good, while its ±28A peak current capability was more than sufficient for the rated power. Peak level approached 100W per channel (19.8dBW) holding well into 4ohms at 18.6dB and still very strong at 18dBW, 2ohms.

Harmonic and particularly intermodulation distortions were at negligible levels, in a sense showing that high-linearity circuits are not in themselves a barrier to good sound quality. Noise levels were fine, and the DC output offsets

*The broad middle ground of the UK amplifier market contains a wide variety of good sounding UK transistor models from around £200 upwards.*

negligible. input overload levels were ample, and stereo separation up with the best, bar the special double-mono amplifier types. Output impedance was low and channel balance very accurate, except at the lowest volume settings. Input sensitivities were sufficient for all classes of source, and the input characteristics can be changed via optional loading plugs. RIAA equalisation followed the IEC rolloff, hence the subsonic fall shown here, while the tone controls were suitably mild in action. The pre-amp output also offered a decent level at low impedance for other power amplifiers. Subjectively, no change in sound quality could be heard with the tone controls engaged.

**SOUND QUALITY**

This amplifier surprised all those who heard it. On moving-coil input the overall subjective rating was 'good plus', which is ahead of the competition. Its character was highly neutral, if very slightly 'clinical', with an open, wide frequency range and very presentable bass, the latter offering power, precision and extension. The midband was well defined, articulate and well-focused while the stereo image showed decent depth and ambience.

A marginal improvement of depth was noticed via moving-magnet input, while the treble remained slightly imperfect; here a hint of 'fuzziness' and 'grain' was a little sweeter than on moving-coil, with some further advance in treble quality and a touch more clarity.

The sound remained very good via aux dominated by a fine transparency and with additional, admittedly minor, improvements in stereo staging, depth, bass power and detail. It could get pretty loud, and sounded very tolerable into clipping, with 103dB possible into the normal loudspeaker. A fine load tolerance was

also evidenced by the 102dB produced into the severe load.

**CONCLUSIONS**

For '87, Audiolab have further enhanced the sound quality, by subtle improvements to the interior circuitry, so fully maintaining the model's keen competition. The 8000A is a fine integrated amplifier of very good power delivery with excellent finish and build quality. The tone controls do not detract from the performance, while its load tolerance is exceptional. A highly versatile model, this superior quality design remains firmly recommended.

**Test measurements**

To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the level into 4ohms and 2ohms is given in dBW (where 0dB = 1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

**TEST RESULTS**

<b>Power output</b>	Integrated amplifier		
Rated power into 8ohms, maker's spec	50W (= 17dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	19.4dBW	19.5dBW	19.0dBW
Both channels, 4ohm load	17.2dBW	17.6dBW	17.0dBW
One channel, 2ohms, pulsed	17.8dBW	18.0dBW	17.3dBW
Instantaneous peak current	+27A -28A		
<b>Distortion</b>	20Hz	1kHz	20kHz
Total harmonic distortion	-90dB	-95dB	-80dB
at rated power, aux input			
Intermodulation, 19/20kHz, rated power, aux input	-85dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm)	-85dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mc)	-80dB		
<b>Noise</b>			
Disc (mm) input (IHF, CCIR weighted)	-78dB		
Disc (mc) input (IHF, CCIR weighted)	-73dB		
Aux/CD input (IHF, CCIR weighted)	-82dB		
Residual, unweighted (volume control at min)	-78dB		
DC output offset	left 2mV, right 3mV		
<b>Input overload</b>	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	29dB	30dB	30dB
Disc (mc) input (IHF)*	26dB	26dB	26dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
<b>Stereo separation</b>			
Disc input (mm)	-90dB	-72dB	-50dB
Aux input	-78dB	-77dB	-56dB
Output impedance (damping)	0.03ohm	0.04ohm	0.12ohm
Channel balance, disc, at 1kHz	0.04dB		
Volume/balance tracking	0dB	-20dB	-60dB
Aux input	0.04dB	0.0dB	3.6dB
<b>Input data</b>	socket type sensitivity loading		
Disc (mm) input	DIN	0.3mV	47kohms 35pF
Disc (mc) input	DIN	0.007mV	100ohms 4.7nF
Aux input	DIN	12mV	20kohms 70pF
Output, pre-amp (tape)	7.7V max, 600ohms		
Disc equalisation error, 30Hz-15kHz	+0.1dB, -2.2dB		
Size (width, height, depth)	44.5 x 7.4 x 34cm		
Typical price inc VAT	£299		

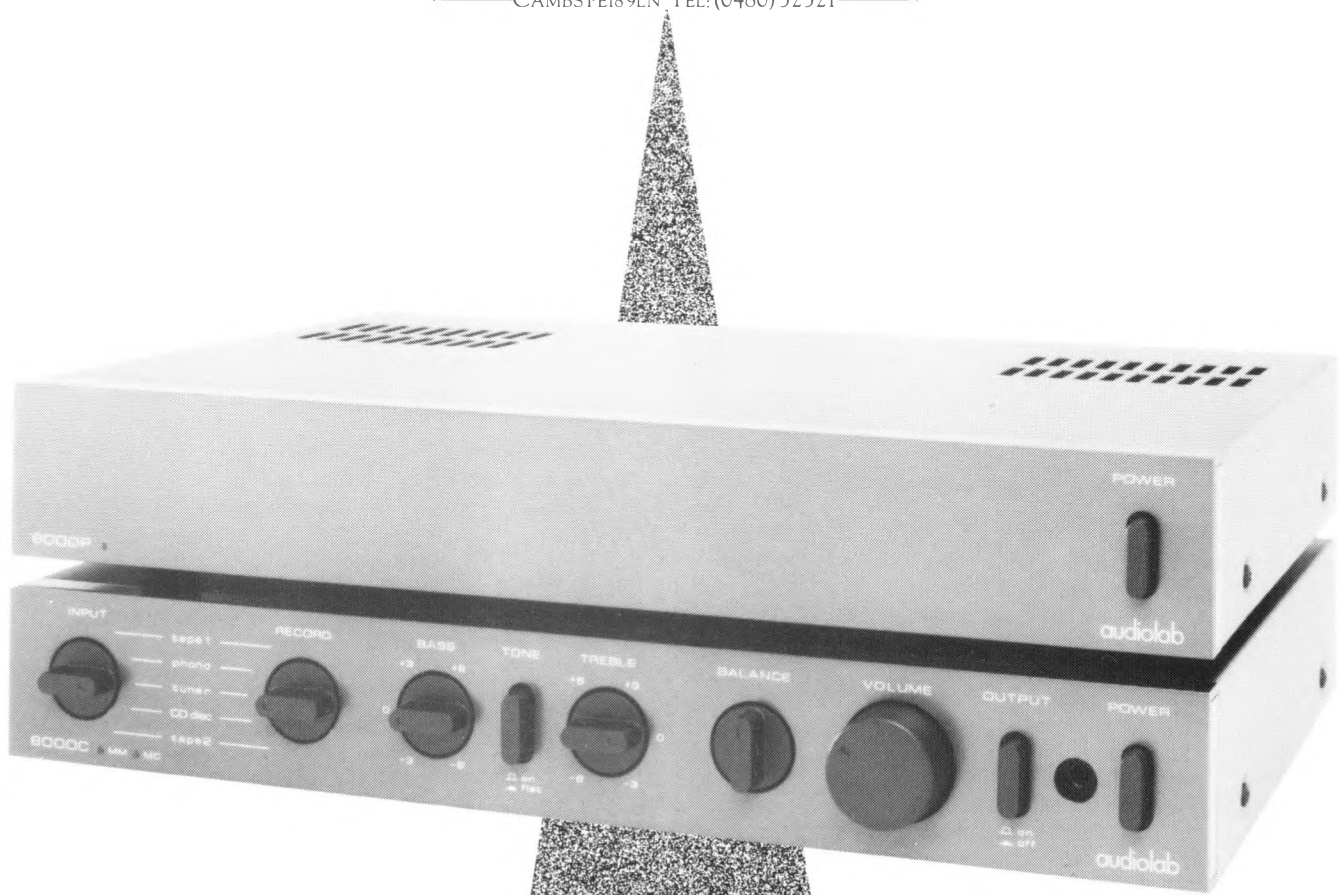
First reviewed: 1983. Retested 1985. Rating: Recommended.

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**AUDIOLAB 8000C/8000P**

CAMBRIDGE SYSTEMS TECHNOLOGY LTD, 26 ROMAN WAY, GODMANCHESTER, HUNTINGDON,  
CAMBS PE18 9LN. TEL: (0480) 52521

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These modern transistor designs offer impeccable specifications, yet much care has also been devoted to how they sound. The 8000C pre-amp is extremely versatile, including quality moving-coil and moving-magnet inputs, plus sensible tone controls which are virtually inaudible in terms of sound quality degradation when not in use; two tape decks and many other inputs may also be accommodated. A headphone outlet fed by its own small power amplifier is also provided.

The 100W (20dBW) per channel power amplifier has no controls bar the on/off switch. Speaker connection is via standard 4mm socket/binding posts.

**SOUND QUALITY**

Used with good cable, the Audiolab separates provided an impressive standard of sound quality, proving tidier, more refined and also more powerful than the 8000A integrated amp. High levels were produced into both loadings: 105dBa into 8ohms and 104dBa into 4ohms.

The good standard of stereo depth was maintained, while that slightly cold 'clinical' character of the integrated 8000A was again noted, indicating that the combination is again best suited to mildly rich speakers and cartridges. Precise and detailed with a clean articulate bass,

the Audiolabs' competitive scores set them apart in their price territory.

**LAB REPORT**

The power amplifier first, is clearly a very 'gutsy' performer with immaculate figures for power bandwidth, adverse load delivery and peak current — to the rest limit of ±40A! The pulsed delivery into 2ohms corresponded to 400W per channel into this load. All distortions were very low, negligibly so in fact, while DC offsets were also microscopic, thanks to the special DC servo in the amplifiers.

The pre-amp also measured very well, with flat frequency responses, good noise levels, sensible sensitivities and impedances, plus fine overload margins. Stereo separation was very good. The pre-amp could provide up to 10V

output, from a low source resistance of 100ohms.

**CONCLUSIONS**

A new round of detail improvements introduced at the end of 1986 have resulted in further significant subjective improvement. As a result, both components fully maintain highly competitive performance in their respective price categories.

**TEST RESULTS**

	Pre- and power amplifier
Rated power into 8ohms, maker's spec	100W (=20dBW)
Power output	20Hz: 1kHz: 20kHz
One channel, 8ohm load	21.6dBW 21.8dBW 21.4dBW
Both channels, 4ohm load	19.6dBW 20.0dBW 19.6dBW
One channel, 2ohms, pulsed	-dBW 20.3dBW -dBW
Instantaneous peak current	+40A -40A
Total harmonic distortion, 20Hz: 1kHz: 20kHz	
at rated power, aux input	<-90dB -93dB -74dB
<b>NOISE</b>	
Disc (mm) input (IHF, CCIR weighted)	-70dB
Disc (mc) input (IHF, CCIR weighted)	-67dB
Aux/CD input (IHF, CCIR weighted)	-70dB
Input overload	20Hz: 1kHz: 20kHz
Disc (mm) input (IHF)	26dB 31dB 30dB
Disc (mc) input (IHF)	30dB 26dB 25dB
Aux/CD input (IHF)	>20dB >20dB >20dB
Input data	socket type sensitivity loading
Disc (mm) input	Phono 0.28mV 47kohms 50pF
Disc (mc) input	Phono 0.018mV 10ohms -nF
Aux input	Phono 15/52mV 20kohms -pF
Power amp	Phono 1100mV 47kohms 320pF
Output, pre-amp (tape)	>5V 100ohms
Disc equalisation error, 30Hz-15kHz	+0dB, -2dB
Size (width, height, depth)	45 x 8 x 34cm, 45 x 8 x 34cm
Typical price inc VAT	£275 £450
First reviewed: 1985 (retested, 1986) Rating: Recommended.	

**MISSION CYRUS TWO AND PSX**

CYRUS ELECTRONICS LTD, STONEHILL, HUNTINGDON, CAMBS PE18 6ED.

TEL: (0480) 57477



**M**ission's *Cyrus One* and *Two* look very similar but important internal differences distinguish them, as well as the matter of some £150 sterling! For the *Two*, the output level has been increased to 50W (17dBW) and output current has also been doubled. Higher quality components are used while the disc stage has also been extensively upgraded to produce an 11dB improvement in noise level *via mc* with optimised input loading. Two large selector switches dominate the front panel, one for the sources and the other for record 'out'. No balance, tone or any other controls are present, save for volume.

The internal construction follows the *One*, using a single printed circuit board, plus a large Holden and Fisher toroidal mains transformer. The direct coupled output uses fast complementary output transistors in classic class A/B mode while the single power supply is shared between the channels. Input connections are phono, the speakers connected *via* large 4mm socket/binding posts which are located rather too close together. Mains input is *via* an IEC socket and matching cable, while a headphone outlet is located on the back panel. (This is not as inconvenient as it sounds, since the rear panel is an accessible horizontal ledge.)

**LAB REPORT**

Producing close on 18dBW on peaks, the *Two* happily drove the 8ohm load to 17.6dBW over the test power bandwidth. A significant 3dB loss in level was noted into 4ohms, both channels driven, suggesting the transformer could be larger (a special booster pack is now available — the optional *PSX*). The pulsed rating on 2ohms showed a little more than 2dB loss, confirming the worthwhile peak current rating of +19.5, -19A. Load tolerance was good. Both types of measured distortion were very low, particularly the high frequency intermodulation. Input noise levels were fine, including moving coil, while the DC offset at the speaker terminals was held to a satisfactory level. Input

overload levels were ample, and the overall output impedance was held to a negligible value. As with the *One*, channel separation was held at a constant but satisfactory average of 45dB.

Volume tracking was fine except at low settings and a better potentiometer would be an advantage here. All input loadings and sensitivities were to a sensible standard, while disc equalisation was accurate with a subsonic rolloff plus a touch of HF rolloff. The significance of the 40Hz power spectrum is not yet well established, but here the *Cyrus Two* was unexceptional.

**SOUND QUALITY**

One word sums up this remarkable amplifier: impressive! Good as the *Cyrus One* undoubtedly is, the *Two* is in another class altogether. The sound stage was spacious and deep, showing fine ambience, focus and breadth. It was transparent and produced much fine detail, remaining neutral and highly confident over the whole frequency range. It could also be driven hard without audible distress.

Maximum sound levels of 103dBa and 101.5dBa into an adverse load were obtained and it also clipped well. The fine quality held up well *via* disc. The tonal character was slightly bright with a touch of mid 'thinness', but lacked the usual hardness or brittleness often encountered with moderately priced gear. It could also do fair justice to some substantially good cartridges such as the van den Hul MC10, costing as much as the amplifier!

**CONCLUSIONS**

Reassessed for 1987 the *Cyrus Two* performance

continues to improve and remains quite exceptional in sound quality terms. Adding the *PSX* (a larger, separate power supply for the power amp section) we have a pre- and power-amp combination of slightly greater power delivery but not necessarily better sound, since the *Cyrus Two* alone is already edging towards true audiophile territory and commands a Best Buy rating.

**Test measurements**

To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the level into 4ohms and 2ohms is given in dBW (where 0dB=1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

**TEST RESULTS**

Power output		Integrated amplifier		
Rated power into 8ohms, maker's spec		50W (= 17dBW)		
Power output	20Hz	1kHz	20kHz	
One channel, 8ohm load	18.3dBW	18.5dBW	18.4dBW	
Both channels, 4ohm load	15.2dBW	15.8dBW	16.0dBW	
One channel, 2ohms, pulsed	-dBW	17.0dBW	-dBW	
Instantaneous peak current		+19.5	-19	
<b>Distortion</b>				
Total harmonic distortion	20Hz	1kHz	20kHz	
at rated power, aux input	-59dB	-68dB	-70dB	
Intermodulation, 19/20kHz: rated power, aux input		>	-88dB	
Intermodulation, 19/20kHz: at 0dBW, disc (mm)		>	-84dB	
Intermodulation, 19/20kHz: at 0dBW, disc (mc)		>	-84dB	
<b>Noise</b>				
Disc (mm) input (IHF, CCIR weighted)		-76.0dB		
Disc (mc) input (IHF, CCIR weighted)		-69.0dB		
Aux/CD input (IHF, CCIR weighted)		-80.0dB		
Residual, unweighted (volume control at min)		-73.0dB		
DC output offset	left	-26mV	right	13mV
DC offset, pre-amp	left	n/a	right	n/a
<b>Input overload</b>				
Disc (mm) input (IHF)	20Hz	1kHz	20kHz	
Disc (mc) input (IHF)	38.0dB	36.0dB	36.0dB	
Disc (mm) input (IHF)	26.0dB	23.0dB	23.0dB	
Aux/CD input (IHF)	>20dB	>20dB	>20dB	
<b>Stereo separation</b>				
Disc input (mm)	47.0dB	47.0dB	46.0dB	
Aux input	43.5dB	43.0dB	42.0dB	
Output impedance (damping)	0.15ohm	0.15ohm	0.15ohm	
Channel balance, disc, at 1kHz			1.8dB	
Volume/balance tracking	0dB	-20dB	-60dB	
Aux input	0.06dB	0.1dB	5.0dB	
<b>Input data</b>				
Disc (mm) input	socket type	sensitivity	loading	
Disc (mm) input	Phono	0.33mV	47kohms	260pF
Disc (mc) input	Phono	0.023mV	470kohms	7.5F
Aux input	Phono	60.0mV	14.0kohms	300pF
Power amp		-mV	-kohms	-pF
Output, pre-amp (tape)		75.0V max	700ohms	
Disc equalisation error, 30Hz-15kHz		+0dB	-1.0dB	
Size (width, height, depth)			21 x 9 x 34cm	
Typical price inc VAT			£300 (£500 with <i>PSX</i> )	
First reviewed: 1985. Rating: Best Buy.				

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MUSICAL FIDELITY MVT/P170

MUSICAL FIDELITY LTD, UNIT 34, SARCOTE TRADING ESTATE, DUDDEN HILL LANE, LONDON NW10  
 TEL: 01-451 7555



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Superficially the MVT might appear to be upmarket version of *The Preamp*, but in fact it is rather more than that. Front panel facilities include a full selector switch plus centre-detent balance control, while the power supply is a substantial outboard unit. The finish is excellent. Input sockets are gold-plated phonos, while the output connections are duplicated in XLR. The MVT can also give a phase-inverted output if required.

Providing a visual match for the MVT, the P170 is a slimline 85W per channel (19dBW) MOSFET power amplifier, constructed in a true double-mono configuration. The circuitry is a very simple, with moderate negative feedback and an input based on an IC op amp.

SOUND QUALITY

The P170 established a strong position in the listening tests, comfortably ahead of Musical Fidelity's earlier *Studio T*, for example. Spacious, if a little 'intense', it was clearly powerful, yet clean and controlled. Stereo images were well resolved with fine focus and pleasing depth. 'Grain' and veiling was kept in reasonable bounds while the bass performance was competent.

The most recent MVT review sample showed that this model is still fully competitive in its class. Voice quality attracted particularly strong praise, but there was less enthusiasm for the sound at the edges of the frequency range, with some congestion and untidiness attracting

criticism. Noted as having its own distinct character, the MVT was again well liked and highly rated.

LAB REPORT

The P170 power amplifier showed some mild weaknesses at high frequencies and into low impedances, but easily exceeded its nominal rating on 8 ohms with music programme, reaching 150W per channel. It just held spec into 4 ohms 1kHz, attaining a true 150W here. Peak current was unexceptional, but this did not appear to constrain the performance unduly. Distortions were generally good though the high frequency intermodulation result relates to a rather lower power. Stereo separation was very good though the input impedance was a rather low 6.5kohms. DC offsets at the output were negligible.

The MVT pre-amplifier showed excellently low distortion as well as good overload headroom. The channels were well balanced with above average separation, and the inputs

were sensibly specified with fine signal-to-noise ratios. Disc RIAA equalisation was accurate and the final output impedance was low enough for long cable runs.

CONCLUSIONS

The P170 acquitted itself well, achieving a fine standard in its price category and a recommendation is clearly in order, particularly for use with kinder speaker loads. The MVT attains true audiophile status. With its own attractive character and at under £1000 it can take on some of the world's finest.

TEST RESULTS

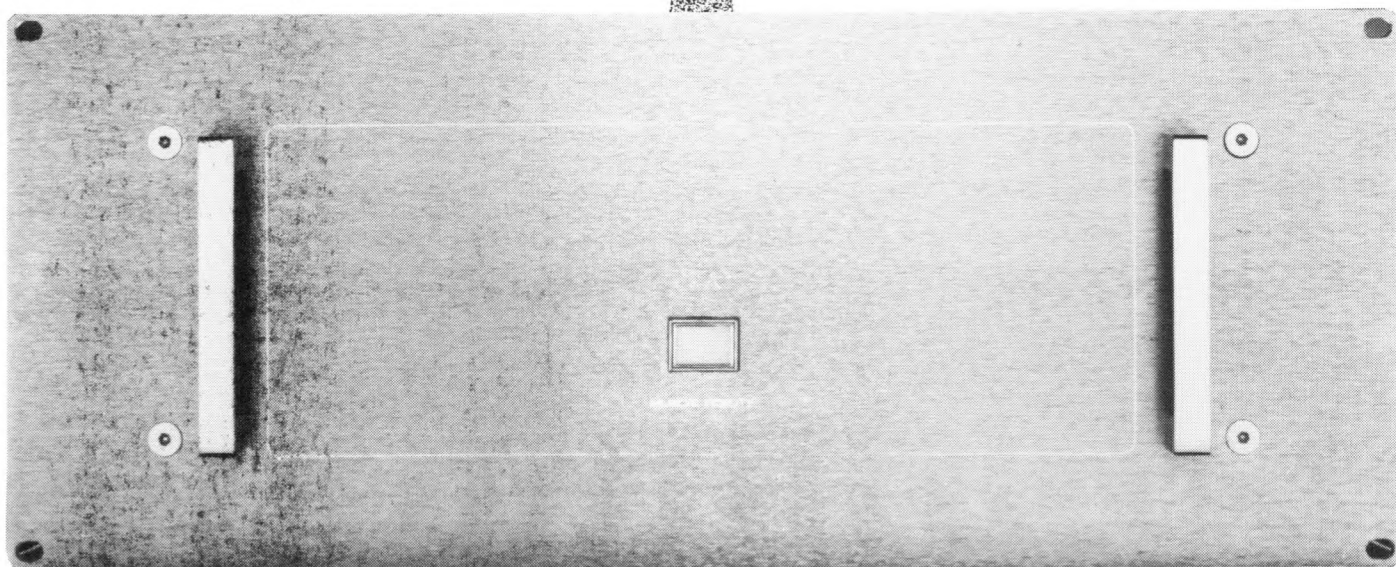
		Pre- and power amplifier	
Rated power into 8ohms, maker's spec		85W (=19dBW)	
Power output	20Hz 1kHz 20kHz		
One channel, 8ohm load		20.3dBW 21.0dBW 17.4dBW	
Both channels, 4ohm load		17.7dBW 18.9dBW 16.6dBW	
One channel, 2ohms, pulsed		-14dBW 14.7dBW -14dBW	
Instantaneous peak current		+8.0A -9.5A	
Total harmonic distortion	20Hz 1kHz 20kHz		
at rated power, aux input		-38.0dB -94.0dB -82.9dB	
Noise			
Disc (mm) input (IHF, CCIR weighted)		-77.0dB	
Disc (mc) input (IHF, CCIR weighted)		-72.5dB	
Aux/CD input (IHF, CCIR weighted)		-93.0dB	
Input overload	20Hz 1kHz 20kHz		
Disc (mm) input (IHF)		32.0dB 31.9dB 31.2dB	
Disc (mc) input (IHF)		27.0dB 25.7dB 25.7dB	
Aux/CD input (IHF)		>20dB >20dB >20dB	
Input data	socket type sensitivity loading		
Disc (mm) input	Phono 1.78mV 46kohms	60pF	
Disc (mc) input	Phono 0.09mV 94kohms	25pF	
Aux input	Phono 89mV 45kohms	-pF	
Power amp	Phono/XLR n/a n/a	n/a n/a	
Outputs, pre-amp		7.8V max, 100ohms	
Disc equalisation error, 30Hz-15kHz		+0dB, -0.34dB	
Size (width, height, depth)		48 x 6 x 20.5cm, 48 x 6 x 23cm	
Typical price inc VAT		£990, £460	

First reviewed: 1986 Rating: Recommended

MUSICAL FIDELITY P270

MUSICAL FIDELITY LTD, 16 OLYMPIC TRADING ESTATE, FULTON RD, WEMBLEY HA9 0ND.

TEL: 01-900 2999



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Following the success of the Tim de Pararvacini-designed P170, a 85W/channel power amp costing around £500, Musical Fidelity have now launched two larger and more expensive power amplifiers, as alternative (and arguably more price-appropriate) partners for their well regarded £1,000 MVT pre-amp. The first of these to appear was the gigantic A370, a £2,000 powerhouse delivering 185W/channel, operating substantially in class A mode and weighing a back-breaking 40kg, which MC and others rate very highly.

But the P270 covered in detail in this review is perhaps better suited to the British pocket and appetite for power. The price matches the MVT at around £1,000, and the unit is correspondingly smaller and lighter (though by no means small and light). The P prefix indicates this is strictly speaking a class A/B design, but one that operates in class A over about 20-30% of its dynamic range.

It is therefore big, black and inevitably rather brutish in appearance, is a heavy load for one person, and gets very hot when on, relying on convection cooling. The case reaches 60°C, which is very warm though it won't actually burn — some 20°C above British Standards. But at least this means it warms up quite quickly, in about 15 mins, and needn't be left on. The heating effect is an inevitable function of part class A operating, giving mild cause for concern over minor details like the electricity bill and the effects on room heating/cooling. (Class A power amplifiers are not an ideal for those without airconditioning who listen at length through the summer months — but why not mount it in the Victorian fireplace instead of that new-fangled gas heater?)

Internal inspection reveals that this is

effectively a 'double mono' design, with a symmetric circuit founded on a high slew rate op-amp input, and using multiple FET devices for the output. The toroids and power supply capacitors are both generous considering the price, with regulators supplying early stages. Attention to constructional detail is reflected in single strand LC internal wiring and custom polypropylene capacitors.

LAB REPORT

The substantial power rating was comfortably exceeded on test, and was generally well maintained into lower impedances, though the ultimate current delivery of +25/-27A peak to peak is no larger than amplifiers less apparently impressive on rating, so this is not really a bargain-price *Scintilla* driver. There was an odd slight peaking in the frequency response at 20Hz, amounting to less than 1dB, while the output impedance is high enough to cause slight response differences with low impedance loudspeakers. In other respects the measurements were fine, and mechanical hum was very low.

SOUND QUALITY

Despite a price that could be considered quite modest in an audiophile context, the P270 fully deserves such status, delivering a sound quality that bears comparison with and catches much of the flavour of models costing far more, though it lacks some subtlety and refinement compared with the very best. The fundamental character was a little rich, with some criticisms of bass unevenness, but an appreciation of good staging with scale, detail and clarity. The treble was a trifle bright, lacking some fine detail but still quite sweet. One observer questioned whether initial impressiveness could become wearing, but others were positively enthusiastic.

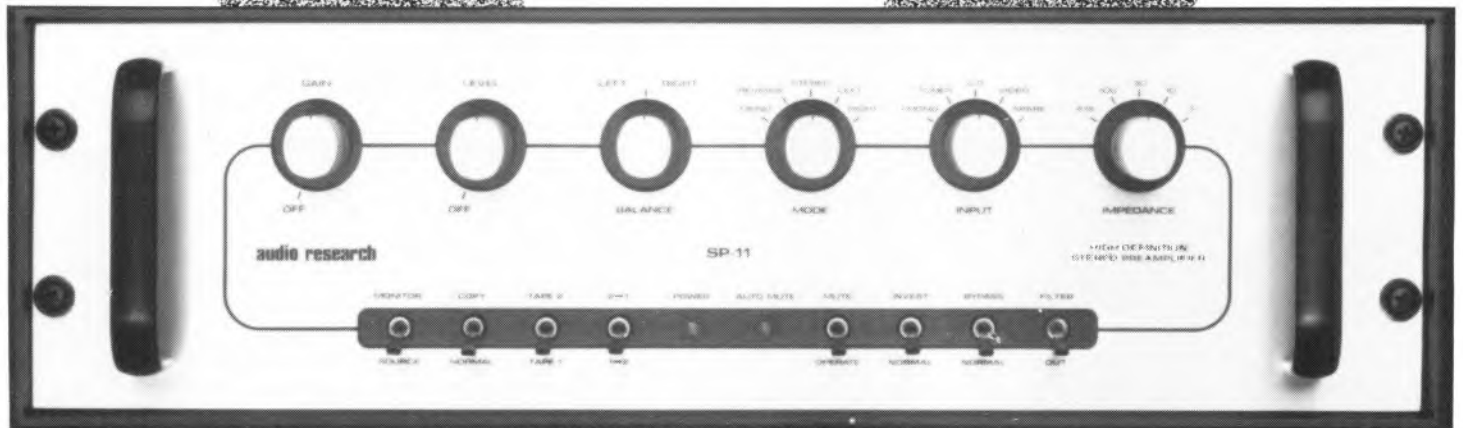
CONCLUSIONS

If the 'hot box' prospect is not a deterrent, this is something of a bargain, offering genuine, big amplifier 'scale', albeit with a sound that is just a little rough around the edges. It clearly merits strong recommendation, offering solid value for money and plenty of load-tolerant watts.

TEST RESULTS

Power output	Integrated amplifier		
Rated power into 8ohms, maker's spec	135W (=21dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	23.7dBW	23.7dBW	23.5dBW
Both channels, 4ohm load	22.6dBW	22.6dBW	22.3dBW
One channel, 2ohms, pulsed	-dBW	23.6dBW	-dBW
Instantaneous peak current	+25, -27A		
<b>Distortion</b>			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	-78dB	-87dB	-72dB
Intermodulation, 19/20kHz, rated power, aux input	-98dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm)	-97dB		
Noise 'A' wtd	-84dB(0dBW), -105dB(full output)		
DC output offset	left 0mV, right 0mV		
Output impedance (damping)	0.13ohm	0.13ohm	0.13ohm
Channel balance, disc, at 1kHz	0.06dB		
Input	phonos	93mV	84kohm 4.4nF
Size (width, height, depth)	48x18x31cm		
Typical price inc VAT	£1,000		

## AUDIO RESEARCH SP11/M100

ABSOLUTE SOUNDS, 42 PARKSIDE, LONDON SW19  
TEL: 01-947 5047A  
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These true 'high end' products are extremely expensive, and together with matching cables will cost in the region of £10,000. Excepting the odd regulator, tubes (valves) are used throughout, and the basic specification is 100W, 20dBW per channel. Since something of comparable power may be purchased for a fraction of the cost of the Audio Research units, we have to be talking of some pretty substantial sound quality advantages to justify the differential. In fact these products are close to the state of the art, with advanced circuit design reflected by exceptional sound quality.

In a sense the M100 monoblock power amplifiers can be seen as a similar logical development. The excellent *D115 II* power amp represents a practical high performance stereo chassis; in the M100 a *D115* frame becomes a mono power amp, with all its resources devoted to just one channel.

Left at this point, such an amplifier would have certain advantages, but ARC have gone further. New generation circuitry lifts the performance well beyond the previous, already very good, standard. High current output drivers have been fitted, while the output biasing scheme has been improved with the advantage of easier setting up. Capacitors have been eliminated from earlier stages by using DC coupling, augmented by an additional servo amplifier to stabilise the correct operating points, dynam-

cally and statically. ARC's balanced cross-coupled circuit technology is retained including the special coupling for the output tubes, both to the primary and secondaries of the superb output transformers.

The *SP11* pre-amplifier is a two-box affair, the second box containing the solidstate power supply. Comprehensive inputs include a disc input suitable for moving-coil cartridges of healthy output, and the ideal loadings may be selected conveniently by a front panel switch. A 'straight line' design, no tone controls are present, and the signal paths are wideband. A bypass switch routes the disc signal direct to the output stage, avoiding the 'balance' and 'mono-stereo' selector sections.

Pre-amplifier circuitry includes advanced cascade configurations combining low noise FETs and valves at the input to improve the overall dynamic range. Good channel separation is assured by the separated internal design and the extensive use of regulated supplies to isolate the channels and separate stages. ARC have long made it a policy to devote as much attention to the sound quality effects of their power supplies as to the amplifying circuitry.

On matching, the *SP11* is capable of driving quite long cables — up to 15 metres if required. On the M100 power amplifiers, output taps are provided for 16, 8 and 4ohm loads, but the *Scintilla* speaker (by the same importer) is a special case.

## SOUND QUALITY

These are both truly exceptional products. They worked superbly as a pair, effortlessly delivering musical dynamic sound stages, and at the end of the review it proved hard to part with them! The new *SP11* pre amp provides still further improvement on the already exceptional *SP10*. It is clearly one of the world's finest, capable of superbly focused, stable stereo images, finely textured and virtually grainless.

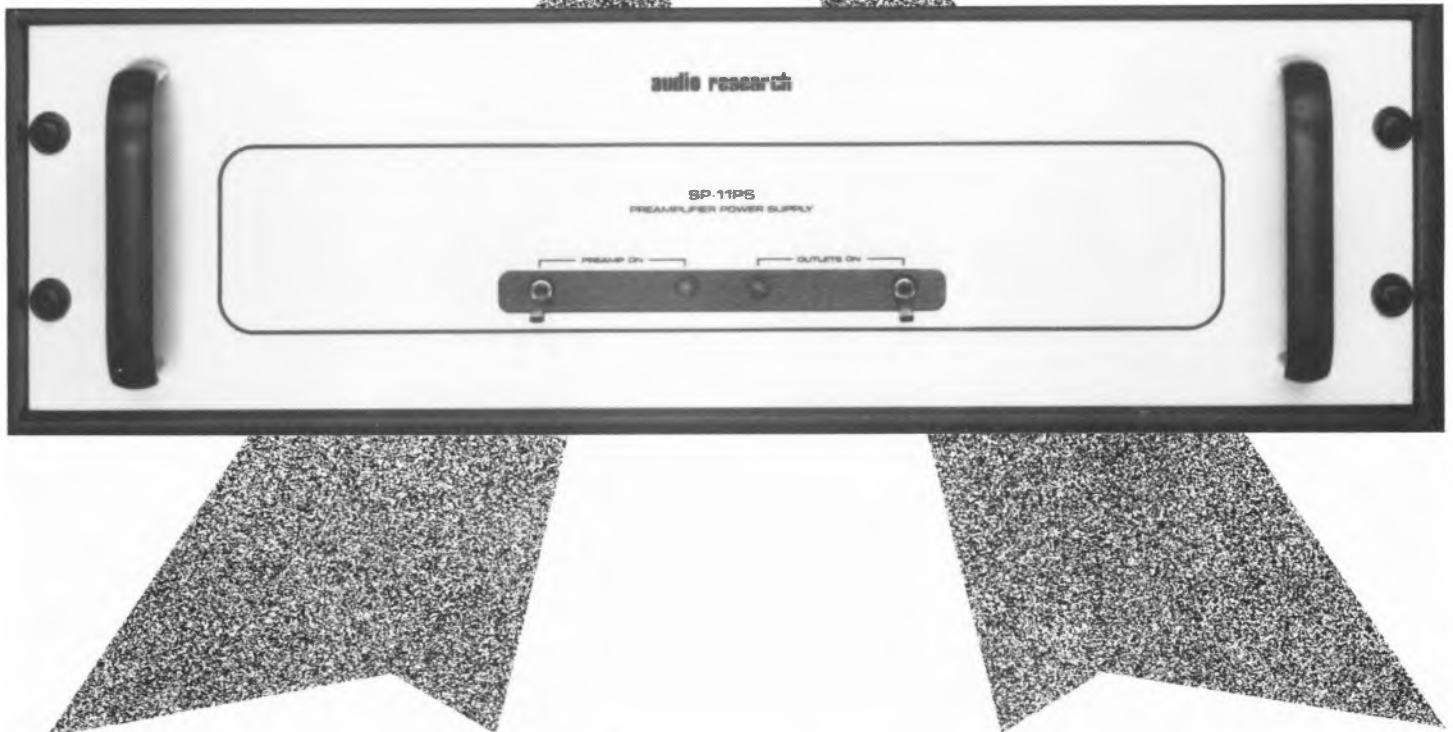
Essentially neutral with only mild coloration, all areas of the audible frequency range were reproduced very well. A particular strength concerned subjective dynamics, where the *SP11* drew and held one's attention by maintaining the 'drive' and 'life' in the programme. This proved true of both classical and popular material over a wide range of programme quality.

The M100 power amplifier initially left us speechless. It was one of those great products that can genuinely expand one's horizons and point to the way ahead. One of the finest amplifiers I have ever had the pleasure to hear, its tonality was extraordinarily rich — one might think too much so if one did not know better. The treble was devoid of grain and false projection while the bass was immensely deep and powerful, suggesting that the loudspeakers had been set in a concrete sub-floor. Against this authoritative, pure musical character, the ampli-



# MONEY NO OBJECT

*Amplifiers have always had a greater tendency towards extravagance than any other component, and several of the following double as space heaters while they are at it (summer or winter!). Expensive amplifiers sound better than cheap ones; the conundrum is whether to passive drive with one top price amplifier set, or multi-amp with something cheaper.*



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fier displays a sparkling lively transient performance with thrilling dynamic impact. Dynamic contrasts took me by surprise, so revealing was this amplifier's performance in this particular area. It was highly transparent over a very wide frequency range, and produced excellent subjective depth in the stereo image. The latter was of huge scale, yet remained superbly and stably focused.

## LAB REPORT

We experienced no headroom problems with the SP11, since it could produce more than 80V output from a moderate 240ohm output impedance. At nominal 0.5V outputs, with an IHF standard input the harmonic and intermodulation distortion figures were very good over the whole frequency range, for example 0.003% at 1kHz. An increase in intermodulation was noted via disc. Noise levels were very good for the nominally moving-magnet disc input and when this was used as a moving-coil compatible input with the appropriate loading, noise levels were just satisfactory; but this is a technical qualification only, and in practice, many owners use Koetsu and other similar cartridges with fine results.

Figures for input overload relate to two gain conditions, set to 'high' for moving-coil and 'low' for moving-magnet. Good overload margins were shown for both conditions, while the reducing margin at high frequencies is not

uncommon with valve pre-amps. Channel separation varied depending on whether the crosstalk was measured right on left or left on right, and was fairly unimpressive at high frequencies. However, no adverse subjective effects were noted as a result of this. The RIAA equalisation was highly accurate.

The M100 power amplifier comfortably met its 20dBW specification when working into a correctly matched 8ohm load. Output impedance was a moderate 0.46ohms, and it showed a good power bandwidth provided that the appropriate load tap was used. Current delivery was pretty good for a valve amplifier and it also proved surprisingly load tolerant. Distortions were satisfactory at full power and improved markedly at more realistic, lower powers. For example, by 0dBW, 1 watt, the 19/20kHz intermodulation distortion had fallen to -72.3dB compared with -47.6dB at full level.

Noise levels were satisfactory while the frequency response was very wide, extending from less than 0.5Hz to 33.5kHz for small -0.5dB limits. Within the audio range it was almost perfectly flat though some variation will be imposed on the output impedance by speaker loading differences. A good result was obtained for the power modulation test, producing a graph dominated by pure harmonics of the input frequency.

## CONCLUSIONS

Both these products are currently secure at their respective price points. Given good matching to the source, the SP11's performance was very good indeed. Such review approval is extended still further in the case of the M100 power amplifier, whose performance bordered on the magical within the current power limits of this transformer-coupled valve design. The comments were all highly positive for an amazing product which is destined to make its own audio legend.

## TEST RESULTS

Rated power into 8ohms, maker's spec	100W (=20dBW)
Power output	20Hz 1kHz 20kHz
One channel, 8ohm load	16.6dBW 21.1dBW 20.4dBW
Both channels, 4ohm load	17.6dBW
One channel, 2ohms, pulsed	16dBW
Instantaneous peak current	+12A -12A
Total harmonic distortion, at rated power, aux input	20Hz 1kHz 20kHz -47.9dB -52.0dB -41.8dB
NOISE*	
Disc (mm) input (IHF, CCIR weighted)	-80dB
Disc (mc) input (IHF, CCIR weighted)	-64dB
Aux/CD input (IHF, CCIR weighted)	-89dB
Input overload	20Hz 1kHz 20kHz
Disc (mm) input (IHF)	25dB 25dB 31dB
Disc (mc) input (IHF)	45dB 45dB 51dB
Aux/CD input (IHF)	>20dB >20dB >20dB
Input data	socket type sensitivity loading
Disc (mm) input	Phono 0.09mV 47kohms 500pF
Disc (mc) input	Phono 0.09mV 100kohms 150pF
Aux input	Phono 29mV 4.7kohms 50pF
Power amp	Phono 69.5mV 100kohms
Output, pre-amp (tape)	94.8V max. 240ohms
Disc equalisation error, 30Hz-15kHz	+0.03dB -0.04dB
Size (width, height, depth)	48 x 14 x 34cm*
Typical price inc VAT	£1510, £2850



## CELLO AUDIO SUITE

AUTOMATION SCIENCES CO, 20 LITTLE GADDESSEN, BERKHAMSTED, HERTS HF4 1PA.

TEL: (044284) 2786

**A** **C**ello (by Mark Levinson) are a fairly new company that brings the legend himself back into high end audio manufacture. The original ML amplifiers created their reputation almost as much for their extravagant prices as undoubtedly fine performance; they are still manufactured and marketed by Mark Levinson Audio Systems (MLAS), and still command considerable respect.

Cello represents a whole new ball game. It is unique in a number of respects — and on this occasion challenges the well-heeled to put down the price of a Porsche for his amplification! Or you can start with a Golf GTI's worth of *Audio Suite* pre-amp, which is the specific subject of this review. But for interest's sake we'll also run through the other goodies lurking under the Cello banner.

In fact Cello is conceived as a complete end-to-end system, in the belief that this is essential in avoiding frustration and disappointment. Signal source components are planned, but are so far limited to the *Chorale* cartridge (see p85), but the *Audio Suite* combines with the tone-shaping *Palette* (see below), *Performance* power amplifiers, and *Amati* loudspeakers to create the rest of the chain. Each component is essentially modular, allowing flexibility in configuration to match changes in circumstances.

### ANCILLARIES

Beyond the *Audio Suite* lies the *Audio Palette*, a similarly large rackable module that is nothing more nor less than £9,000 worth of tone controller. The original Mark Levinson designs were amongst the first to abandon tone controls because of their adverse influence on sound quality. The UK audiophile has spent a decade talking himself out of wanting such devices, and nowadays the majority of enthusiast oriented designs have 'straight through' circuitry. Then along comes Mr Levinson with one that he claims really works (claims which seem largely substantiated).

However, *Palette* is a long way from any normal tone control or equaliser. It is really an expression of the philosophy that some gentle tone-shaping can be preferable in some instances, providing the equalising circuitry is of the highest quality. The unit looks very imposing with its 12 large round matching knobs, six of which provide gentle equalisation around

six frequency centres, four in-band and the other two just beyond audibility for trimming the rolloffs. Long Litz-type connectors couple *Palette* to the rest of the system, so the unit may be operated from the listening seat.

*Performance* is a high power, class A/B transistor power amplifier, rated at a conservative 200W into 8ohms and unlikely ever to run out of current. Each channel has separate amplification and power supply chassis, the four required for stereo operation weighing some 136kg, and costing over £25,000. *Amati* are derived from the classic AR *LST* loudspeakers in terms of the overall concept, providing full range output from a quite compact source, with the option of stacking extra modules if extra level is required.

### AUDIO SUITE

The *Suite* itself does a pre-amp's job, but is something of a system in its own right. Fed from a massive external, fully regulated power supply the size of many power amplifiers, it is a large full-width rack to which the desired pre-amp modules are fitted, and can accommodate any desired selection of inputs and outputs from a wide (and planned wider) selection.

Unused sections of the rack are fitted with blanking plates until such time as they are needed. Furthermore, the various modules are

available at different quality/price points (from the very expensive to the faintly ludicrous, it's true). This exceptional flexibility naturally ensures that the entire system is 'future ready', able to accommodate any new requirements or performance upgrades. The rack itself is a passive device without electronics, which consists of a dozen substantial copper buss bars which provide signal and power supply paths between the modules and power supply, the requisite contacts being made automatically when the module is screwed into place. This buss bar system acts like the 'virtual earth' system often used in studio mixing desks: the output module simply reads the buss, while the input modules may be assigned as required (severally or one at a time, according to taste!). Balanced line operation is available on some of the modules and extends through the power amplification.

One key element of the *Suite* is its remarkable 'volume control', probably the least compromised and most expensive such device ever produced, and clearly the product of frustration with a component that was increasingly becoming the limiting factor in the signal path. The Cello control is a 59 position rotary attenuator, using discrete high quality metal film resistors throughout. It is fully calibrated, typically holding 1dB steps with an accuracy of 0.1%. 'Feel' is enhanced by the low torque shaft running in ballbearings, with positive detent action.

The quality of components and construction is completely beyond criticism — a glance inside is guaranteed to stimulate the salivary glands of any red-blooded electronics engineer. A major design consideration is longevity and longterm reliability — which accounts for the exotic connectors that are used, simply because most standard types show some deterioration over an extended period. Fischer (3-wire) connectors are preferred for balanced work, and Tiffany phonos for unbalanced applications, though any connectors may be specified.

### OPTIONS

The *Audio Suite* shopping list is formidable. You've got to start with the £1270 *Master Supply* and £1575 *Mainframe*. You then need to add at least one but probably more input modules and an output module. These modules are currently offered in B (basic) and P (premium) forms, the former combining discrete components with ICs



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and costing around £1,000, the latter being constructed entirely in discrete components and retailing at nearer £3,000 each.

A typical configuration would include premium m-c cartridge, premium output, and basic line input (a passive unbalanced switcher for up to five general sources), and this would add up to a total price close to £10,000. Additional balanced premium line inputs cost around £1,000 a time.

**LAB REPORT**

Mildly exhausted by the general description, what can one say? The prospect of finding any technical flaws in a system of such pretension and price is risible, and testing bound to be largely going through the motions. We analysed both premium and basic inputs, the printed data referring to the former. There was not much difference, and nothing worth criticising on either of them.

One interesting observation is that although the disc RIAA response is very flat from 20Hz-20kHz, distinct rolloffs commence immediately beyond that range. This is probably a good thing, but it could be described as a little conservative in the light of current trends in 'high end' pre-amps.

**SOUND QUALITY**

After the foregoing it would be disappointing if the *Audio Suite* didn't deliver the sonic goods. Happily quite the reverse, the *Suite* comfortably established new standards of reference in a number of performance areas. The combination

of relaxing high resolution across a wide bandwidth and through a deep and 'fast' dynamic range was entirely seductive.

Delicacy, transparency, and 'bounce' were all notable characteristics, while the stereo staging was handsomely extended every which way with focus, depth and precision. The *Suite* is to some extent only as good as its sources, but can be relied upon to make as good a job as possible with whatever it receives — vinyl surface noise effects seemed less inclined to get in the way than is usually the case.

**CONCLUSIONS**

The *Audio Suite* may be a silly price, but it is a far from silly product. Anyone who is really

searching for the best ought to make a serious effort to check this one out. The aesthetics may not be to everyone's taste, but the operational feel and constructional standards match a superb sound quality. The unique architecture makes conventional pre-amps appear a little conceptually dated, ensuring a freedom from the old bugbear of regular obsolescence. With *Cello* you just upgrade a module (granted that said module can cost as much as most pre-amps). Recommendation is mandatory.

**TEST RESULTS**

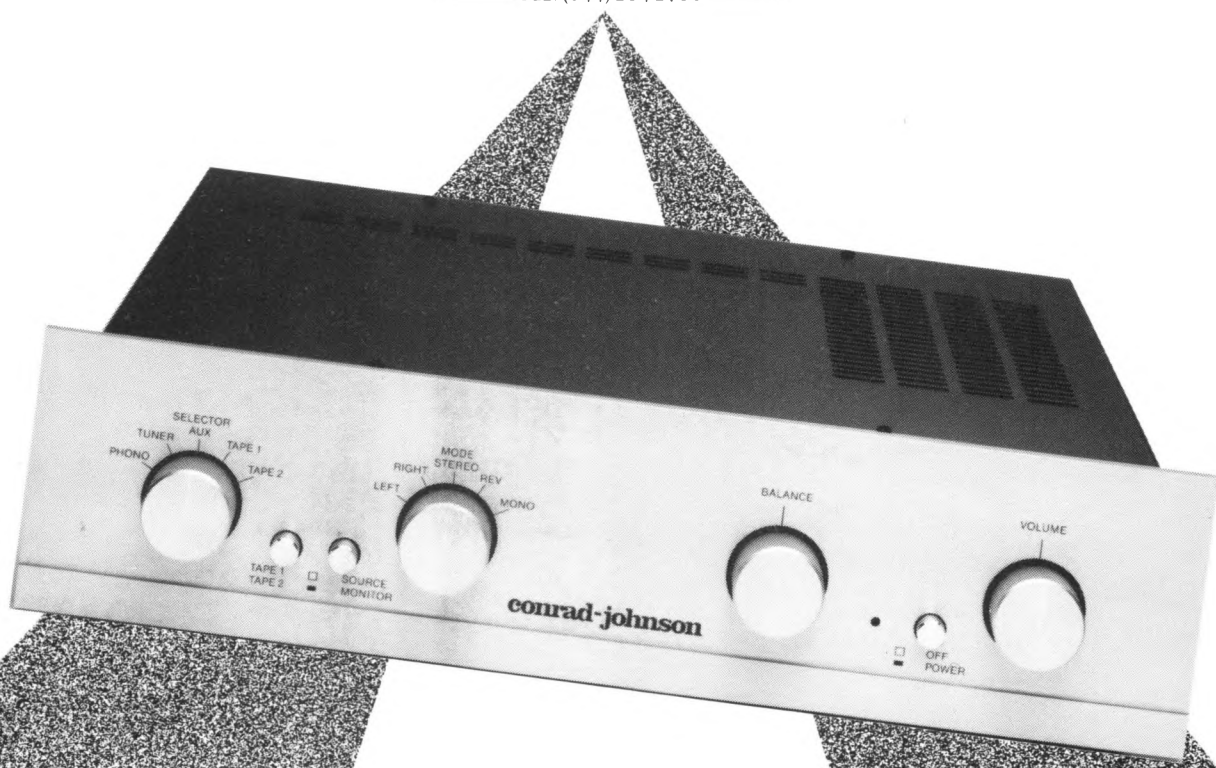
<b>Power output</b>	Pre-amp		
<b>Distortion</b>			
Total harmonic distortion, _____ 20Hz 1kHz 20kHz			
at rated level, disc _____	<-90dB	<-88dB	<-90dB
Intermodulation, 19/20kHz, rated power, aux input _____	<-90dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm) _____			-73dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc) _____			-63dB
<b>Noise</b>			
Disc (mm) input (IHF, CCIR weighted) _____			n/a
Disc (mc) input (IHF, CCIR weighted) _____			-64dB
Aux/CD input (IHF, CCIR weighted) _____			-84dB
Residual, unweighted (volume control at min) _____			-97dB
DC offset, pre-amp _____	left 0mV, right 0mV		
<b>Input overload</b>	20Hz 1kHz 20kHz		
Disc (mm) input (IHF) _____	n/a	n/a	n/a
Disc (mc) input (IHF)* _____	30dB	28dB	28.4dB
Aux/CD input (IHF) _____	>20dB	>20dB	>20dB
<b>Stereo separation</b>			
Disc input (mm) _____	>110dB	86dB	64dB
Aux input _____	<-110dB		
	B	76dB	56dB
Channel balance, disc, at 1kHz _____			0.01dB
<b>Volume/balance tracking</b>	GdB	-20dB	-60dB
Aux input _____	0dB	0.03dB	0.01dB
<b>Input data</b>	socket type	sensitivity	loading
Disc (mc) input* _____	Fischer bal.	0.15mV	992ohms 50pF
Aux input _____	Fischer bal.	165mV	10kohms 480pF
Output, pre-amp (tape) _____			16.8V max, 91ohms
Disc equalisation error, 30Hz-15kHz _____		+0.1dB, -0.05dB	
Size (width, height, depth) _____			48x23x30
Typical price inc VAT _____			from £6,000 (typically £10,000)



**CONRAD JOHNSON PV5/MV50**

AUTOMATION SCIENCES CO, 20 LITTLE GADDESSEN, BERKHAMSTED, HERTS HP4 1PA.

TEL: (044) 284 2786



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Long established in their American home market, Conrad Johnson high quality valve amplifiers are now gaining a foothold in the UK too. The line currently includes products from about £995 upwards, the PV5/MV50 combination occupies the middle price range — though at around £3800 a pair, they are clearly 'high end' audiophile products as far as the UK is concerned.

For 1987, the PV5 is now more simply made, and is without the rack mounting and handles of the earlier version in which the mode selector and balance controls had been by-passed to improve transparency. The PV5 is roughly equivalent to the Audio Research SP8 at a similar price. Well equipped, its facilities include a moving-magnet input which has sufficient gain to work with higher-output moving-coil cartridges, at the expense of some background noise; ideally a good step-up transformer (at extra cost) is required for m-c use. The PV5's output characteristics are compatible with most power amplifiers.

The MV50 is a compact power amplifier of fairly traditional valve design, rated at 50W (17dBW) per channel. Transformer taps are provided for 4, 8 and 16ohm. The MV50 was reasonably load-tolerant, with a better current delivery than the earlier MV45 (reviewed back in 1985).

**SOUND QUALITY**

Assessed in combination, the CJs offered a very pleasant and musical sound, almost what one might have been led to expect from traditional tube gear. At low to moderate power levels there was a delicate grace to the sound with a tonal richness and spacious perspective which beguiled the listening panel.

Auditioned separately, both PV5 and MV50 performed very well, possessing fine stereo

precision, depth, tonal accuracy and detail which placed them in the top rank.

The MV50 possessed undeniable virtues redolent of the Premier series. Good sound levels were achieved, free from strain, the 4ohm tap providing the finest control and bass attack. Treble was excellent, bass very natural. Depth perspectives were finely-drawn, giving a relaxed musical performance full of subtle detail with excellent stereo focus.

**LAB REPORT**

Power output was excellent at mid frequencies but was weaker at the band extremes. For a 1% distortion limit, the 20Hz power was 16.2dBW. The 4ohm delivery showed great improvement over the old MV45, 6.5dB at 20Hz. Peak current and 2ohm delivery were also quite good.

Low level harmonic distortion was very good and at full power the 1kHz distortion held to 0.05%, though it deteriorated at the frequency extremes.

The pre-amp noise levels were satisfactory (only just for mc) while overload levels were exemplary. Stereo channel separation was about average with volume tracking and balance both excellent. Disc equalisation was essentially flat, bar a mild lift at extreme low frequencies. The power amp output impedance was reasonable at around 0.8ohm (8ohms), contrasting with the MV45's weak 3.5ohms at 20kHz.

**CONCLUSIONS**

These CJs performed very well on audition. The 'by-passed' PV5 is a genuine audiophile proposition, and the MV50 offers exceptional performance. 'Premier 50' would perhaps have been a fairer title as we felt it could reach the old Premier Four a thing or two. The MV50

partners both the PV5 and the Premier Three well, the latter also available 'by-passed', with improved sound quality.

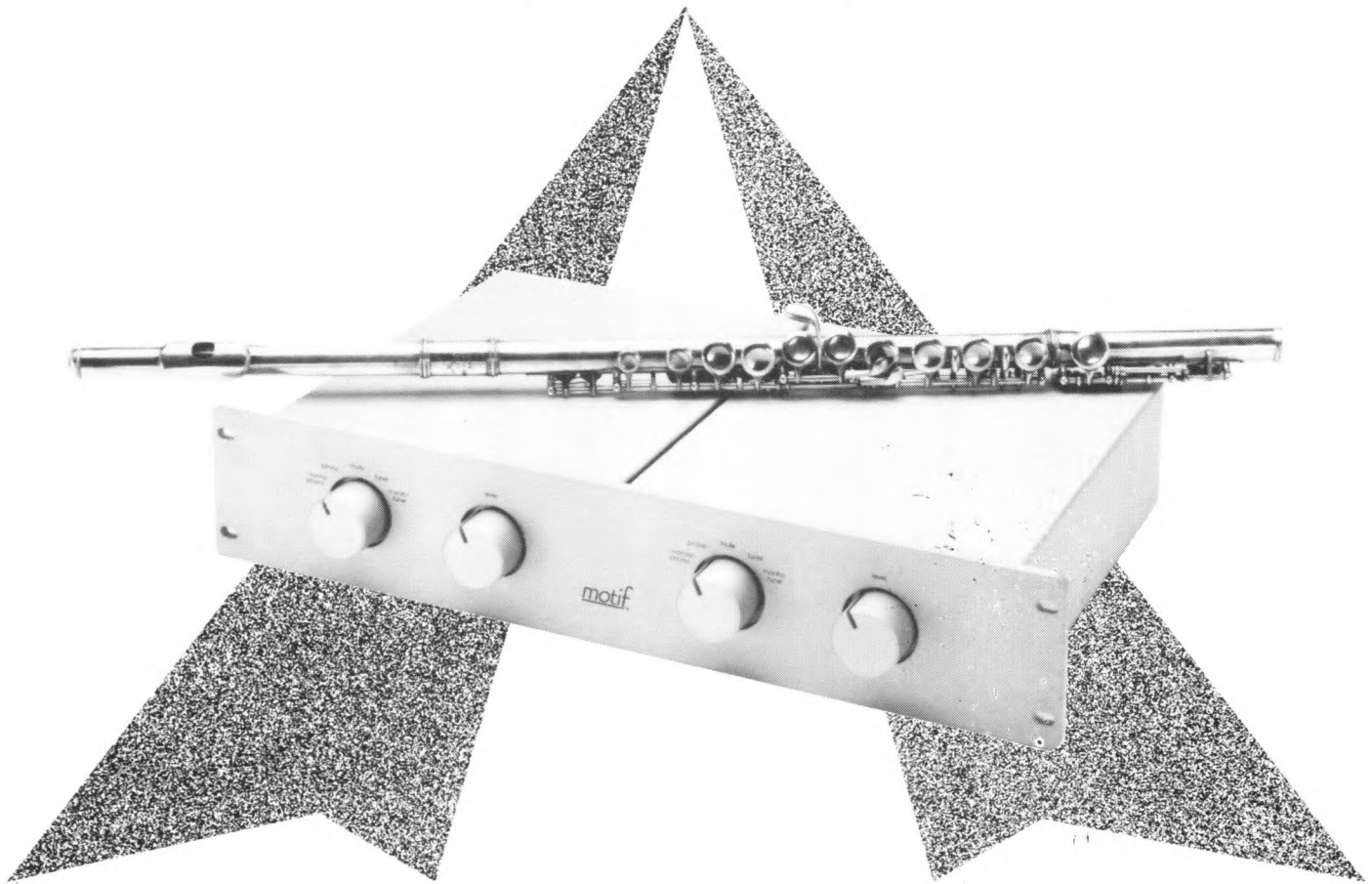
Together the pair represent a substantial audiophile achievement at a cost of some £3800, attaining firm recommendation.

**TEST RESULTS**

Power output	Integrated amplifier		
Rated power into 8ohms, maker's spec	50W (= 17dBW)		
Power output	20Hz:	1kHz:	20kHz:
One channel, 8ohm load	16.2dBW	18.1dBW	16.2dBW
Both channels, 4ohm load	14.4dBW	14.9dBW	11.1dBW
One channel, 2ohms, pulsed	-1dBW	14.5dBW	-1dBW
Instantaneous peak current	+7.3A -9.7A		
<b>Distortion</b>			
Total harmonic distortion,	20Hz:	1kHz:	20kHz:
at rated power, aux input	-41.8dB	-66.7dB	-34.8dB
Intermodulation, 19/20kHz, rated power, aux input	-24.8dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm)	-57.4dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mc)	-63dB		
<b>Noise</b>			
Disc (mm) input (IHF, CCIR weighted)	-62dB		
Disc (mc) input (IHF, CCIR weighted)	-53dB		
Aux/CD input (IHF, CCIR weighted)	-80dB		
Residual, unweighted (volume control at min)	-76.5dB		
DC output offset	left 0mV, right 0mV		
DC offset, pre-amp	left 0mV, right 0mV		
<b>Input overload</b>			
Disc (mm) input (IHF)	36dB	40dB	34dB
Disc (mc) input (IHF)*	56dB	60dB	54dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
<b>Stereo separation</b>			
Disc input (mm)	52dB	60dB	40dB
Aux input	98.2dB	100.9dB	71.6dB
Output impedance (damping)	0.87ohm	0.87ohm	0.58ohm
Channel balance, disc, at 1kHz	-0.10dB		
<b>Volume/balance tracking</b>			
Aux input	0dB	-20dB	-60dB
Disc input	0.08dB	0.10dB	0.10dB
<b>Input data</b>	socket type sensitivity loading		
Disc (mm) input	Phono	0.041mV	47kohms 60pF
Disc (mc) input*	-	0.041mV	47kohms 60pF
Aux input	Phono	5.2mV	43kohms 30pF
Power amp	Phono	114mV	100kohms 270pF
Output, pre-amp (tape)	>20V max, 140ohms		
Disc equalisation error, 30Hz-15kHz	+0.43dB, -0.1dB		
Size (width, height, depth)	41 x 10 x 27cm, 48 x 27 x 32cm		
Typical price inc VAT	£2010, £1795.		
Note: *mc figures refer to 'mm' input; channel balance, MV50 only, 500mV input.*PV5/MV45			
First Reviewed: 1985. Rating: Recommended			

**CONRAD JOHNSON MOTIF MC-8**

AUTOMATION SCIENCES CO, 20 LITTLE GADDESSEN, BERKHAMSTEAD, HERTS HP4 1PA.  
 TEL: 044284 2786



**T**he Motif series of products are Conrad Johnson's transistor alternative to their renowned valve amplifiers, and use FET technology in place of valves. There are currently two such 'minimalist' pre-amps on the UK market, the MC-8 being the cheaper (c£2,500), newer version which is a cost-pared version of the original £4,000 MC-7. This review concentrates on the MC-8, but with subjective and objective comparison to the '7. A matching M100 power amplifier is now also available, but has not yet been assessed.

Whereas the MC-7 has a determinedly double-mono construction — to the extent that the only components shared between the channels are the outboard power supply case and pre-amp fascia plate — the MC-8 has a conventional stereo layout, complete with such luxuries as a balance control. Economies have been achieved through the single case and on-board power supply, but not on the quality of internal componentry.

The simple, substantial, almost featureless design is beautifully finished in brushed 'silver', with just the selectors, volume and balance controls on the front panel, while the rear carries a switch to choose between the separate moving magnet and moving coil inputs — the latter inverting absolute phase, which can prove misleading during subjective comparisons. Sockets are high quality Tiffany phonos, and no on/off switch is provided, as the unit is designed to be left on more or less permanently.

The circuitry is very simple, using a minimum of components many of which are exclusive to C-J. There are no electrolytic capacitors what-

ever, the power supply using small but good quality polystyrene types. The basic construction is largely symmetrical between channels, operating in class A with single-ended FET devices throughout.

**LAB REPORT**

The frequency response was flat, showing a slight improvement over a '7 sample measured some months ago and confirming that the slight error has now been corrected for all *Motifs*. Though designated mm and m-c, the former is sufficiently sensitive for some of the higher output 'low output' cartridges.

The distortion characteristics were a trifle disappointing considering the price level: following the figures obtained for the '7 very closely, high frequency intermodulation and overload could both have been improved, while the '8 showed similar mild weakness on channel separation at high frequencies. In other respects the technical performance was first class, with high quality construction standards throughout.

**SOUND QUALITY**

The *Motif 8* suffers from one significant disadvantage — comparison with the '7. In isolation it is recognisably a very refined device, one of the best around and fully capable of justifying its not inconsiderable price. It sounded fast yet polite, fundamentally neutral yet with a slightly 'light', 'bright' balance, lacking a little 'weight'. Stereo space and depth were very good, as were transparency, focus and dynamics. Whereas the '7 sounded remarkably similar in character, it delivered a significantly more solid

image and sense of space, with all-round greater precision and control.

**CONCLUSIONS**

The *Motif 8* is an undoubted success in maintaining the essential character of the *Motif* sound at a significant reduction in cost. At the same time it sits a trifle uneasily in the marketplace, inasmuch as people prepared to pay £2,500 for a pre-amp are quite likely to be in a position to spend £4,000 — and are consequently better advised to go for the '7. This aside, the fine sound quality demands recommendation.

**TEST RESULTS**

Distortion			
Total harmonic distortion, _____	20Hz	1kHz	20kHz
at rated power, CD input _____	-83dB	-83dB	-80dB
Intermodulation, 19/20kHz, rated power, aux input _____	-71dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm) _____	-80dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mc) _____	-30dB		
Noise			
Disc (mm) input (IHF, CCIR weighted) _____	-72.0dB		
Disc (mc) input (IHF, CCIR weighted) _____	-64dB		
Aux/CD input (IHF, CCIR weighted) _____	-80dB		
Residual, unweighted (volume control at mm) _____	-88dB		
DC offset, pre-amp _____	0.0mV		
Input overload			
Disc (mm) input (IHF) _____	32dB	31dB	17.8dB
Disc (mc) input (IHF)* _____	31dB	30dB	20dB
Aux/CD input (IHF) _____	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc) _____	64dB	66dB	38dB
CD input _____	88dB	63dB	37dB
Channel balance, disc, at 1kHz _____			0.04dB
Volume/balance tracking			
_____	0.02(0dB)	0.2dB(-20dB)	0.26dB(-60dB)
Input data			
_____	socket type	sensitivity	loading
Disc (mm) input phono _____		0.82mV	36kohms
Disc (mc) input* phono _____		0.07mV	120pF
CD input _____	phono	41.5mV	20kohms
Output, pre-amp (tape) _____			6V, 130ohms
Disc equalisation error, 30Hz-15kHz _____			+0, -0.18dB
Size (width, height, depth) _____			48x33x9.5cm
Typical price inc VAT _____			£2,500

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## CONRAD JOHNSON PREMIER THREE/ PREMIER FOUR

AUTOMATION SCIENCES CO, 20 LITTLE GADDESSEN, BERKHAMSTED, HERTS HP4 1PA.

TEL: (044) 284 2786



**M**ost prestigious of the Premier line of pre-amplifiers, the *Three* has enjoyed the status of an audio legend for some years now. A valve (or tube) model of advanced design, it has been regarded as one of the most musically accurate pre-amplifiers made, and is a fitting partner for either of the major Premier power amps, namely the stereo 100W per channel *Four* and the mono block, twin chassis, 200W per channel *Five*.

As an alternative, a customer may order a bypassed version of the *Three*, with channel balance and stereo/mono selector functions omitted electrically, although the controls remain on the front panel. Such bypassing further shortens the 'straight line' of a circuit design where all tone controls and filters have already been left out. Recent circuit improvements to the *Three* include the use of van den Hul silver-plated single strand monocrystal copper wire in critical signal paths.

Over several months we had the opportunity to audition an original version, a more recent bypassed model, and a sample from current 1986 production. With each stage, we found significant advances in sound quality, although, (in line with the practice of several other companies) CJ do not make a habit of publicising such changes.

This is a full 19in wide model with rack mount facilities and black handles, a champagne gold, aluminium front panel of black casing. The moving-magnet disc input is relatively low noise, and will also accept the higher output moving-coil cartridges such as the van den Hul MC10 and MC1B or the Koersus. Other inputs include tuner, aux/CD, tape 1 and tape 2. Monitoring is also possible from both tape outputs, though the cross-dubbing facility takes some working out and is not as simple to use as that of many Japanese designs. All sockets are gold plated phonos.

Inside, the build is of the highest quality with selected tubes and custom CJ polystyrene capacitors of massive size and excellent quality. The disc input section comprises five triodes arranged as two cascaded cascodes with a cathode follower output; these circuits give maximum output and low noise. The line stage uses four triodes, with cathode followers buffering each triode amplifier. Comprehensive solid state regulation is employed for all supplies, including heaters. The inbuilt transformer is silent and

virtually vibration free.

Specific features include the mechanical decoupling of the main board on anti-vibration mountings, with a non-magnetic lower cover positioned adjacent to the circuit board track. Overall, the construction is low resonance, with what at first sight seems an excessive number of fixing screws. The US mains outlets are inactive for UK operation.

The *Four* power amplifier is built on a massive aluminium chassis some 22in deep overall a decent shelf is therefore required to support its substantial 80lb weight. Alternatively, it will also fit 19in rack centres. The thick champagne gold alloy front panel is bare except for the carrying handles and large on/off lever.

This tube design, uses four Philips EL34 output valves per channel in a standard ultra linear output configuration. The output transformer is tapped for optimum switching into 4, 8 and 16ohm loads. LEDs are provided for rapid setting of the optimum bias points. Large power supplies are used, and the straightforward circuit built with the highest quality parts.

### SOUND QUALITY

Auditioned with a variety of high quality power amps and loudspeakers, there was little doubt concerning the pedigree of the *Three*. Stereo images were seductively and sympathetically presented, with excellent depth and ambience. Focus was very good, while the resolution of subtle detail was even better. Tonal quality was

outstanding with very natural mid ranges, and little of the excess richness of earlier designs. The treble was also outstandingly clear, without perceptible distortion, while the bass also set very high standards for depth, speed and attack.

Sound stages were broad and spacious yet coherent and believable. Extended listening was a pleasure and we found the model quieter, more transparent and more dynamic than earlier samples, confirming the evolutionary improvement that has taken place for this top line performer.

It partnered the Audio Research D115 II power amplifier particularly well.

The current *Four* power amplifier is much improved over the model of a few years ago. The bass is fine — clean, powerful, extended and pretty tight. In the mid the sound was well focused — sweet and ambient, extremely natural with excellent instrumental separation. Most of the treble range was nearly as good, but with a hint of imprecision at the edge of the audible range.

Stereo images were very well focused with first rate stage width and height coupled with excellent depth. Across a broad midrange the transparency and resolution bordered on state of the art. Ambience was *its forte* — it proved exceptionally revealing of instrumental locations without any falseness. Dynamics proved to be another strong point. This amplifier has a big heart and would generate genuinely high sound levels without any strain, both on 4 and 8ohms.

### LAB REPORT

Taking the *Premier Three* first, the RIAA equalisation mer fine  $\pm 0.15\text{dB}$  response limits, 12Hz to 40kHz, when fed into a typical load. The response fell marginally by 0.4dB at 20Hz when fed into a low 10kohm load, reaching  $-3\text{dB}$  at 10Hz. Channel balance was excellent and distortion via the line input was negligible. The high frequency intermodulation via the disc input was uninspiring but in line with other valve amplifier results. Noise levels were low, from a subjective viewpoint, though numerically the moving-coil equivalent result is just satisfactory.

Input overloads were ample while the output headroom was exemplary, measuring up to 78volts from a low 50ohm source impedance — suitable for long cable runs if required. Channel separation was generally good, better than most other tube models.



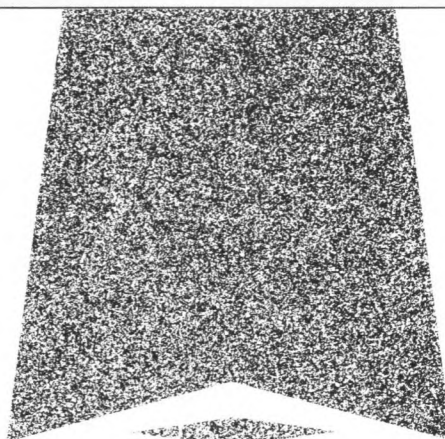


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Bandwidths were wide; for example, the line input was  $-0.5\text{dB}$  at 6Hz and 140kHz,  $-3\text{dB}$  at 1Hz and above 400kHz. For disc, the  $-3\text{dB}$  points were 1Hz and 120kHz, with no subsonic filtering.

Rated at 100W per channel (20dBW) the Premier Four cruised through the midband, with some diminution at the band extremes. Depending on the allowable distortion limits, various 20kHz power levels could be quoted. Peak current was generous, 14.5A, increasing to almost 19A on the 4ohm tap. Output levels were in general only 1dB greater on 8 as compared with 4ohm taps, and with the latter was preferred for general use. This amplifier was surprisingly load tolerant, and would drive a wide range of loudspeakers. At full power the distortion was weak at the band extremes, but was much better in the vital midrange at lower powers. At full power the high frequency intermodulation was fine, improving to an excellent  $-84\text{dB}$  at around 1 watt.

Noise levels were electrically fine, and transformer hum moderate. Frequency response was very flat at  $\pm 3\text{dB}$  from 0.5Hz to 57kHz. Output impedance was higher than usual at around 0.6ohm, reducing to 0.46ohm via the 4ohm tapping. Easy to drive, the Four behaved well in clip, showing good overload headroom.



### CONCLUSIONS

The Premier Three is a musically accurate and graceful performer, which proved versatile for a wide range of inputs including moving-coil cartridges with sufficiently healthy output. A neat single-box unit with low noise, I found it a delight to use and felt that it amply justified its high price when compared with the alternatives. A world-class audiophile product, we found the Premier Three certainly deserved its reputation.

With an excellent sound quality as well as a substantially good lab tested performance, the

Premier Four 100W (20dB) power amplifier gave good service during the review. Subjectively it was rather louder than the figures indicated, and it could produce volume levels sufficient for demanding programme. Depth, ambience, mid tonality and transparency were in the top class making this one of the finest amplifiers in this elevated price bracket.

### TEST RESULTS

		Pre and power amplifier		
Rated power into 8ohms, maker's spec		100W (20dBW)		
Power output		20Hz	1kHz	20kHz
One channel, 8ohm load		16.8dBW	20.6dBW	19.7dBW
Both channels, 4ohm load		14.0dBW	18.2dBW	11dBW
One channel, 2ohms, pulsed			17dBW	
Instantaneous peak current		+15A, -14A		
Total harmonic distortion,		20Hz	1kHz	20kHz
at rated power, aux input		see text -61dB -35dB		

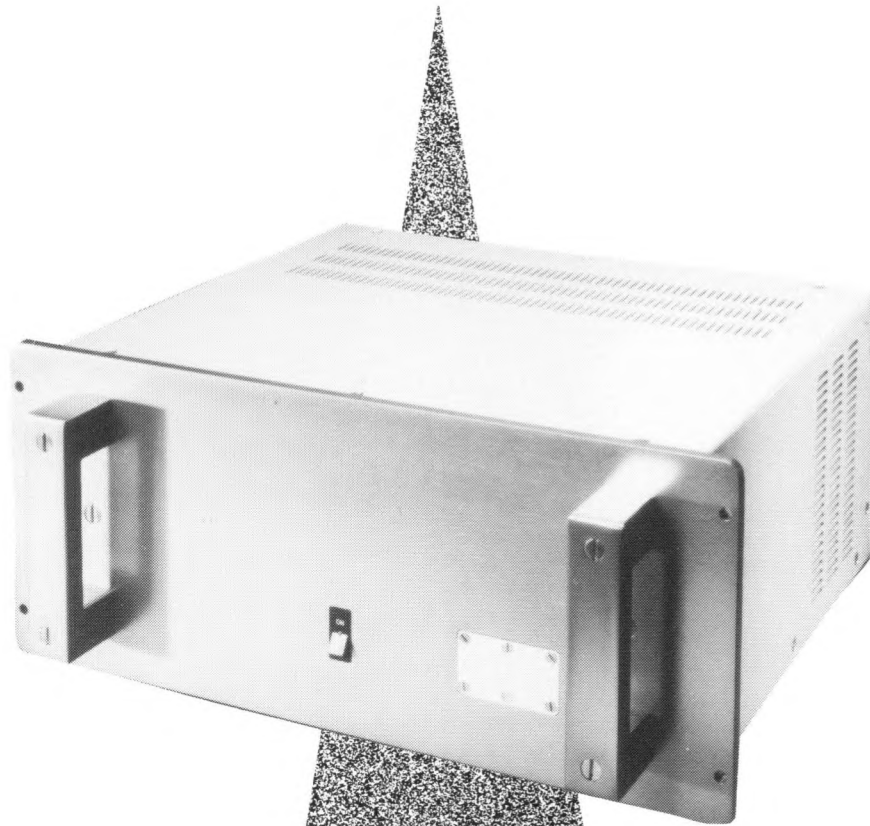
		NOISE		
Disc (mm) input (IHF, CCIR weighted)		-73dB		
Disc (mc) input		-55dB		
Aux/CD input (IHF, CCIR weighted)		-75dB		
Input overload		20Hz	1kHz	20kHz
Disc (mm) input (IHF)		40.4dB	41.7dB	29.8dB
Disc (mc) input (IHF)				
Aux/CD input (IHF)		>20dB	>20dB	>20dB
Input data		socket type	V sensitivity	loading
Disc (mm) input		Phono 0.18mV	45kohms	
Disc (mc) input				
Aux input		0.04mV	0.10kohms	0.61pF
Power amp		85mV	90kohms	
Output, pre-amp (tape)		78V max, 50ohms		
Disc equalisation error, 30Hz-15kHz		+0dB, -0.3dB		
Size (width, height, depth)		48x14x38cm		
Typical price inc VAT		£3400, £3600		

First reviewed: The Collection 1986

**KRELL PAM5/KSA50 Mk 2**

ABSOLUTE SOUNDS LTD, 42 PARKSIDE, LONDON SW19.

TEL: 01-947 5047



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**B**uilt and finished to the highest standards, the Krell KSA-50 power amplifier is an expensive American heavyweight, though modestly rated at 50W (17dBW) per channel. Alternatives at 100W and 200W are also available.

The KSA-50 is constructed as a double-mono design, with massive power supplies to each channel. The amplifier runs in pure Class A into 8ohm loads up to its rated power, and has rapid warm up (minutes rather than the usual hour or so for other Class A designs.) The fan is relatively quiet, producing no more noise than the large toroidal transformers fitted.

The PAM-5 uses a single external power supply and offers good moving-coil input facilities.

**SOUND QUALITY**

Re-auditioned for 1986, the Krell KSA-50 has held its own. It remains a powerful, musical-sounding model, giving good stereo depth and ambience, fine clarity and excellent stereo focus. Tidy and controlled, dynamics were very good, and its high rating position was maintained. The PAM-5 is a welcome newcomer, in our view now quite to KSA-50 standard, and a very worthy partner overall.

Essentially neutral, PAM-5 gave good definition throughout the frequency range with a good measure of 'excitement' and involvement in its sound. The special CD input was rather better than the auxiliary for this signal source, and comparably good results were obtained on analogue moving-coil.

Compared with the finest references, the Krells betrayed a mild 'dryness' and a hint of

dimensional restriction but the results remained very good.

**LAB REPORT**

Rated at only 17dBW, the KSA-50 typically produced on continuous ratings a 19.9dBW output level, and such was the extraordinary power bandwidth that no significant fall occurred from 20Hz to 20kHz, relative to 1kHz. Likewise the loss into 4 and 2ohms was small. Peak output was approaching 100W, reading 19.9dBW, with 18.2dBW still provided into 2ohms, the Krell proving to have one of the 'stiffest' output and power sections measured. Peak power into 2ohms exceeded 250W. Peak current output was ± 32A, which was sufficient for the worst loads.

Both pre-, and power amplifier were exemplary on other parameters. Noise level and separa-

tion were fine, and all distortions negligible at all levels below clipping. Substantially accurate, the RIAA equalisation is slightly tailored for a specific sound.

**CONCLUSIONS**

In addition to the KSA-50, the '100 and '200 units were auditioned recently, and showed small but progressive improvements as well as greater power. Superbly built, Krell products remain a good investment in listening pleasure.

Both the KSA-50 and the PAM-5 are of recommendable quality, despite their high prices.

**TEST RESULTS**

Rated power into 8ohms, maker's spec	Pre- and power amplifier _____ 50W (= 17dBW)		
Power output _____	20Hz	1kHz	20kHz
One channel, 8ohm load _____	19.9dBW	19.9dBW	19.9dBW
Both channels, 4ohm load _____	19.7dBW	19.7dBW	19.65dBW
One channel, 2ohms, pulsed _____	-dBW	18.2dBW	-dBW
Instantaneous peak current _____	+ 32A - 32A		
Total harmonic distortion, _____	20Hz	1kHz	20kHz
at rated power, aux input _____	-86.0dB	-89.6dB	-72.5dB

**NOISE**

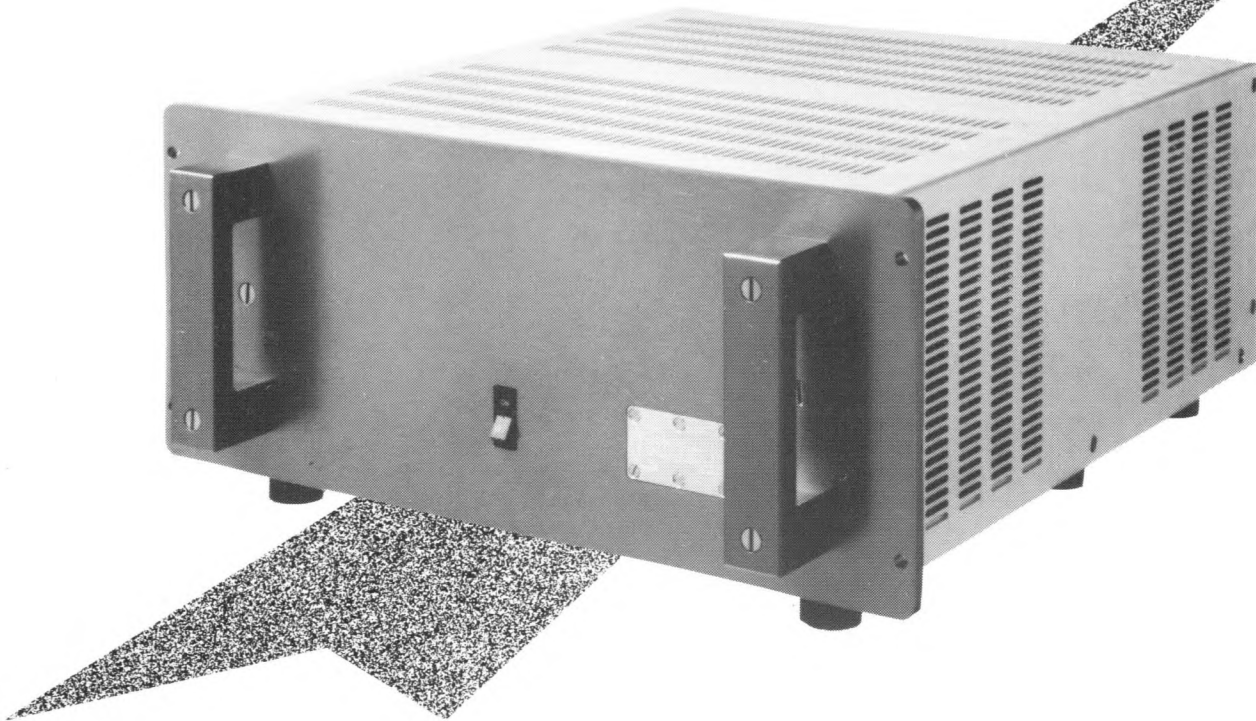
Disc (mm) input (IHF, CCIR weighted) _____	_____		
Disc (mc) input (IHF, CCIR weighted) _____	-60.0dB*		
Aux/CD input (IHF, CCIR weighted) _____	-88.0dB		
Input overload _____	20Hz	1kHz	20kHz
Disc (mm) input (IHF) _____	-dB	-dB	-dB
Disc (mc) input (IHF) _____	20.8dB	20.5dB	21.5dB
Aux/CD input (IHF) _____	>20dB	>20dB	>20dB
Input data _____	socket type	sensitivity	loading
Disc (mm) input _____	-	-mV	-kohms
Disc (mc) input _____	Phono	0.076mV	100kohms
Aux input _____	Phono	136mV	9.4kohms
Power amp _____	-	-mV	-kohms
Output, pre-amp (tape) _____	8.25V max, 11ohms		
Disc equalisation error, 30Hz-15kHz _____	+0.30dB, -0.65dB		
Size (width, height, depth) _____	48 × 5 × 29cm, 48 × 21 × 43cm		
Typical price inc VAT _____	£1589, £2300		

\*improved since our test  
First reviewed: PAM5, 1986; KSA50, 1983 (reassessed 1985, 1986).  
Rating: Recommended.

**KRELL KMA-100 II**

ABSOLUTE SOUNDS LTD, 42 PARKSIDE, LONDON SW19.

TEL: 01-947 5047



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**K**rell were the first US high end amplifier brand for many years to make any significant impact on the UK market, when the KSA-50 first started to appear about four years ago. It was expensive by UK standards, but Krell's power amp trademark is 'class A' operation (or at any rate class A over most of the available dynamic range), which guarantees high bulk, heat and cost per Watt, while at the same time offering stable operating device temperatures. In effect class A working is equivalent to regulating the power supplies of a class A/B configuration.

However, US audiophiles are a power hungry breed, and 50Watts a side does lack a certain machismo appeal (even though Krell are extremely generous with the current reserves). So the home market prefers monoblocks with even more current capability, or the higher power models in mono and stereo formats — which are now spreading to the UK. There is also a wide range of PAM pre-amp partners which have evolved along similar lines. This review concentrates on the KMA-100 monoblocks — at £2,500 each, several steps up the ladder from the KSA-50 featured elsewhere — and also involved comparative auditioning with the significantly cheaper stereo KSA-100.

In fact the difficult decision for someone contemplating £5,000+ for a pair of KMAs is whether to go instead for a PAIR of KSAs (for a grand or two more) and bi-amp the loudspeakers, passively or actively. It is a dilemma that the word-processing pundit (and the importer for that matter) is unable to resolve — the only course is to try out the alternatives. (First, find someone who has both a pair of KSAs and a pair of KMAs in stock...)

Though all Krells look alike on the surface, each uses different circuitry specific to its task, the monoblocks possessing relatively more current capability and being 'more class A' than the stereo models. External finish is to the highest standards, anodised to a soft silver grey with gilt brightwork. Construction is non-magnetic, using mainly aluminium, and with extensive use of military grade componentry, massive high-current power supplies and very high slew rate bi-polar output transistors. The KMA-100s have permanent fan cooling, which is audible but not intrusive (given clean mains), sounding a little like the airconditioning of a modern hotel room.

**LAB REPORT**

Rated at 100W/8ohms, this is effectively the class A rating, and the KMA-100s can virtually double this delivery in practice. They are capable of delivering a massive +45/-46A into any load, 1ohm *Scintillas* included — indeed big Apogeess and Krells seem more or less made for each other. The bandwidth is sensibly rolled off above audibility to a -3dB point at 70kHz. All the measured performance parameters for distortion, noise etc, were excellent.

**SOUND QUALITY**

Our main listening sessions had earlier updated Mk1 KMA-100s, plus a current KSA-100 II for interest's sake, and correlation was later made with a brand new production pair of KMAs. Both generations of monoblock were clearly superior to the stereo model, particularly in terms of 'grip', 'solidity', focus and control, though the KSA still delivered 'reference' standards of sound quality for its price.

The earlier KMAs suffered a little from fan

noise, but gave outstanding sound quality, transparent and big in scale with tremendous relaxed power. Stereo staging was wide, deep and precise, with solid focusing and great stability. Criticisms were minor. One listener wondered whether the sound was just a little too relaxing and controlled, while a slight 'bright' emphasis was also considered a mild departure from neutrality. This was found to have been resolved on the later samples, with treble sounding significantly sweeter, while the fan noise was also effectively cured.

**CONCLUSIONS**

The KMA-100 is a genuine reference standard power amplifier, arguably the best that *Choice* has assessed, capable of justifying an extravagant pricetag in an appropriate system and in comparison with its KSA stereo sibling. Its *forte* is the combination of tremendous headroom and control that define its unique character, plus an ability to drive any sort of load up to genuine high levels. Similarly the KSA 100 II may also be recommended as an outstanding performer.

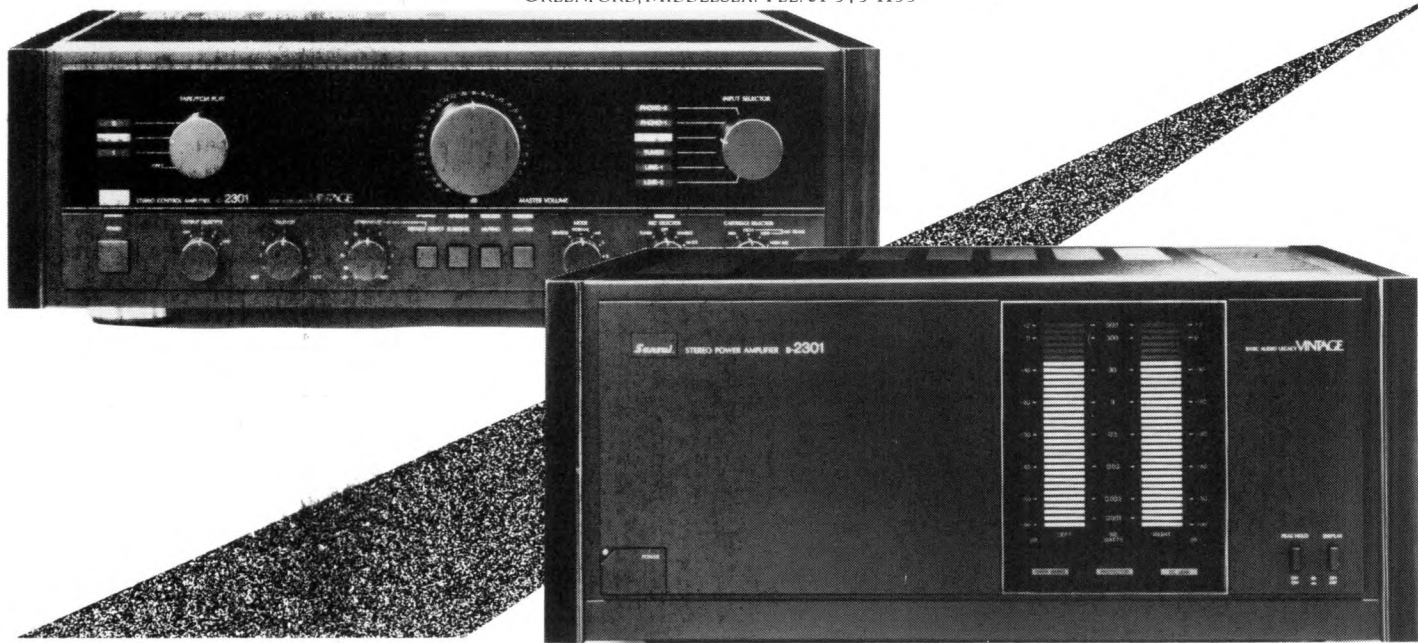
**TEST RESULTS**

<b>Power output</b>	Integrated amplifier		
Rated power into 8ohms, maker's spec	20Hz	1kHz	20kHz
Power output	23dBW	23dBW	22.8dBW
One channel, 8ohm load	22.5dBW	22.5dBW	22.2dBW
Both channels, 4ohm load	-dBW	22.3dBW	-dBW
One channel, 2ohms, pulsed	+45/-46A		
Instantaneous peak current	-78dB(0dBW), -98dB(rated power)		
<b>Distortion</b>	DC output offset 0		
Total harmonic distortion, 20Hz	1kHz	20kHz	0.04 ohms
at rated power, aux input	-75dB	-77dB	-66dB
Intermodulation, 19/20kHz, rated power, aux input	-86dB		
Intermodulation, 19/20kHz, at 0dBW	-105dB		
<b>Noise</b>	Input 48x48x23cm		
'A' wtd	Typical price inc VAT £5,750 per pair		



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The Japanese 'high end' amplifier marketplace is totally different from the US or UK, and although certain products operate successfully in all three places, they are rarely those of Japanese origins. In Japan itself audio enthusiasm/fanaticism reaches new highs in the quest for the unattainable. 'Classic' designs from the past are highly regarded and generally available for exorbitant prices, and 'roll your own' kits — sometimes based on prewar valves and circuits — are by no means uncommon. Not surprisingly, such products do not make a major contribution to the export drive.

However, at the other end of the scale the Japanese consumer electronics giants dominate world markets and fight a bitter struggle for brand loyalty on the home market. One strategy is the 'flagship' product which is expected to reflect credit on the more humble models in the range. It invariably involves the very latest transistor amplifier technology, and also usually provides a deluxe (if not OTT) standard of construction and finish. Over the past five years during the resurgence of the UK 'audiophile' market, such necessarily expensive models have often been left out of the UK product listings. But CD has reawakened enthusiasm and there are now signs of a serious attempt by several consumer electronics brands to get back into the top end of the market.

The Sansui 'Vintage Series' pre-/power combination featured here is a reasonably typical example of the presentation and full-feature specification that such models include as a matter of course. The particular technical feature shared by both is balanced operation, where a floating ground is kept separate from the main grounding — an approach which is almost universal in professional equipment.

Extensive provision of switches, knobs and power metres, plus a most superior rosewood lacquered trim gives the pre-amp a certain *je ne sais quoi*, yet it seems unavoidably out of place — something of a dinosaur — amongst the 'minimalist' models of today's 'high end'. That said, the pre-amp is a 'straight line' device

eschewing tone controls and 'double mono' in basic construction. There can be few rivals for flexibility in switching and controlling various sources and recorders, including 'source direct'. Interestingly, the moving-coil step up is provided by internal transformers — another characteristically Japanese preference.

The power amplifier is exceptionally heavy, incorporating a pure copper chassis, 1.3kVA toroid transformer and rated at 300W/channel. Eight 150W transistors per channel operate the complementary bi-polar output, and no less than six power supplies are used, with high quality reservoirs and selected components.

**LAB REPORT**

The extravagant power output was confirmed in the lab but with some reduction into lower impedances, dropping back 3dB into 2ohms and delivering a comparatively modest  $\pm 30A$  peak current. Not surprisingly, the measured performance was exemplary, with low noise and distortions, flat responses, fine channel separation, and plenty of overload margins. Mechanical noise was low, power supply stability excellent, and residual distortions were of low order, though the overall bandwidths were rather extended at high frequencies.

**SOUND QUALITY**

The 2301s turned in a very respectable subjective performance, though the power amplifier is rated rather higher than the pre-amp. In fact the pre-amp attracted some distinctly negative comments when assessed in isolation, but reactions were more positive when used in combination with the power amplifier. Whereas the C2301 alone had sounded distinctly 'bitty', lacking 'speed' and definition plus control at the frequency extremes, the combination seemed better integrated, particularly in the bass. However, there was still some 'hardness' and suspect focus at high frequencies.

The power amplifier scored a very respectable rating on its own — unusually so for such a massively powerful device. The sound was a trifle 'lazy' and bland, but with lots of headroom and

a relaxed 'rich' character, hardening somewhat a higher levels.

**CONCLUSIONS**

This beautifully built and engineered combination sits well outside the audiophile mainstream against which it competes on price. While it offers great flexibility, the sound did not really measure up, the main criticisms being directed at the pre-amp. The power amplifier alone could be well worth considering where very high rated output is required.

**TEST RESULTS**

<b>Power output</b>			
Rated power into 8ohms, maker's spec	300W	25dBW	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	26.3dBW	26.3dBW	26dBW
Both channels, 4ohm load	24.8dBW	24.8dBW	24.4dBW
One channel, 2ohms, pulsed		22dBW	
Instantaneous peak current	$\pm 30A$		
<b>Distortion</b>			
Total harmonic distortion, at rated power, aux input	20Hz	1kHz	20kHz
	-82dB	-92dB	-81dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)	-70dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mc)	-77dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mc)	-79dB		
<b>Noise</b>			
Disc (mm) input (IHF, CCIR weighted)	-79dB		
Disc (mc) input (IHF, CCIR weighted)	-70dB		
Aux/CD input (IHF, CCIR weighted)	-84dB		
Residual, unweighted (volume control at min)	< -100dB		
DC output offset	left 30mV	right 37mV	
DC offset, pre-amp	left 0mV	right -2mV	
<b>Input overload</b>	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	39.7dB	39dB	38dB
Disc (mc) input (IHF)*	42dB	44dB	44dB
CD input (IHF)	>20dB	>20dB	>20dB
<b>Stereo separation</b>			
Disc input (mm)	88dB	88dB	65dB
CD input	114dB	83dB	58dB
Output impedance (damping)	0.048ohm	0.048ohm	0.08ohm
Channel balance, disc, at 1kHz	0.64dB		
<b>Volume/balance tracking</b>			
	0.01dB(0dB)	0.31dB(-20dB)	0.27dB-60dB
<b>Input data</b> socket type sensitivity loading			
Disc (mm) input phono	0.89mV	32kohms	750pF
Disc (mc) input* phono	0.11mV	1.4kohms	10nF
CD input phono	63mV	60kohms	1,000pF
Power amp cannnon	54.5mV	15kohms	n/a
Output, pre-amp (tape)	28.3V max, 99ohms		
Disc equalisation error, 30Hz-15kHz	+0dB, -0.18dB		
Size (width, height, depth)	(47x21x50)+(47x16x42)cm		
Typical price inc VAT	£2,306, £1,880		

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Compact Disc Players	P.O.A.	Monitor Audio R352	add £100	Thorens TD166	add £55
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# Tuners



**W**ith the steady increase in the number of alternative media to choose from, FM radio has slipped somewhat from its position as a primed hi-fi source. Which is a pity particularly so in the UK where actual live music is a regular feature of the BBC's frequently excellent output. The tuner is the amplifier's poor relation, selling only 20-25% the quantity of its more glamorous partner in specialist shops.

The reasons are several. The most important one for the enthusiast seems to be that for the price of a tuner he/she could significantly upgrade the record playing chain or amplifier. The popular option is to stick with whatever happens to be around — tranny radio or something left over from an earlier system perhaps. And the BBC's messing around with AM/FM programming doesn't help much either.

Other factors include a lack of incentive and/or tuner expertise amongst amplifier manufacturers — tuners are more difficult to design and manufacture than amplifiers, and there's also less money in them.

Furthermore, combining the twin objectives of first class signal reception performance with audiophile sound quality has proved historically quite difficult.

The intention of this introduction is not to persuade you that you ought to like radio and invest in a tuner, but at least urge you to give it a serious second thought. After some ten years of serious thought as a professional hi-fi journalist, I finally bought my first serious tuner, exactly a year ago. Now that it is spending a

fortnight's holiday chez Colloms, being measured for the *NAT 01* review on the facing page, I am missing it rather a lot — and that is a true acid test both of the tuner and the medium.

Given the comparatively luxurious network reception conditions available in the UK compared with some overseas markets, RF reception sensitivity is rarely a problem, but coping with competing signals and multipath effects is no simple task. The big opportunity for the amplifier specialist is therefore to apply his skills in sound quality upon the audio section of the tuner. A tuner that sounds both natural and unfatiguing to listeners who are already aware

of 'real' hi-fi sound is the key to persuading reluctant customers to add a tuner to their sources.

Aerials are all too often ignored. A decent tuner increasingly needs a good aerial to help it collect the wanted signal from all the other RF hash that pollutes the ether. Don't make the tuner's life more difficult than it already is by trying to get away with an indoor aerial tucked down with the transformers at the back of the hi-fi. Have a proper roof job done by finding the person in your area who understands local RF conditions (or call Ron Smith in Luton).

We've selected a rather small group of tuners as good enough for inclusion in *The Collection*, based on achieving very good RF or subjective performance, plus at least reasonable standards on both. There are not too many contenders on our files, but it is over a year since our last *Amplifiers & Tuners* edition, and hopefully some new qualifiers might well come out of that issue's imminent update — certainly more and more manufacturers seem to be having a go.

The only obviously audiophile-oriented tuner on the UK market is the extravagant Naim *NAT 01*, which we have fully re-assessed. The *Quad FM4* is another classically simple and good-sounding model, but at a much lower price level. For the ultimate RF performance and professional specifications it is difficult to find a rival for the comprehensively equipped *Revox B261*, while the *Technics ST-G7* is an exceedingly capable contender at a much lower price. *Revox*, incidentally, have engineered a 'round the house' system similar in some ways to the *B&C* reviewed in the *Systems* section (see pp41-43), which also includes a very respectable tuner.



# NAIM NAT 01

NAIM AUDIO LTD, SOUTHAMPTON ROAD, SALISBURY SP1 2LN.

TEL: (0722) 332266



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There are now two Naim FM tuners, but this review concentrates on the top model, the £1000 two-box NAT01. The second newer NAT101 model is a pared down version with smaller power supply and mechanical tuning indicator; at two-thirds the cost it is still on the expensive side in terms of the marketplace, but offers a similar design philosophy as the '01 at a slightly lower performance level. Naim place particular emphasis on the need for the best possible aerial system for the best possible results, in their leaflets and instructions to dealers.

Both the NAT01 units are contained within Naim's 'half width' modules, one being a substantial power supply and the other containing the actual tuner. The original plan involved producing additional modules for AM and TV tuning, to be driven from the same power supply. Though the AM module looks increasingly unlikely, the TV module is definitely on the schedule — at a guess it will appear around the time that stereo TV is transmitted in the Salisbury area . . . (which could be 1988).

NAT01 follows the usual Naim tradition of simplicity first and foremost, and a minimum of user adjustment. The power supply contains only a switch in preparation for any additional tuning modules, and so may be sited out of the way for the time being. The tuner itself just has a single large knob and a digital frequency display, backed up by two indicator lights. The tuning itself uses digital synthesis, so the tuning knob generates a shaft-encoded frequency output. This somewhat elaborate procedure is adopted to mimic the convenient tuning action of a traditional flywheel system rather than mess

around with pushbuttons.

Most of the necessary functions like stereo/mono switching are performed automatically. The lower indicator arrow comes on to indicate signal, while the upper is added when the tuner switches to stereo, while the frequency display itself brightens perceptibly when the station is precisely tuned. It was felt that presets would not be necessary because the user should soon learn the handful of main local frequencies like telephone numbers. Speaking from a year's experience, this is only partly true: one only easily remembers the frequencies that are tuned regularly — staying mainly on one station soon brings amnesia. That aside, the extreme simplicity is much appreciated by one who is interested in the content as opposed to the medium of radio.

## LAB REPORT

The NAT01 performed most satisfactorily on the lab tests. The frequency response was flat up to around 10kHz, then beginning an initially gradual rolloff (-2dB at 15kHz), which is a sensible characteristic; curiously, a presumably harmless 3.5dB peak was recorded at a subsonic 7.5Hz.

The various RF measurements indicated a high quality carefully aligned 'front end', entirely effective at capturing wanted and rejecting unwanted aerial input and showing evidence of careful quality control. The automatic muting threshold is set a little higher than most, so this is clearly not a tuner for those who wish to explore the airwaves and pull in weak, distant stations.

## SOUND QUALITY

There may be better sounding tuners around

somewhere in the world, but we have yet to hear one. The sound is recognisably 'Naim-like', but NAT01 provides an unusually transparent window onto the broadcasting studio. This can be something of a two-edged sword: one is sometimes discomforted by the generally mediocre quality of much recorded music output, but when a real live broadcast comes along the difference is immediately, spine-tinglingly obvious — even if the music isn't to taste, it is difficult not to stay tuned. And radio drama takes on a dynamic realism quite devoid of the artificiality that most tuners seem to introduce.

## CONCLUSIONS

Serious hi-fi listeners interested primarily in the content of radio could find NAT01 (or its cheaper NAT101) something of a pleasant surprise, the overall sound remaining remarkably civilised and easy on the ear while still proving responsive to the fundamental quality of the broadcast. Clearly meriting recommendation, the crucial question will then be whether or not radio programming rates an expenditure of £1000.

## TEST RESULTS

	Tuner
Sensitivity for 50dB signal-to-noise Mono/stereo	7µ70µV
Ultimate signal-to-noise (CCIR/ARM, 1kHz ref)	—
Mono/stereo	72dB/66dB
Muting threshold	55µV
Alternate channel selectivity	-66dB
Pilot tone rejection, 19kHz/38kHz	-54/-76dB
AM rejection	-73dB
Capture ratio	2.3dB
Total harmonic distortion	—
At 100% mod, 1kHz mono/stereo	-50/-60dB
Stereo separation, 1kHz/5kHz/10kHz	35dB/37dB/35dB
Output level, 100% mod	200mV
Channel balance stereo	-0.02dB
Dimensions (width, depth, height)	(21×36×8.5)×2cms
Typical price inc VAT	£1000

# QUAD FM4

QUAD ELECTROACOUSTICS LTD, 30 ST PETERS ROAD, HUNTINGDON, CAMBS, PE18 7DB.

TEL: (0480) 52561



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**A** characteristically distinctive design from this famous British company, this mid-priced Quad tuner has been intelligently designed and works with a minimum of fuss. A large, well-weighted tuning knob gives manual station selection, the tuned frequency shown on the large digital display. A combined signal-strength/centre-tune bar graph is included in the display, and was found to work well. Seven pre-set stations may be automatically programmed, appropriately marked BBC1 through 4; BBC LR (local radio); and ILR1/ILR2 for the local commercial stations.

Rear panel facilities include a three-pin IEC mains input, a shrouded IEC three-pin mains outlet, plus a 75ohm (female) coaxial aerial socket and DIN audio output. Both finish and constructional standards are high.

## SOUND QUALITY

Despite digital tuning, the FM4 had clean backgrounds free from the annoying whistles. By the time input reached 1mV, it showed decently quiet stereo backgrounds, and the sound quality was much favoured. Stereo images were well focused, and pleasing depth was reproduced. Tonally it sounded quite neutral, and the treble

was free of grain or harshness. Some mild loss of detail and bass attack was apparent when compared with the original sources, but this is a favourable result when the attainment of some of the other models is taken into account.

## LAB REPORT

The FM4 was quite sensitive, reaching 50dB stereo quieting (1kHz ref, CCIR/ARM) by 70µV and a 66dB ultimate stereo signal-to-noise ratio by 2mV, which is a satisfactory result, (slightly better than the broadcast chain). This tuner was not at its best separating a weak from a nearby strong station, with a rather below average

selectivity of around 50dB. Conversely AM rejection and capture ratio were quite good. Output level was lower than usual at 300mV but good pilot tone rejection was shown. Total harmonic distortion was about average with 0.25% mono and 0.5% stereo (full modulation, left or right channel only). It also responded well to overmodulation, and attained good stereo separation.

## CONCLUSIONS

This tuner appeals on the grounds of its fine sound, excellent ease of use, good build and finish, and a more than satisfactory technical performance. Clearly a quality design.

## TEST RESULTS

Sensitivity for 50dB signal-to-noise Mono/stereo	70µV/70µV
Ultimate signal-to-noise (CCIR/ARM, 1kHz ref)	
Mono/stereo	70dB/66dB
Muting threshold	
Alternate channel selectivity	-49dB
Pilot tone rejection, 19kHz/38kHz	-63dB
AM rejection	-61dB
Capture ratio	1.8dB
Total harmonic distortion at 100% mod, 1kHz	
Mono/stereo	0.25%/0.35%
Stereo separation, 1kHz/5kHz/10kHz	48dB/38dB/30dB
Output level, 100% mod	300mV
Dimensions (width, depth, height)	32x21x6cm
Typical price inc VAT	£279

First reviewed: 1983. Rating: Recommended.

# REVOX B261

F.W.O. BAUCH LTD, 49 THEOBALD STREET, BOREHAMWOOD, HERTS WD2 4RZ.  
 TEL: 01-953 0091



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This is a remarkable FM tuner, closer to professional than domestic build quality. For FM only, it has a host of facilities ranging from auto aerial rotation to twin volume-adjustable headphone sockets. Digitally synthesised, the tuner has space for 20 preset stations whose names may be entered via a keyboard and are then displayed on selection. The signal-strength meter is highly accurate and all facilities worked well including the variable muting and stereo thresholds. Infra-red remote control is possible, and this model is also compatible with the new line of Revox electronics. Variable and fixed output level phono sockets are provided, while the aerial input is 75ohm coaxial (male). A DIN audio socket is also included.

## SOUND QUALITY

This tuner was superbly engineered, and felt 'right' when setting up for the auditioning. It proved to be sensitive, with good quieting by  $50\mu\text{V}$  and was almost silent at  $500\mu\text{V}$  with no spurious tones or whistles. The sound quality rated as 'good', if slightly subdued and softened when compared to the original source, but very pleasant nonetheless, with a clean treble. The mid tonal balance appeared a little thin, but not seriously so, while stereo focus was good and depth satisfactory.

## LAB REPORT

The IHF mono 50dB quieting figure was an impressive  $1.6\mu\text{V}$ , and our 50dB stereo (1kHz ref CCIR/ARM) figure was achieved at a good  $45\mu\text{V}$ . This is a sensitive tuner suited to a wide range of reception conditions, particularly if the aerial rotation facility is taken into account. Alternate channel selectivity was very good and capture ratio excellent, as was the AM suppression at no less than 77dB. Distortion was low, particularly when overmodulated. Pilot tone suppression was excellent and the ultimate

signal-to-noise ratios were also pretty good. Stereo separation rated as very good, reaching 60dB mid band, while audio output was an ample 2.2 volts, variable to suit the matching amplifier. The treble response was very flat from 100Hz to 2kHz but showed a very slight lift around 0.6dB in the last two octaves.

## CONCLUSIONS

This comprehensive tuner was a most sophisticated and well executed example of modern broadcast design. For the FM enthusiast with a deep pocket it would be a logical choice, and can be expected to give years of service. On a hill site in southern England many of Europe's transmitters will be accessible.

## TEST RESULTS

	Tuner
Sensitivity for 50dB signal-to-noise Mono/stereo	$4\mu\text{V}/45\mu\text{V}$
Ultimate signal-to-noise (CCIR/ARM, 1kHz ref)	
Mono/stereo	76dB/70dB
Muting threshold	variable
Alternate channel selectivity	-82dB
Pilot tone rejection, 19kHz/38kHz	-82dB
AM rejection	-77dB
Capture ratio	0.8dB
Total harmonic distortion at 100% mod, 1kHz	
Mono/stereo	0.04%/0.15%
Stereo separation, 1kHz/5kHz/10kHz	60dB/51dB/39dB
Output level, 100% mod	2.2V
Dimensions (width, depth, height)	45x33x15cm
Typical price inc VAT	£1148

First reviewed: 1983. Rating: Recommended.



# WHEN YOU LISTEN TO THE SL6S, YOU'LL NOTICE SOMETHING MISSING

What you see here, or rather what you don't see here, is every loudspeaker designer's dream.

For it is well known that every cabinet loudspeaker has one major problem to overcome: the cabinet.

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The SL6S comes the closest yet to this ideal using conventional materials. By reducing the panel thickness we were able to reduce energy storage. A new, vertical, figure-of-eight brace tightly supports the cabinet, pushing up the frequency of the panel resonances.

The combined effect is just what we wanted. Less colouration, less muddle, better stereo imaging, allowing your ears to hear images in space so much more clearly – as they do in real life.

We could have stopped there, but, using laser interferometry, we also discovered how drive units make their own unwanted contributions. By scanning the vibrating diaphragm with a laser beam and using computer analysis, we can create a 3-D model and actually watch its behaviour.

We saw how poor connections between speaker diaphragms and their surrounds, dust caps and lead out wires were spoiling the picture, and of course the sound. It also made obvious the advantages of the metal dome tweeter.

Our latest research has shown how the aluminium dome tweeter improves both sensitivity and clarity at the highest audible frequencies.

At the other end of the spectrum we saw that the speed and articulation of the bass could be improved by increasing the flexibility of the roll surround. To do this without compromising mid range clarity in any way needed a unique solution: the bonding together of two materials of different flexibilities.

All this has made the SL6S an extraordinary loudspeaker by any standards.

Hi-Fi Answers wrote: "The SL6S is capable of higher levels, is

more articulate in mid range, images better, and has a more open, spacious presentation."

But we leave the final word to Gramophone who concluded by saying: "It has been a pleasure listening to and writing about this fine loudspeaker."

The SL6S. For those who want to listen to music, not loudspeakers.

Celestion International, Ditton Works, Foxhall Road,  
**CELESTION** Ipswich, Suffolk,  
L O U D S P E A K E R S England.



# TECHNICS ST-G7

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S

**T**echnics have long enjoyed a reputation for producing good tuners; the ST-G7 reviewed here is an upmarket model whose comprehensive facilities include a socket for connection to a computer terminal.

Finished in the traditional Technics dark bronze, it sports a backlit liquid crystal display like the Revox. It is a synthesiser design, and an array of push-buttons allow pre-selection of up to 16 stations from the FM and medium wave bands. A special 'gold' capacitor provides power for the preset station memories even if the unit is switched off for a week.

Automatic or manual switching for two IF bandwidths helps optimise reception, and the display is calibrated to read signal strengths in dB. Fine setting of AM and FM synthesised frequencies is possible, and a recorder calibration output is also provided.

## SOUND QUALITY

Highly rated on test, the stereo quality was fine by 400µV signal strength, and the background was clear of whistles once perfectly in tune. Audio quality was considered to be close to the

original source, with good dynamics. Good stereo, depth and focus as well as a wide neutral frequency range were also apparent.

However, it sounded quite poor on AM, with a muffled and laboured effect. Heavy coloration was also present and it was considered quite fatiguing to listen to.

## LAB REPORT

Our test methods differ in some respects from those used to specify the G7, and the results are further complicated by a dual bandwidth IF. On 'wide', which gives best sound quality, sensitivity was normal while signal-to-noise ratios were also very good. (CCIR ARM 1kHz.) Alternate channel selectivity was satisfactory in 'wide', and good in 'narrow'. Multiplex tone rejection was excellent — no trace of it could be found! AM rejection was also excellent, together with a fine capture ratio.

Harmonic distortion, while excellent in mono, degraded to 'satisfactory' in stereo, which was a pity. Channel separation was very good in 'wide' but rather worse in the narrow IF mode.

## CONCLUSIONS

In the optimum 'wide' mode the audio performance was very good, with the RF parameters a little less so. 'Narrow' will allow reception in difficult conditions but it is a sonic compromise nonetheless. The overall sound quality was much liked, and together with the features and major test results indicates sufficient value for recommendation even at this high price.

## TEST RESULTS

Sensitivity for 50dB signal-to-noise Mono/stereo	5µV/50µV
Ultimate signal-to-noise (CCIR/ARM, 1kHz ref)	
Mono/stereo	77dB/70dB
Muting threshold	8µV
Alternate channel selectivity	47dB/72dB
Pilot tone rejection, 19kHz/38kHz	>90dB/90dB
AM rejection	>70dB
Capture ratio	1.5dB
Total harmonic distortion at 100% mod, 1kHz	
Mono/stereo	-70dB/-55(-34*)dB
Stereo separation, 1kHz/5kHz/10kHz	53(20*)dB/45(16*)dB/36dB
Output level, 100% mod	675mV
Channel balance	0.7dB
Dimensions (width, depth, height)	43×28×10cm
Typical price inc VAT	£370
*Narrow IF bandwidth	
First reviewed: 1985. Rating: Recommended	

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sensitivity and maximum amplifier output are effectively doubled. A conjugate load matching network is difficult to design because it simultaneously tailors frequency, phase and impedance. But the computer helps quite a bit.

'It is this scientific approach, so different from hi-fi pseudo-science, that convinced me to leave the University of Sydney and join KEF.'

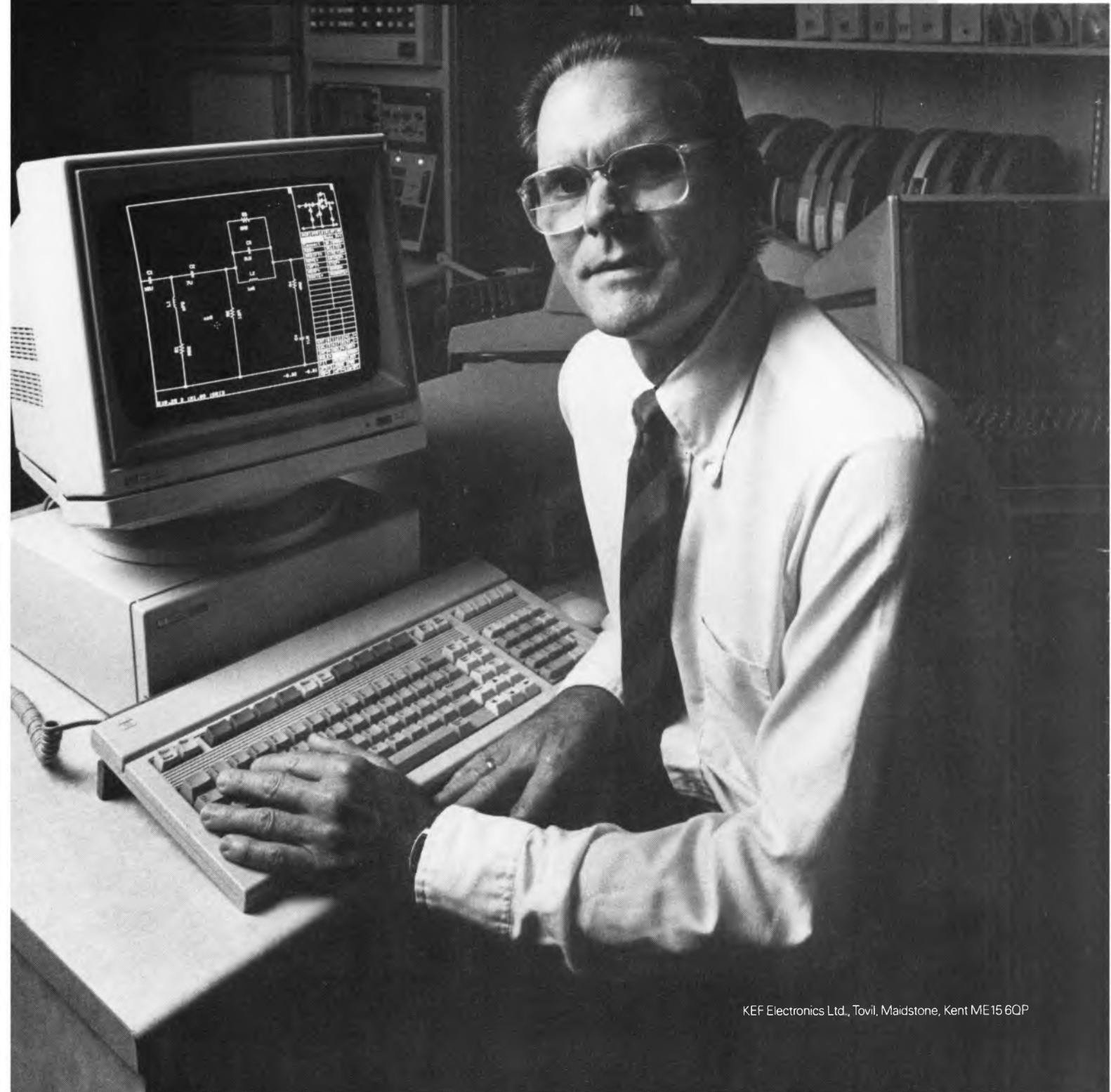


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*—Dr. Richard Small, HEAD OF KEF RESEARCH*





# Loudspeakers

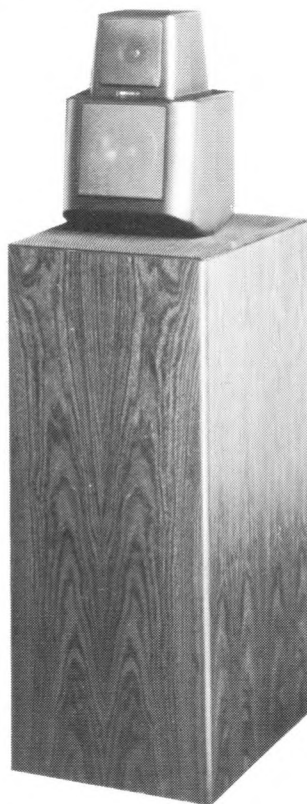
Cheap loudspeakers might be hi-fi's most boring product, with the regulation two drivers stuffed into a chipboard cabinet, but the high priced examples are definitely the most varied and interesting, ranging from delicate miniatures with aerospace cabinetwork up to giant panels, ribbons, horns and fancy sealed boxes, with every possible (or impossible) variation on the way.

It was once popularly held that the loudspeaker was the most important item in the hi-fi chain, because all models invariably show significant technical flaws and provide radically different presentations of the soundfield. It has since become widely accepted that the presentation itself is less important than the content thereof, and that content is largely a function of items earlier in the chain. So the emphasis on turntables and amplifiers instead of loudspeakers has been quite noticeable for some years on the UK market.

This year suggests that the pendulum is beginning to swing back a little. Perhaps there are now enough exotic turntables out there to justify partnering them with a few more exotic loudspeakers? The 1986 *Collection* concentrated on introducing some of the more expensive loudspeaker creations that were imported from the United States, partly no doubt because the UK had introduced little in the way of prestige models. This year we are almost inundated with possibilities, especially from the UK, and have been compelled to leave many until next summer at least, while still covering for the first time a number of new (and old) models which are essential UK contenders. The resultant selection not only covers the best of the middle and up-market models we have encountered, but also gives a broad perspective over the various different technologies and approaches.

## DYNAMIC DRAMA

Dynamic drivers are capable of combining exceptional loudness and low frequency 'punch' (bettered only perhaps by architectural horns), as the selection here ably displays. The giant US JBL and Infinity make a striking contrast with the more compact 'hybrid' KEF 107 and the evergreen Linn *Isobarik* and Yamaha *NS1000*. Naim's radical new SBL is covered in the Systems section of this book, while Celestion



weigh in with their unusual 600-based 'three-box' array. This provides aural proof of the maxim that a good big one beats a good little one, as Celestion's two top miniatures clearly lack the drama and scale of big loudspeakers, aptly meriting the title 'small but perfectly formed.'

But for real drama and awe-inspiring dynamic headroom, it is hard not to cast an envious glance at the Tannoy *Westminster*, a giant fullrange horn system which gives sensitivity and midrange 'bite' a new meaning. But there's no such thing as free lunch unfortunately . . .

## THE BBC LEGACY

The BBC Research Department's research on acoustic assessment and plastics technologies has had a major influence on post-war UK speaker design. This fundamental work lies at the roots of a number of compact high quality domestic and professional 'monitors' from several manufacturers which set high standards for tonal accuracy, low coloration and precise stereo imagery. Noted more for midrange subtlety than low frequency 'slam', many have steadily evolved to suit the domestic music sources, while there remains strong justification for using the sort of speaker the Beeb themselves use, particularly if you're a radio fan.

## PANELS DO IT DIFFERENTLY

The panel speakers covered here include electrostatics, dynamics and ribbons, but the fact that they are panel-shaped and lack any real enclosure outweighs the other considerations. An ultra-light large-area diaphragm couples quite differently from a dynamic driver to the air molecules in the room, and the radiation pattern is also quite distinct. Tall panels in fact behave like line- rather than point-sources — beaming a 'ray' of sound down the room instead of allowing it to spread out from a small area. For large/long rooms, panels 'throw' the sound down to the far field much more effectively than their nominal measured sensitivity might suggest.

The lack of a cabinet as such is probably even more important, as this is the source of many of the ills of conventional box loudspeakers. The results are very beguiling, though they are not achieved without a price, often involving 'difficult' amplifier loads and limits on loudness capability and low frequency extension, not to mention a degree of visual obtrusiveness that is not easily accepted domestically.

## GETTING TO GRIPS

Those pondering loudspeaker purchase should take into account such considerations as their taste in music and the size of their rooms, the levels they like to be able to use, and the relative importance of such things as bass extension and stereo precision. And anyone planning to select one of the box speakers in this volume must budget at least £50 extra for a decent set of stands — more might be advisable in some cases — and it is not probably worth looking closely at interconnect cables as well. Loudspeakers interact rather unpredictably with the room in which they are placed, so some experimentation on positioning may well be worthwhile.

The one clear trend amongst these loudspeakers is the gradual integration in the more elaborate designs of power amplifiers, electronics, and loudspeakers. Active drive is one alternative, while passive bi-amping is increasingly becoming available and a viable proposition. These two possibilities are discussed in a little more detail in the Amplifiers introduction (p 97).



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## ON DEMONSTRATION STUDIO 1

### AMPLIFIERS

Audiolab	8000 Pre/power (100w)
Cambridge	C75/A75 Pre/power (100w)
DNM	Primus Pre-amp
Linn	LK1/LK2 Pre/power (60w)
Magnum	250 Pre/power (150w)
Mission	Cyrus 2/PSX
Musical Fidelity	P172/P170 Pre/power (85w)
Naim	NAC42-5/NAP110 Pre/power (35w)
Quad	34/606 Pre/power (140w)

### TURNTABLES

Linn	Axis	} Various arms and cartridges
Linn	LP12	
Michell	Syncro	
Revolver		
Systemdek	2X and 4	

### SPEAKERS

Celestion	SL 65
Epos	ES 14
Linn	Kan
Magneplanar	SMG
Mission	770F
Rogers	LS3/5A
Rogers	LS 7
S D Acoustics	SD 2
Spendor	SP 1
Spendor	SP 2

### CASSETTE DECKS

Denon	DRM 33HX
Nakamichi	BX 300

### CD PLAYERS

Denon	DCD 1500
Mission	PCM 4000
Yamaha	CD 2000

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## ON DEMONSTRATION STUDIO 2

### AMPLIFIERS

Audio Innovations	800 Pre/power (25w Class A)
Audio Research	SP11/D115 Pre/power (115w)
Beard	CS06/P101 Pre/power (100w)
DNM	Series 3 Pre-amp
EAR	519 Power-amps
Krell	PAM 5/KSA 50 Pre/power (50w)
Linn	Sratos Pre/power (120w)
Musical Fidelity	MVT/A370 Pre/power (185w)
Naim	NAC32-5/NAP250 Pre/power (70w)
Quicksilver	Mono Block Power-amps

### TURNTABLES

Linn	LP12	} Various arms (Linn, Alphason, Zeta plus cartridges Goldbug Kiseki and Koetsu
Michell	Gyrodec	
The Source		

### SPEAKERS

Celestion	SL 600
KEF	Ref 107
Linn	Isobarik
Magneplanar	MC1C
Magneplanar	MG 3
Martin Logan	Electrostatic
Meridian	M 20
Quad	ESL 63
S D Acoustics	SD 1

### CASSETTE DECKS

Nakamichi	CR 7
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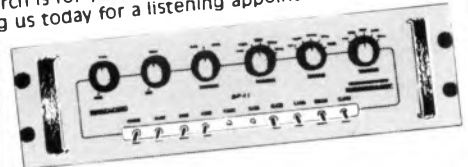
### CD PLAYERS

Cambridge	CD 1
Meridian	MCD PRO
Mission	PCM 7000

## TOPICS '87

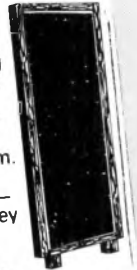
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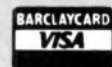


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## CELESTION 6000



*Like the internal combustion engine for cars, the dynamic drive unit remains the motive power of most loudspeakers. The following group shows the variety of imaginative solutions adopted by different designers to combine wide dynamic range and subtlety.*

Celestion's new System 6000 loudspeaker is both an extension of the already highly regarded SL6000 compact monitor, and a system in its own right. After discussion, we decided it deserved its own separate presentation, but the reader should refer to SL6000 review for more details on the satellite units themselves. The lucky owner of a pair of 600s (or certain other speakers perhaps, notably the Quad ESL63) can purchase the 6000 upgrade (bass units and electronic crossover) and add his choice of an extra stereo power amplifier.

With its radical lightweight alloy cabinet, the 600 is already regarded as a reference standard for fine stereo imaging and low coloration. But its basic dimensions inevitably restrict bass extension, loudness capability and power handling to a significant degree. The only solution is to add extra bass driving capability and so ease the demands on the small drive unit. But preserving the qualities of the 600 demanded extra care, some years of research and development, and a solution as radical as the original 600.

The difficult part was in producing a subwoofer system whose enclosure was good enough not to swamp and dominate the sound of the system, masking the 600's greatest virtue. And the solution was to do without an enclosure entirely. Using a simple, low-stress frame, the 6000 subwoofer is an open-baffle twin-dipole design, more similar to a panel than enclosure loudspeaker, but with some of the characteristics of conventional dynamic drive units. To get real extension from a panel, you need substantial frontal area to prevent front-to-back cancellation — or you can supply the equalisation electronically in an active filter unit as Celestion have done here.

Electronic equalisation offers flexibility in bass alignment to suit room characteristics, while the separate mid-treble box and dipole bass structure allows the latter to be oriented to minimise the

excitation of room resonances, while the former are directed to give the best stereophony.

The 6000 bass unit may not be to everyone's taste aesthetically — there is an inescapable Star Wars air which suits the high-tech environment better than the ancestral pile. And if you can ignore the feeling that Royal Navy radar operatives may be watching your every move, there is no avoiding the conclusion that this is a most ingenious design which appears to offer remarkable performance from quite compact dimensions.

## SOUND QUALITY

From the start there was no doubt that this is a genuine fullrange audiophile quality speaker system. It sounded completely coherent, and showed significantly greater authority than the 600 alone. Gratifyingly, the subwoofers did not detract from the essential transparency of the standard 600, and on some material the addition was barely detectable. Put on some wideband material and turn the wick up and the differences become real enough. The inherently mildly 'rich' upper bass balance is maintained, but reduced intermodulation (avoiding working the midrange unit down into the bass region) improves resolution and articulation substantially.

The system could achieve respectable rather than dramatically high levels, and substantial power amplifiers are required for full exploitation. The 6000 proved responsive to the improvements offered by costly amplification, so the electronic equalisation circuitry clearly provides only marginal signal degradation, and the end result was fully competitive with several large exotic panel models, while offering a superior overall performance balance to most. The extreme bass and treble were both naturally restrained, coloration was very low — a touch of nasality and a hint of sibilant exaggeration were noted — but the absence of

cabinet effects and good subjective speed and control told their own story.

## LAB REPORT

No problems were encountered when measuring the supplied active equaliser unit, which shows very low distortion and is well tailored to the system, crossing over at 100Hz with effective 24dB/octave slopes. The sensitivity of the bass unit is higher than the 600 system, so there is no fear of low frequency overload — even when set to 20Hz extension, the equalisation is only +4.5dB at 20Hz.

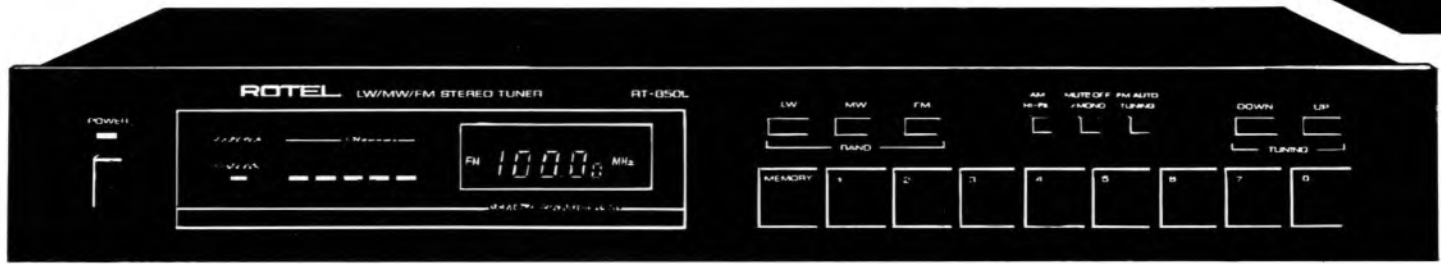
The frequency responses were excellent on- and off-axis, with good low frequency extension to 25Hz. The effect of the directional dipole was evident in the room responses. With a little care and experiment it was possible to 'tune' the bass direction with respect to room boundaries to give a very even, extended response. The sensitivity is a low 82.5dB/W, suggesting a maximum loudness of around 100dBA. The impedance has a reasonably 'kind' 8ohms characteristic — except at very high frequencies where some capacitance has been known to upset some amplifiers.

## CONCLUSIONS

We have waited a long time for bass extension to go with Celestion's 6-series, but the wait has been well worthwhile. This ingenious addition gives much more than it takes away, the only minor reservation relating to the electronics, which are very good rather than great. The 6000 deserves confident recommendation as a balanced full range system which ably builds on the strengths of the 600, qualified to the degree that this is not a super-loud or -sensitive system. And as a parting note, Quad ESL63 users might be interested to know what a good match the 6000 bass system is for these popular electrostatics, offering similar benefits to those afforded the 600.



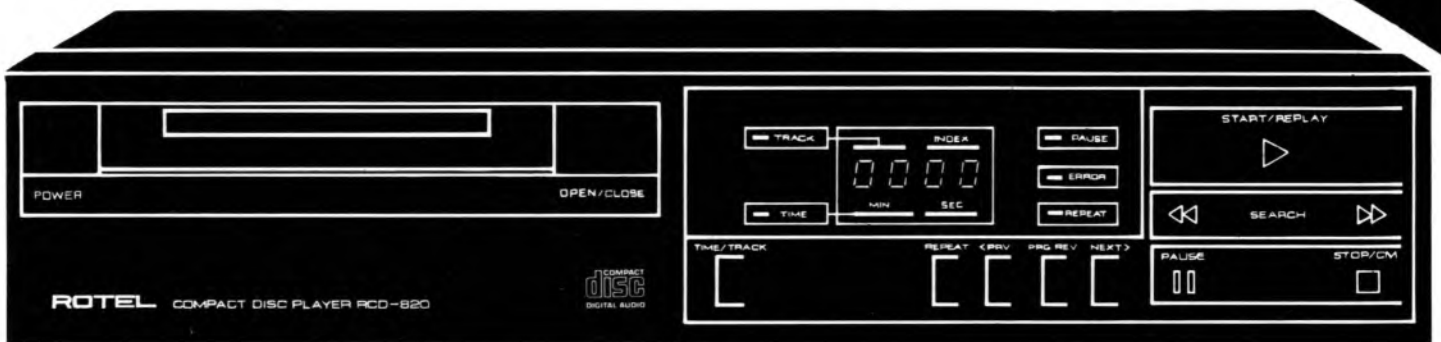
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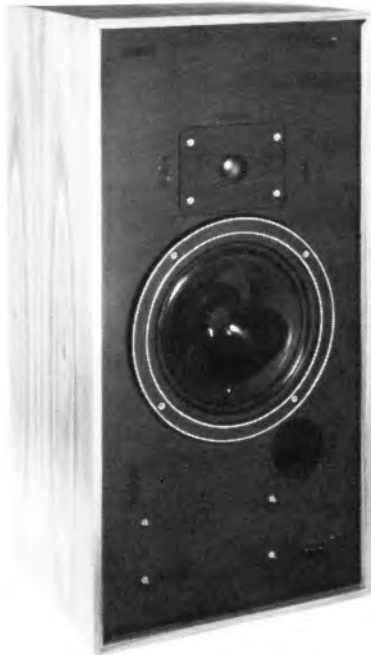
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# INFINITY REFERENCE STANDARD IIB

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Infinity's giant *Reference Standard* loudspeaker system, now in *Series III* form, has a 1,500lb shipping weight, with the stereo pair employing a total of 12×300mm servo-controlled bass units, 24 planar mid drivers and 72 tweeters.

There are two smaller models in the series, the *IB*, and the *IIB* which is the subject of this review. As I write, I am sitting in front of a large area of natural mid-tone oak veneer, rising some 1.6 metres from the floor. The breadth of each is 57cm, which is enhanced both acoustically and visually by a convex curvature to the front panel. Including plugs and grille, the system is quite shallow, however, measuring some 30cm deep. The systems come right- and left-handed, and a distinguishing feature of the range is Infinity's own drivers, the planar foil EMIM mid units and the EMIT high frequency drivers. Infinity also build their own polypropylene-coned woofers.

In the *IIB* three mid units are mounted in a vertical line, and come into operation above 150Hz, a favourably low crossover point. As a group the mid array continues to 800Hz, while the central module continues to 4kHz in order to maintain good directivity. The upper section of the baffle is open and the mid drivers are bi-directional, open-backed units, thereby ensuring freedom from box coloration. The treble units are closed-back, and to maintain the balance of sound between front and rear, a second tweeter is fitted facing rearwards. The vertical slot of each tweeter has a radiating aperture of 50×15mm, and an additional 15×22mm 'super-tweeter' is employed to maintain good directivity above 8kHz. The tweeters are mounted laterally with respect to the mid drivers, but potential polar problems are minimised by the essentially linear phase, time-aligned nature of the planar drivers.

The lower five-eighths of each baffle is a rigid sealed-box enclosure driven by a pair of high power 250mm bass drivers, employing BBC-style flared polypropylene diaphragms. These well-damped units would normally present a relatively limited bass extension, but in the *IIB* they are designed to work with a matching low frequency equaliser. This suppresses the natural system resonance and results in a range claimed to extend to 29Hz, ±2dB; without such a technique a 60Hz rolloff could be expected.

In the US, floor mounting is anticipated, but our experiments have shown that a rigid low stand of 75-100mm height can improve the sound, adding 'speed' and 'power' to the bass. Such a stand requires point contact at both floor/stand and stand/speaker interfaces, with adjustable spikes for the floor and *Tip Toes* or similar for the speakers. If the speaker is so elevated it is important to adjust the vertical angle or tilt so that the optimum mid-treble axis is directed at the listener, as this ensures optimum clarity and focus from the system.

## BI-AMPLIFICATION

This is certainly a complicated speaker to set up, and while it can be used with a single stereo



amplifier, it really comes into its own when bi-amped. In this mode, only the low pass arm of the crossover frequency is electronic and the rest is passive.

The basic price is £3,550 and the importers, Automation Sciences, are offering a package complete with a custom solid-state bass amplifier and a Conrad Johnson MV50 valve mid/treble amplifier for a total of £5,800. This provides an attractive start, but the real dynamic quality of the *RSIIB* can only be realised using larger amplifiers with substantial 40hm power ratings. On test, we used an *ARC D115 II* for the bass and a *C-J Premier Four* for the mid-treble.

## SOUND QUALITY

Once set up and properly in phase, the system as a whole provided five pre-set level control, so the speaker can be fine-tuned to optimise its relationship with both the system and the room. In our tests, bass and contour settings were left close to the recommended levels, while the 1-4kHz level was kept at the specified 12 o'clock level. The upper units were preferred when set between 10 and 11 o'clock.

First impressions were of an open, 'unboxy' sound of large scale and with impressive soundstage height and width. Initially it sounded 'different' to other systems, with some recognisable idiosyncracies, but proved so easy to live with sonically (if not visually for me!) that one became adjusted very quickly. Set for the optimum mid tonal balance, the bass in my view was excessive for small rooms, but was nonetheless very highly rated for speed, depth, tonality, resolution and ultimate power. Full orchestra was handled very well, including the amazing *Telarc*s, as was the *HFN* 'garage door' track.

Essential at this price level, the *IIB* possessed regions of uncompromised transparency, particularly above 500Hz where space, air and subtle detail were reproduced with ease. In my room the stereo focus was good rather than excellent, but I am assured that in bigger rooms allowing a greater subject spacing, the focus continues to improve, as it does for example with the *Magneplanars*. Below 500Hz it seemed somewhat recessive by comparison with our references, while 'cello and piano left hand seemed a touch lightweight and could have done with more power and projection. Coloration was generally low, though the planar drivers did have their own distinctive quality.

While the sound could be adjusted to give good tonal balance and a smooth overall result

quite free from hardness or compressive effects, at times there was a feeling of separate units, not quite achieving perfect blending.

## LAB REPORT

The system type precluded full anechoic testing, but representative axial measurements were carried out, plus the revealing computer-generated response in-room.

Given the complications of bi-amplification, the basic sensitivity was estimated at around 90dB, which is high, making the most of smaller amplifiers and providing high sound levels with large ones, for example up to 110dB in-room for a stereo pair. This is a genuinely large-scale system, with low distortion and a wide dynamic range. Checks on impedance showed 3.6ohms at 100Hz and 3.5ohms at 1kHz, so a 4ohm rating should be assumed and the matching amplifiers chosen and used accordingly.

Using near field measurement, the bass was well extended to 30Hz, -3dB, and was only 6dB down at 25Hz. Notwithstanding the measurement difficulties, it was nonetheless felt that the overall axial responses were somewhat uneven. We had expected a smoother, and better integrated output given the kind of 1/3 octave averaging employed. The curves varied quite a lot with small changes in mike position, indicating broad driver overlaps. The *IIB* was also noticeably directional in the vertical axis, this also noted during the setting-up procedure.

In-room, on the optimum setting, and with computer averaging, the output settled down noticeably. The range 60Hz to 15kHz was almost within ±2.5dB, a respectable achievement. Output appeared uniform and well integrated, except in the low bass where some 5dB lift was present at 50Hz reaching 10dB at 30Hz and 25Hz, though this is not as subjectively damaging as one might expect; in larger spaces the performance will probably be close to correct.

## CONCLUSIONS

This impressive large-scale speaker may be used in a number of ways, in packages including power amplifiers that cost from £5000 to around the £7000 level. Its many controls complicate the issue, but ultimately allow great versatility with respect to system matching and optimum room interfacing. A little uneven in performance, it had areas of truly great performance, including such aces as low coloration, transparency and sweetness. Furthermore it can play loud and has near effortless, extended, dynamic, low distortion bass. As such, it demands to be taken seriously.

## TEST RESULTS

Size (height × width × depth) \_\_\_\_\_ 160 × 57 × 30cm  
Recommended amplifier power per channel (for 96dB/A per pair at 2 metres minimum) \_\_\_\_\_ 100 to 250W  
Recommended placement \_\_\_\_\_ on low stand, free space  
Frequency response, within ±3dB at 2 metres \_\_\_\_\_ 50Hz to 17kHz  
Low frequency rolloff (-6dB point) at 1 metre \_\_\_\_\_ 25Hz  
Voltage sensitivity  
(ref. 2.83V or 1 watt into 8ohms at 1 metre) \_\_\_\_\_ approx 90dBW  
Approximate max sound level (pair) at 2 metres \_\_\_\_\_ 110BA  
Impedance characteristic (ease of drive) \_\_\_\_\_ average 4ohms  
Forward response uniformity \_\_\_\_\_ good  
Typical price per pair \_\_\_\_\_ £3550 (inc LF equaliser)  
First reviewed *The Collection* 1986.

**JBL 250 Ti**

HARMAN (AUDIO) UK LTD, MILL STREET, SLOUGH, BERKS SL2 5DD.  
TEL: (0753) 76911

**F**lagship model of the JBL Ti series, the 250 is a large and imposing speaker of unusual design. A key feature is the development of a new dome tweeter. Made from a thin foil of titanium (chemical symbol Ti), no significant resonances or break-ups occur within the working audio range, its performance closely approaching the fabled acoustic piston with perfectly defined behaviour.

The 250 Ti is a large floor-standing enclosure, superbly finished in natural oiled veneer, with nicely rounded front edges and a tweeter mount executed in solid hardwood. Built as mirror image pairs, these substantial monoliths include a prominent inwards taper from the base to the top, slightly tilting the line drawn between the drive units, and a second taper reducing the depth of the enclosure towards the top. Height is an imposing 1.32m (52in) and the speaker sits very stably on its massive base section, 0.57m wide by 0.36 deep (22.5 x 14in). Weight is also sizeable at 68kg (150lbs) and two people are required to lift each enclosure.

Grilles are dimensioned to cover the lower three drivers, leaving the striking tweeters and mounting exposed, leading at least one visitor to remark upon the 250's 'Cyclopean' appearance. The 16mm thick grille frame is unrebrated but JBL have avoided the worst effects by lifting the grille 15mm away from the front panel.

In this generous four-way design, the bass is handled by a 360mm diameter doped pulp-cone driver, powered by a massive 100mm motor unit with an edge-wound copper voice coil. A rigid cap seals the diaphragm centre while the edge is suspended on a quite narrow polyurethane foam surround. Energised by a massive magnet of the SFG type (symmetrical field pole structure) which offers low distortion from ceramic magnets, the unit is built on a rigid cast alloy frame and operates up to 400Hz.

Frequencies between 400Hz and 1.4kHz are allocated to a 200mm midrange unit, a traditional design with a ribbed pulp cone but an oversize 50mm motor-coil. This unit is self-terminating via its integral doped surround.

Classed as a midrange but in fact operating in the low treble from 1.4kHz to 5.2kHz, the third driver has a 100mm polypropylene cone, terminated in a high-loss synthetic roll surround. The cone material is loaded to increase stiffness and extend its operating range; JBL's curves suggest a response good to 6kHz.

The tweeter is a 25mm dome made in one piece from 25 micron titanium foil, including the surround which uses JBL's proprietary Diamond Pleat pattern to provide the necessary compliance. A side effect of this form of construction is the higher than usual fundamental

resonance coupled with a high mechanical Q factor. As part of the design strategy JBL have used a compensator network to flatten the input impedance of the tweeter, and in addition they have chosen a higher crossover frequency than usual — 5.2kHz instead of the usual 2.5 to 3.5kHz.

An electrical compensation technique is also applied to the bass driver circuit to flatten its characteristic and smooth the crossover response. Built to a high standard, the crossover capacitors include bypass components to improve the transient response of the electrolytic types.

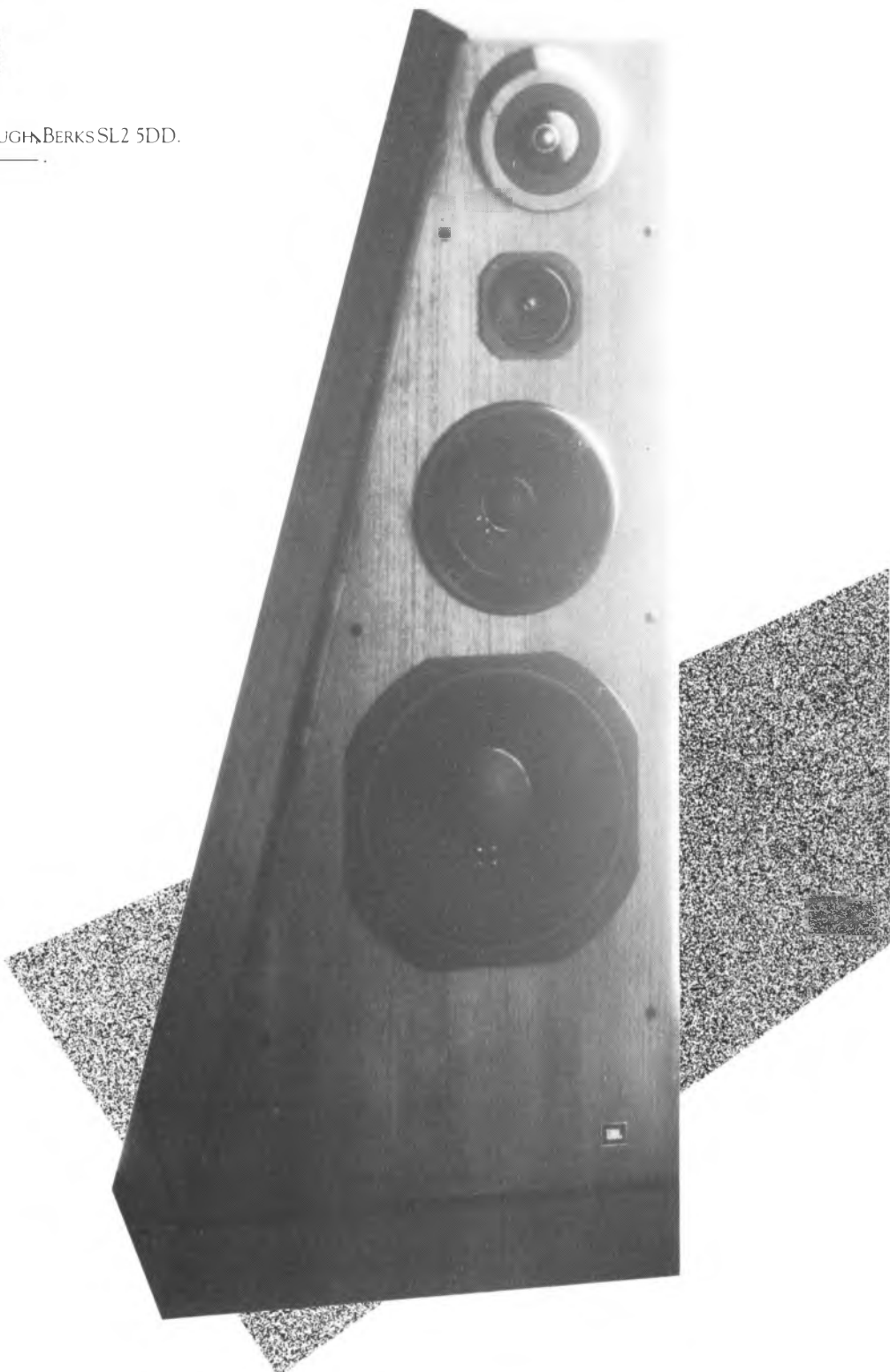
Electrical connection is via 4mm socket/binding posts, and this region of the back panel also carries an array of screw down connector bars which may be re-arranged as desired, to provide

tonal balance control via attenuation of the upper three drivers. Listening tests early on found the most accurate sound in the test system and room was with the mid at 0, and the two upper units both wired for -1dB.

The low frequency enclosure is reflex tuned by a large, 105mm diameter tunnel port, 130mm deep and with a 30Hz bass resonance. On test the low bass was sometimes felt to be excessive, so a light plug of polyester wadding was placed in the duct. In general this was preferred and room responses taken for both conditions seemed to back this opinion.

**SOUND QUALITY**

First impressions of the 250 were encouraging. Big in image scale, with an effortless feeling of





power in reserve, the speakers' physical height lent a related feeling of height and 'dimension' to the sound. It could be driven hard with up to 350W peak programme per channel without any signs of distress or limiting, and could also handle big inputs in the bass, delivering a massive floor-shaking 'slam', rather excessively with the undamped reflex ports. Using the plugs the bass was subjectively considered to be well extended but lost its 'leaden' quality, the sound gaining in articulation and percussive impact.

Taken overall, the speaker seemed relatively clean and surprisingly sweet. The historic JBL 'nasality' and 'bite' were absent, and it could handle a difficult chorus of treble voices without subjective hardness or aggression.

However, stereo depth was surprisingly weak, the sound transparent in places but in general

rather shallow in dimensional terms. Recorded ambience and hall acoustics did not develop properly. Stereo focus was good, but not outstanding.

Tonally 'even' with the optimised attenuator settings, the voice range was a touch 'grating' and thinned while the treble, although specifically of excellent quality, did not blend perfectly, showing mild excess sibilance.

With broad orchestral music, a mild cluttering of frequency bands was felt to be associated with individual drive units, though this was much less obvious on popular programme material.

On piano it was unimpressive, the right hand range was sometimes near-xylophonic, while the left hand was occasionally nasal. Essentially distortion free, the speakers seemed to sound

slow and undynamic, and were felt to be less involving than we had anticipated.

### LAB REPORT

The impedance characteristic showed a fine 8ohm result, making this an easy-to-drive design. The sensitivity was on target at a high 89dB/W, providing high sound levels of up to 109dBA in-room. Amplifiers from 50W to 300W per channel would be sensible, chosen according to room size, sound level required, and quality.

A fair representation of the anechoic response in third octaves was achieved. The preferred mild depression in the treble was seen, but otherwise the speaker met tight  $\pm 2.5$ dB limits from a low 30Hz to 20kHz. The -6dB point was below 25Hz! Looking at the forward responses, the 30° and 45° off-lateral outputs were good, aligning well with the major axial response above. A deeper loss occurred in the 15° output taken above axis (unlikely in practice in view of this speaker's reach above a seated listener), and was centred in the upper cross-over region.

Turning to the computer averaged room response, the bass of the standard product was clearly excessive, rising 10dB above the otherwise well defined main response. Only very large spaces could accommodate this characteristic, one which I have noted with other very large US systems. With the ports damped, a much better low frequency balance was achieved and here it was plain that ample bass output remained, at least to 25Hz.

### CONCLUSIONS

As factory referenced, these speakers showed a significant excess in the bass and treble. Having carried out the adjustments described above, an accurate in-room response was achieved, both measured and subjectively assessed. The design is also superbly built and finished, has a high power handling and volume capability, low distortion and an extended smooth response. However, it did not show the required level of dynamic presentation, transparency and stereo depth expected from a flagship model at this price level, and I would therefore advise careful audition prior to purchase.

### TEST RESULTS

Size (height × width × depth)	132 × 57 × 36cm
Recommended amplifier power per channel	(see text)
Recommended placement	free space on floor
Frequency response, within $\pm 3$ dB at 2 metres	30Hz to 20kHz
Low frequency rolloff (-6dB point) at 1 metre	25Hz
Voltage sensitivity	(ref. 2.83V or 1 watt into 8ohms at 1 metre)
Approximate max sound level (pair) at 2 metres	109dBA
Impedance characteristic (ease of drive)	straightforward
Forward response uniformity	good+
Typical price per pair, including VAT	£3299
<i>First reviewed: The Collection 1986</i>	

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## KEF 107

KEF ELECTRONICS LTD, TOVIL, MAIDSTONE, KENT ME15 6QP  
 TEL: (0622) 672261

**A** new flagship model from KEF is a rare and inevitably innovative event, and the Summer '86 launch of Model 107, introducing a 'hybrid' approach to crossover network design, is no exception. 'Hybrid' in this instance refers to a combination of active and passive drive techniques. The loudspeaker is supplied complete with a small and neat mains-powered unit that takes over the role of equalising the loudspeaker's response between pre- and power amplifiers (or within the tape record/replay loop of an integrated amplifier), while performing a few other useful tricks besides.

The loudspeakers themselves are quite large, but attractively styled and not unduly obtrusive. However, they should ideally be sited clear of walls to give lowest coloration from the wide dispersion mid and treble, and are in any case clearly better suited to the larger room.

The ancestry of both the 105 and 104/2 models may be seen in the physical makeup of the 107, but with obvious refinements. The bass section uses the efficient 'coupled cavity' principle introduced on 104/2, but with larger drivers and enclosures, plus a port which exhausts upwards immediately under the midrange driver, giving good co-unit integration and even horizontal dispersion. As before distortion is reduced by operating the twin drivers in opposition, with mechanical coupling. The mid and treble units are mounted in a head assembly similar to that used in Model 105 but with substantial reinforcement and extra damping.

Each enclosure has a complex and very closely tolerated dividing network which incorporates KEF's 'conjugate load matching' technique. This adds extra components in parallel to 'neutralise' the impedance and phase load variations across the frequency range. The result is a completely flat 4ohm impedance which allows any reasonable amplifier to use its full power potential, by avoiding any 'awkward spots' which can limit available headroom.

The advantages of supplying the equalisation electronically ahead of the power amplifier are twofold. The main task of equalisation is to extend the bass response, and in a passive crossover this is normally achieved by wasting some of the power supplied in the midband. By using electronics, KEF boost the bass power supplied instead, and so avoid this wastage, which is worthwhile because the midrange contains the highest energy levels with most types of music.

The equaliser unit also has a wide range of bass alignment options, allowing user selection of the ultimate low frequency cutoff, the Q factor which determines the 'character' of the bass (rich, dry etc), and a 'contour' to compensate for room boundary effects. These greatly assist in matching the system to the room, the site in that room, the other components of the system, and the personal taste of the user — and give an ability to choose the tradeoff between system loudness and bass extension according to circumstances.

### SOUND QUALITY

The model 107 gave remarkable results with quite modest amplification, proving capable of extravagantly high listening levels and a large scale sound, the unusually good dynamic headroom giving a welcome sense of ease and lack of strain at most normal levels. Coloration was low, stereo spacious and precise, with fine detail well portrayed, while the overall balance — closer to the older 105 than KEF's more recent 104/2 — was neutral and free from any exaggeration. However, 107 is capable of 5dB more loudness than 105, and proved superior in extension and other qualities besides.

Minor criticisms were noted nevertheless. There was a slight loss of 'air' and 'dulling' in the extreme treble, plus a touch of mid congestion in the upper vocal range. While the bass sounded impressively clear, 'fast' and dynamic, it was also a touch 'heavy' at very low frequencies — true even with the best K-UBE

setting for room and site. With certain special discs such as the Telarc 1812 cannons the heavily boosted bass could be driven into distortion, but this was never any problem using normal material.

When used on the end of a top line system with thousands of pounds worth of amplification, the improvement over cheaper amplification was not as great as had been expected. The finger of suspicion points to the K-UBE itself, and this was more or less confirmed by trying the system K-UBE-less. Without its designed equalisation, and listening through the balance changes, an improvement in transparency was noted.

### LAB REPORT

Measurement gave the K-UBE a clean bill of technical health and confirmed the accuracy of the various equalisation functions. The overall range of adjustment can be quite high, from a 12dB cut at 50Hz to a 22dB boost at 10Hz, the latter inevitably making some demands on amplifier headroom under some circumstances. More typically, +6dB at 30Hz should pose no problems, and the high inherent sensitivity of 90dB/W is further assistance. The impedance was confirmed as an essentially resistive 4ohms, which should create no problems with a decent modern amplifier — rather the reverse, the amplifier should find it easy to deliver near rated power without drama.

The frequency response measured superbly on axis, within +/- 2dB 40Hz-20kHz. Mild crossover region unevenness measured above axis should not trouble the seated listener, while lateral off-axis and nearfield plots showed fine control and drive unit integration. The room responses confirmed a natural (K-UBE-less) extension down to 25Hz, and confirmed the subjectively noted slight excess of low bass relative to upper bass/lower mid when the K-UBE was used.

### CONCLUSIONS

Taken overall Model 107 looks a remarkable package, combining accuracy and stereo subtlety with high sensitivity, loudness and bass extension, plus unusual user flexibility in a package of excellent acoustic performance and reasonably modest dimensions. Its particular forte lies in driving large rooms without the need for expensive amplification, but the moderate transparency limitations of the K-UBE electronics somewhat restrict its suitability for partnering more exotic amplification.

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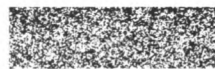
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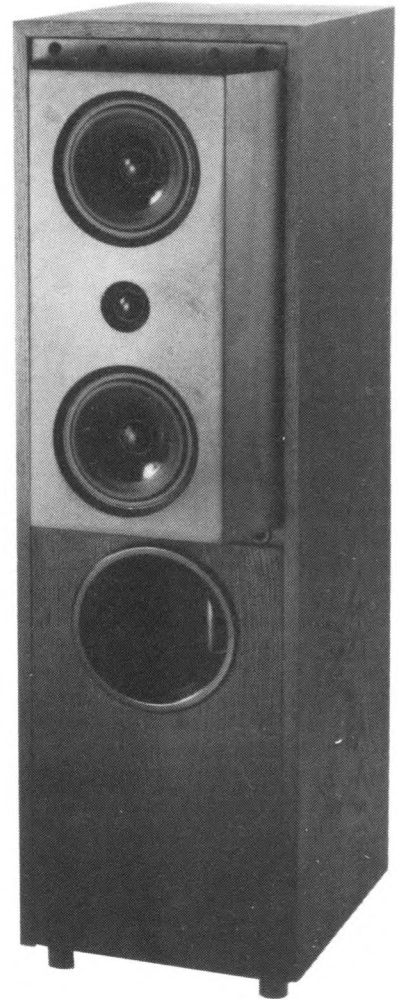
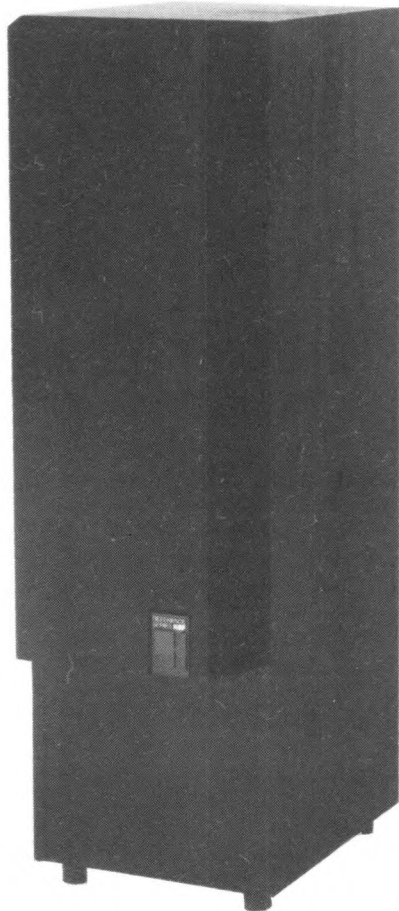
## KEF 104.2

KEF ELECTRONICS LTD, TOVIL, MAIDSTONE, KENT ME15 6QP.

TEL: (0622) 672261



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### SOUND QUALITY

When first auditioned in 1984, our early pair of 104.2s immediately showed many good qualities, among them dry 'quick' transients, very good stereo focus with fairly good depth, much fine instrumental detail and considerable clarity in the midrange. Conversely, these samples had a slightly 'odd' bass quality which reduced the ability to differentiate between bass sounds. Nor was the bass subjectively well extended. The treble was of generally good quality but the mid showed a significant forwardness, which compressed depth and gave a hardened, thinned quality to the tonal balance.

Production models have overcome most of these points of earlier criticism. The bass now sounds more open and better integrated with the midrange, while the latter also has more body. In addition the upper-mid harshness has been ameliorated, all with a barely noticeable shift in the original response curve.

### LAB REPORT

A complex speaker of very advanced design, the 104.2 uses a total of five drivers. Inside the enclosure are two 200mm pulp cone bass units, vertically mounted facing each other and back loaded by sealed chambers above and below. Their output feeds a damped central chamber, which is fitted with a large diameter, high velocity port, the effect being that of a second-order resonant circuit with a 12dB/octave rolloff below bass resonance. The port continues to transmit output above resonance, right up to the lower crossover frequency of 150Hz. From 150Hz to 3kHz or so, two 110mm Bextrene cone midrange units operate in parallel, mounted above and below the 25mm soft-dome ferro-fluid damped treble unit.

The enclosure is extremely rigid and well damped, with a low acoustic output, and the system employs a very complex crossover with full compensation for input impedance. The total system presents a flat 4ohm resistive load, optimally matched to modern amplifiers.

Pair matching was very good at better than  $\pm 0.75$ dB while the reference midband sensitivity met the high specification at 92dB/W, albeit for a 4ohm system on an 8ohm 'watt'. The grille is best left on and is properly integrated acoustically. The main mid octave showed a 2dB lift after the lower frequency range while the  $-6$ dB point registered a modest 50Hz. Our at 2 metres the forward response family looked very tidy, while the '15° above' response indicated the cabiner axis should be directed at the listener. Tight  $\pm 2$ dB limits sufficed for a 65Hz to 20kHz axial response, though some band to band imbalances were suggested. KEF's distortion specification was a touch optimistic in extending to 20Hz, but actually the 104 did offer low levels of distortion over the entire range. On compression, we noted an excellent 0.11dB while the intermodulation product was negligible, since the 400Hz signature tone

appeared above the crossover point.

As claimed, the impedance was almost perfectly flat reflecting a uniform 4ohm resistance, and uncritical of most amplifiers or cable type. For extended high power drive, 4ohm rated amplifiers are a sensible choice.

### CONCLUSIONS

The 104.2 remains a touch 'lively' and 'up front', with some treble 'grain', but its merits of good 'speed', dynamics, stereo and loudness can now assert themselves, and in its current production form, the speaker qualifies for recommendation.

### TEST RESULTS

Size (height  $\times$  width  $\times$  depth) 90  $\times$  28  $\times$  41.5cm  
 Recommended amplifier power per channel (for 96dB/A per pair at 2 metres minimum) 10—200W  
 Recommended placement floor, away from side walls  
 Frequency response, within  $\pm 3$ dB at 2 metres 60Hz—20kHz  
 Low frequency rolloff ( $-6$ dB point) at 1 metre 50Hz  
 Voltage sensitivity (ref. 2.83V or 1 watt into 8ohms at 1 metre) 92dB/W  
 Approximate max sound level (pair) at 2 metres 110dB/A  
 Impedance characteristic (ease of drive) an easy 4ohm load  
 Forward response: uniformity very good  
 Typical price per pair, including VAT £768  
 First reviewed: 1984; retested 1985. Rating: Recommended.

## LINN ISOBARIK

LINN PRODUCTS LTD, 257 DRAKEMIRE DRIVE, CASTLE MILK, GLASGOW G45 9SZ.  
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**T**ypical of expensive loudspeakers in being substantially different from everything else around, the *Isobarik* attracts strong praise or criticism depending on personal taste. Such polarisation can leave the unfortunate reviewer in the position of judge and jury, forced to pick sides.

However, the situation here is rather different. The marketplace has already delivered the verdict, because the *Isobarik* shares with the Quad ESL63 the distinction of being the only £1000+ speakers to have sold in quantity on the UK market over a number of years. Furthermore your reviewer in this case is an acknowledged 'Barik' fan, with regular experience going back nearly ten years. Rest assured I do not plan to heap nothing but praise...

Though undoubtedly big, the *Isobarik* is dwarfed by many other 'high end' loudspeakers. And being designed for sitting close up against a rear wall, its visual obtrusiveness is further minimised. The heavily reinforced MDF cabinetwork is nicely veneered and finished, with a reasonable attempt at some discreet styling. The professional style Cannon terminals may not encourage experiment with different speaker cables, but does ensure a good quality connection.

A heavy cabinet with steel internal bracing rods and six drive units results in a substantial mass which is not easily handled by one person. Matching spiked stands are *de rigueur* for good performance, those from Linn (£99) being highly regarded, though alternatives from the Sound Factory were used for listening.

Substantial though the *Isobarik* is, it doesn't make much of a plant stand. The drive units, concealed beneath acoustically transparent foam grilles, are distributed over the front baffle and the top surface with the second bass unit lurking within the box. Each driver is twinned, and they are connected in parallel to give a nominal 4ohm load, so partnering amplifiers need to be able to deliver plenty of current.

The *Isobarik* is available in two versions, the active crossover-less PMS and the passive DMS. Given the tripling of PMS power amplifier costs, it is hardly surprising that the DMS is the more popular model, but most of my experience has been of the PMS, via (ageing) Naim NAP250 power amplifiers and NAX02/Hi-Cap active crossover. (Now that they have their own amplifiers, Linn are developing an alternative active drive for the PMS, which differs from the Naim approach by incorporating complex equalisation

within the filter unit: a prototype has been doing the rounds in a roadshow, but is not yet finalised for production.)

The KEF B139 bass and B110 midrange units have long and illustrious histories, are further modified by Linn, and are partnered by a Highquphon tweeter from Scandinavia (very similar to the Scanspeak unit which was fitted until a few years ago). The internal bass driver is closely coupled to the external unit via a short chamber, so that the two operate in acoustic series. There has been much discussion of the net result of such an arrangement, but it is certain that one consequence is a cabinet half the size it would need to be for similar bass extension with a single B139. Mutual interaction also seems to broaden and suppress the fundamental resonance somewhat, giving a decidedly 'tight', low-Q resultant.

The twinned midrange and tweeter units are even more controversial, the semi-omnidirectional configuration undoubtedly compromising stereo image precision. A personal view is that the mutual perpendicularity of the drivers is a cunning means of avoiding information loss: baffle or cabinet vibration can interact and interfere with drive unit output, but such a mechanism is unlikely to operate simultaneously in the horizontal and vertical planes, so when one driver is thus compromised, its twin should remain unaffected.

### SOUND QUALITY

The impressive bass performance is one of the *barik's* greatest strengths. On the lead-in groove of an LP the almost total absence of general low

frequency background 'grumbling' makes one wonder whether there is any real bass at all — until the programme starts, when it becomes apparent that there is bass when it's meant to be there, and not when it's not. Essentially, the normal low frequency resonance of loudspeaker systems has been rather effectively suppressed. Bass extension is as good or better than the competition, while the relative level, on the lean side but assisted by wall mounting, seems well-judged for European-sized rooms. Subjective speed here is quite exceptional.

The midrange has a notably wide dynamic range, but there is also a degree of coloration, partly contributed by the wall location, which some may find irritating. This tends to be more exposed than usual because of the fine bass control and somewhat 'forward' overall balance. The treble perhaps lacks the transparent 'sparkle' of the very best, but is innocuously informative, providing plenty of detail without attracting unwelcome attention to itself.

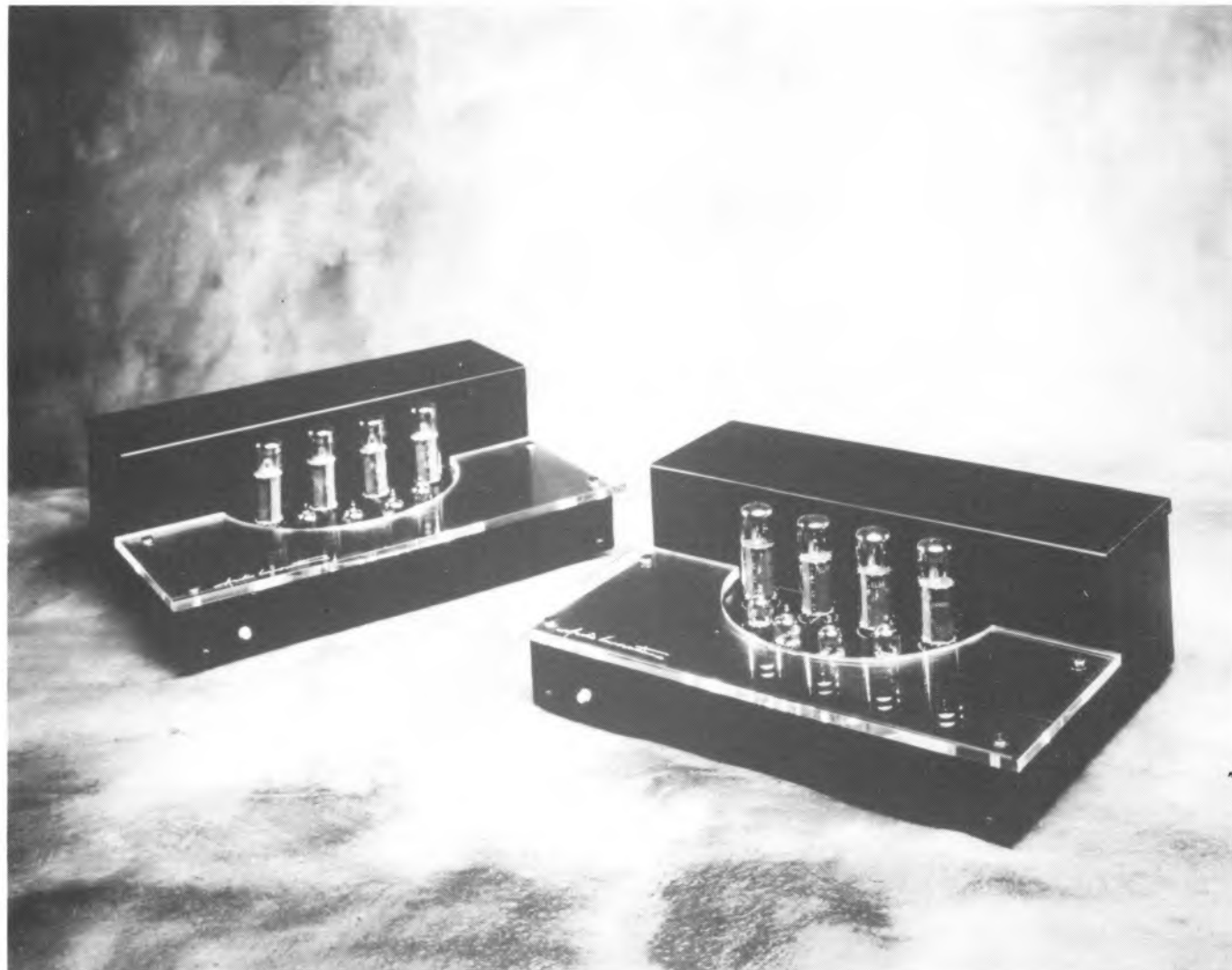
Stereo imaging is perhaps the *Isobarik's* 'bete noir'. Certainly it lacks the tight focus and the ability to create the fine soundstage detail of many other designs, because the apparent individual images created tend to be a little 'overblown'. However, the images which are created do tend to sound unusually 'solid', and the soundstage as a whole retains total coherence. Arguably not the ideal speaker for fans of simple live acoustic recordings, the *Isobarik* seems well suited to the creations of the modern recording studio.

Needless to say the above characteristics largely apply to both active and passive *barik's*, but the active PMS scores several points above the DMS in a number of areas, notably dynamic range, perceived bandwidth resolution, and the ability to create an exceptional sense of scale and solidity.

### CONCLUSIONS

No more nor less idiosyncratic than most £1000+ loudspeakers, the *Isobarik* has certain exceptional capabilities, particularly when actively driven, which demand its serious consideration as a state of the art contender. It particularly provides exceptional dynamic range and bass performance within a generally domestically acceptable package, and is well suited to modern studio recordings. It is extremely revealing of source and amplifier inadequacies, and so may be recommended subject to careful individual assessment in a system context. Estimated typical price £1495.

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**T**his is a relatively compact, superbly-crafted three-way sealed-box speaker, of highly rigid and braced construction, and with an exterior black 'piano' surface finish. Working best on strong stands, it can also be placed near, but not too close to the rear wall; 30cm is about right.

The bass driver is a top-class 300mm pulp cone unit, built on a die-cast alloy frame and employing a massive motor system. The protective grille over the bass driver rings a little, and fussy owners could discard them, as we did for our tests. The mid and treble units, 85mm and 30mm respectively, are Yamaha's unique ultra-hard beryllium dome units, both fitted with front phase correctors. Level controls are also provided for mid and treble, and we obtained the best balance and curves with mid at '-2' and treble '-1'.

A high-quality, high-power crossover divides the frequency range at around 600Hz, and 5kHz, with spring clips for electrical connection at the rear of the speakers.

**SOUND QUALITY**

This speaker has historically attracted some censure, notably on analogue-based programme. However, the latest samples (1985), using mainly digital programme, the speaker appeared to 'come to life', and produced an impressive sound. The bass was quite exceptional, it appeared to produce good stop-start transients, and was also

sufficiently transparent to reproduce the natural acoustic on many recordings. Stereo images were well focused giving a decent depth effect.

Some coloration was still evident, namely a slightly 'deadened' presence range with some mid 'nasality' and a trace of 'lipiness' and 'grain' to the treble, which is accentuated by distorted programme. On high-quality material, however, its 'monitor' label appeared justified by high sound levels with negligible subjective distortion.

**LAB REPORT**

The high 90dB/W sensitivity was slightly compromised by an impedance which dropped to 4 ohms at 80Hz. This qualifies the speaker as a fairly difficult load.

System resonance was 35Hz, which was lower than the previous samples, giving good bass extension to 40Hz, -6dB, with a desirably slow, damped rolloff below this point. The axial response was pretty uniform at 1 metre but by 2 metres some 'lumpiness' had crept in through the mid treble. Aside from this, however, the forward integration was very good over the range

of measurement axes.

On the computer-averaged room response, the clean extended bass was clearly evident, with the treble register well shaped; overall this is quite a well balanced result.

At 96dB sound level, distortion was remarkably low, with third harmonic much less than 0.1% above 500Hz and second averaging just 0.3 to 0.5%, even at lower frequencies. At the 86dB level, distortion was exemplary. Furthermore, the speaker had high peak power handling capacity of up to 200W, and high sound levels were possible from a stereo pair — up to 108dBA in a typical room!

**CONCLUSIONS**

The long-lived NS1000 remains quite competitively priced. Satisfactory on analogue sources and really coming into its own on digital, the NS1000 is a worthy contender, and well worth considering.

**TEST RESULTS**

Size (height x width x depth)	67.5 x 37.5 x 32.5cm
Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres)	(10)–200W
Recommended placement	30cm from wall on rigid stands
Frequency response, within ±3dB at 2 metres	50Hz to 16kHz
Low frequency rolloff (-6dB point) at 1 metre	40Hz
Voltage sensitivity (ref. 2.83V or 1 watt into 8ohms at 1 metre)	90dB/W
Approximate max sound level (pair) at 2 metres	108dBA
Impedance characteristic (ease of drive)	below average
Forward response uniformity	very good
Typical price per pair, including VAT	£900
First reviewed: 1976; retested 1978 and subsequently reassessed; retested 1983 and subsequently reassessed 1984, 1985. Rating: Recommended.	

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## CELESTION SL6S/SL600

CELESTION INTERNATIONAL LTD, DITTON WORKS, FOXHALL ROAD, IPSWICH, SUFFOLK IP3 8JP.

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David Prakes

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**A** 'luxury compact' loudspeaker, the SL6S is a thoroughgoing redesign of the famous SL6 primarily aiming to cure the sensitivity and bass limitations of the original design. The new 32mm aluminium dome tweeter offers both a higher frequency first bending mode and a lower mass, leading to higher sensitivity than the electroformed copper dome tweeter which it displaces. The closed-box cabinet is now made in medium density fibreboard (MDF), with thinner panels to reduce energy storage. A 'figure 8' brace and inset back panel help make the cabinet rigid; foam absorption is now used internally. It is available in black or walnut wood veneer finish, with optional high twin-pillar stands.

The 165mm Kobex-coned mid/bass driver is now built in a lugged die-cast chassis, which is bolted rather than clamped onto the cabinet. The unique two-part surround is effectively a mechanical crossover. The PVC originally used to terminate the SL6 cone was good at reducing travelling waves in the cone, but was stiff and impaired bass impact. Laser velocimetric analysis showed that termination was already complete half-way through the roll surround, so Celestion have introduced a two-piece surround, the outer half in soft rubber giving a freer suspension at lower frequencies for improved bass articulation and 'speed'. The voice-coil inductance of this driver has also been reduced, to give better bass 'attack'.

The crossover is hard-wired and gives improved integration; a change of slope on the high pass leg has altered polar distribution, and stand height is now less critical. Gold-plated binding posts are fitted.

### SOUND QUALITY

The SL6 has a generous, open sound with good stereo depth and separation — an altogether brighter, more out-of-the-box sound than its predecessor, it is also more capable of catching

the impact and power of bass notes. SL6 bass performance was marred by cabinet effects and the 'slowing' effect of the stiff mid/bass driver surround; the new speaker has a notably articulate bass, free from 'congestion' or 'drumming' coloration.

Furthermore, SL6 delivers something of the exceptional stereo imagery achieved in the more expensive metal-cabinet SL600 (still based on original SL6 drivers and crossover).

A comparison of response traces shows the extra treble energy in the '6S which makes the speaker a little 'bright', and can produce a slight 'pinched' coloration, though otherwise the mid-band sounds unusually transparent.

### LAB REPORT

For the 'S' model sensitivity has improved by roughly 2dB, and the maximum sound level achievable by a pair in-room is now increased to just over 100dB, from the previous 98dB. The speakers showed good pair matching, and the grille and its frame had little effect on the anechoic measurements. The 2m forward response curves are particularly even, showing evidence of the increased treble energy.

The 96dB distortion plots showed some improvement in high frequency figures over the SL6, but at this level this compact speaker is

nearing its limits. The 86dB traces show a dramatic reduction in the 200Hz third harmonic cabinet problem, which was very clearly seen in traces taken on the earlier SL6. The distortion performance at this level is good.

The SL6S computer averaged in-room response shows much better driver integration than before. A uniform output with surprisingly extended low frequencies combines excellent room interfacing with an impressively smooth treble rolloff. The '6S crossover presents a better load than SL6, the one 60ohm minimum confirming a true 8ohm load.

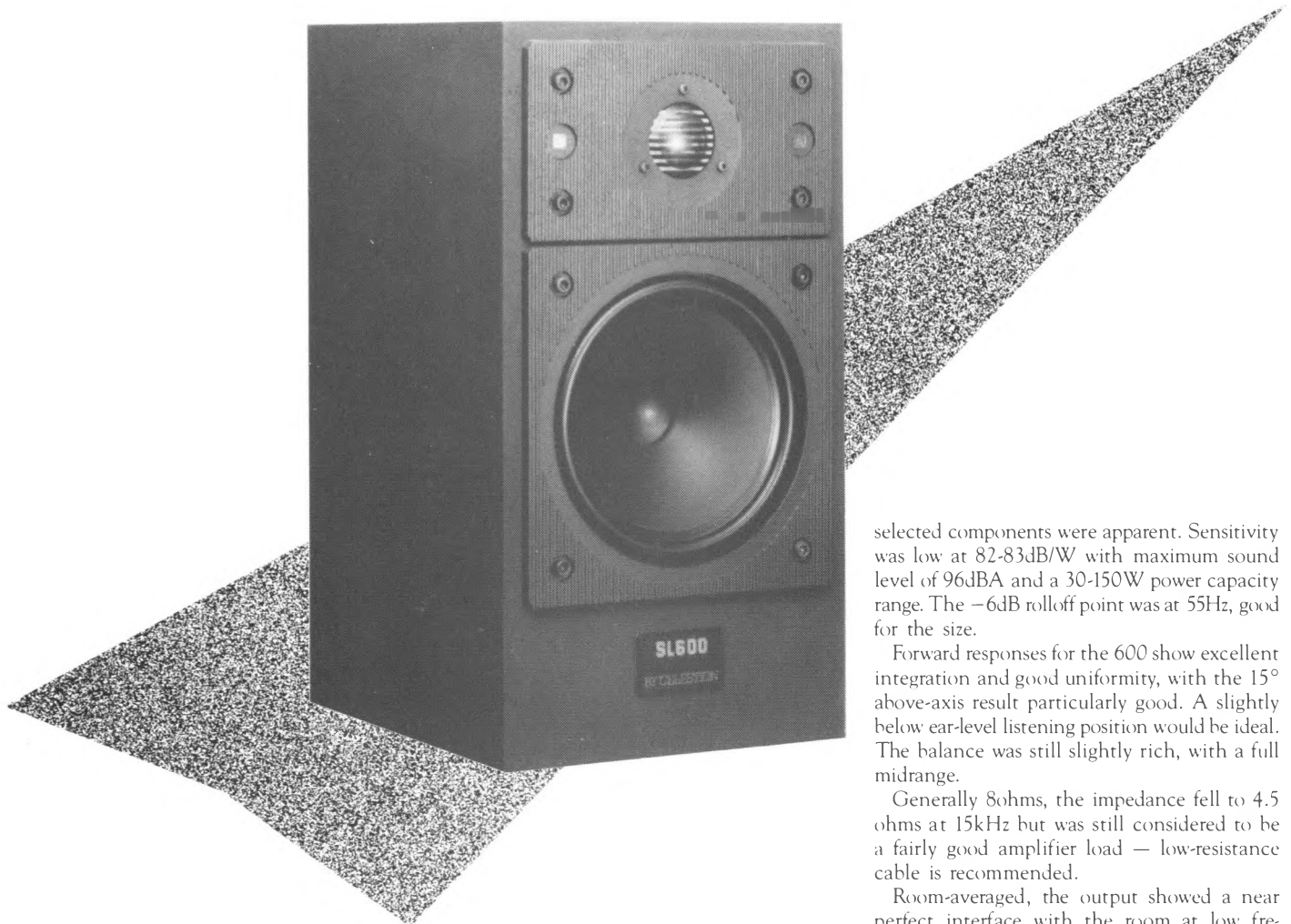
### CONCLUSIONS

Retaining the strengths of the SL6, the SL6S loses none of that design's sweet treble and musical detail. Bass performance has been improved in both extension and clarity, and the redesigned speaker is altogether more neutral, producing some of the excellent imaging properties of the SL600 at under half the price.

Improved sensitivity and continued good drive characteristics make this an easy speaker to match; better treble dispersion allows greater freedom in room placement. The twin-pillar 40cm stands (L series) are recommended for the preferred free space location. SL6S rates as one of the very best compact speakers and carries



*Celestion's approach remains essentially unique: for '87 they've provided extra 'welly' with a unique low coloration subwoofer system (see 6000 review).*



selected components were apparent. Sensitivity was low at 82-83dB/W with maximum sound level of 96dBA and a 30-150W power capacity range. The -6dB rolloff point was at 55Hz, good for the size.

Forward responses for the 600 show excellent integration and good uniformity, with the 15° above-axis result particularly good. A slightly below ear-level listening position would be ideal. The balance was still slightly rich, with a full midrange.

Generally 8ohms, the impedance fell to 4.5 ohms at 15kHz but was still considered to be a fairly good amplifier load — low-resistance cable is recommended.

Room-averaged, the output showed a near perfect interface with the room at low frequencies, having a slight presence droop, a mildly rich treble balance and a smooth rolloff.

### CONCLUSIONS

Arguably one of the finest speakers of its size ever produced, the SL600 has also undergone manufacturing improvements, and despite a somewhat shaky start, the performance of production samples should now be fully up to standard. Compatible mass-loaded stands (Cliff Stone) are now available, and these enhance the performance, which is fully commensurate with the price!

### TEST RESULTS

Size (height x width x depth) 37 x 20 x 25.5cm  
 Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres) (20) -150W  
 Recommended placement open stands (Celestion)  
 Frequency response, within ± 3dB, at 2 metres 60Hz to 20kHz  
 Low frequency rolloff (-6dB point) at 1 metre 55Hz  
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre) 82.5dB/W  
 Approximate maximum sound level (pair) at 2 metres 98dBA  
 Impedance characteristic (ease of drive) fairly good  
 Forward response uniformity very good  
 Typical price per pair, inc VAT £700  
 First reviewed 1983. Rating: Recommended

*Loudspeakers author Martin Colloms' involvement as design consultant finds David Praker writing this review, based on his own interpretation of the lab and listening data.*

a clear recommendation.

### TEST RESULTS

Size (height x width x depth) 37.5 x 20 x 27cm  
 Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres) (20) -150W  
 Recommended placement free space, 40cm stand  
 Frequency response, within ± 3dB, at 2 metres 60Hz to 16kHz  
 Low frequency rolloff (-6dB point) at 1 metre 50Hz  
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre) 84dB/W  
 Approximate maximum sound level (pair) at 2 metres 101dBA  
 Impedance characteristic (ease of drive) good  
 Forward response uniformity good+  
 Typical price per pair, inc VAT £350  
 First reviewed: 1986. Rating: Recommended

### CELESTION SL600

Developed from the original SL6, the SL600 features a special alloy honeycomb enclosure and selected drivers. Both are of essentially identical performance, but price and sound quality differ greatly due to the advanced cabinet of the model 600.

A two-way miniature sealed box design of 12 litres internal volume, the design employs a die-cast, Kobex-coned 165mm bass/mid unit fitted with a generous magnet. The special 37mm copper-dome tweeter has an integral motor coil former and offers high power handling capacity. Both units are of excellent quality, having benefited from new design and constructional techni-

ques plus laser analysis.

The high power 12dB/octave crossover uses separate bass and treble boards. Each crossover is matched to a specific tweeter to correctly align the 21kHz compensation network.

The cabinet is an ultra-light, ultra-rigid aluminium honeycomb box, with special multi-layer graded acoustic absorption within. The very high material cost is in fact the main reason for the higher price. Plain 4mm sockets are provided for connection and the grille is omitted. External finish is a handsome charcoal coloured Nextel with gold legends.

### SOUND QUALITY

The SL600 showed a correct, brighter balance than the original SL6, and scored significantly better still, with a remarkable, almost 'holographic' stereo precision maintained over the entire spectrum. Coloration was very low, detail abundant, and the overall effect was one of airy transparency and subtlety. The bass was reasonably extended, 'quick' and well differentiated, and high scores were awarded. Clearly this speaker is an exceptional device, with transparency the keynote.

### LAB REPORT

The tight balance and integration of the 600's

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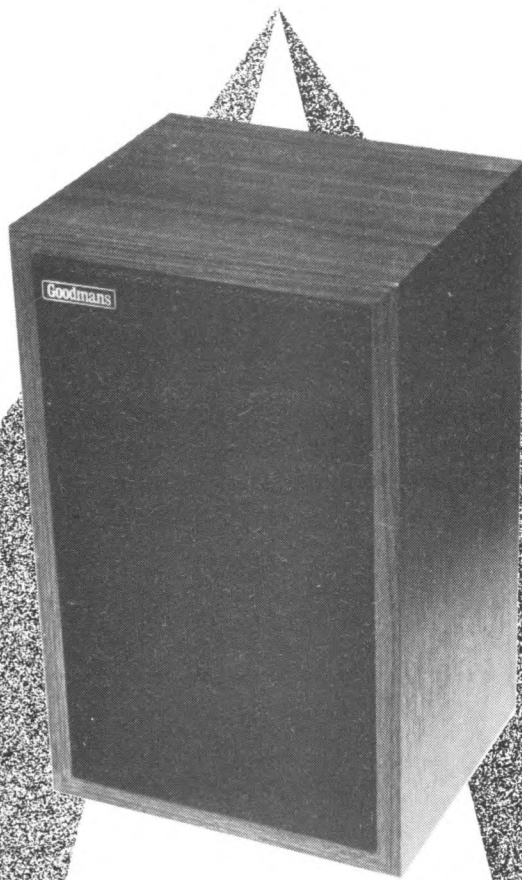
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**BBC LS3/5a**

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*The BBC's Research Laboratory has had an immense influence on post-war UK loudspeaker design and taste. The following selection covers some of the finest current examples with the closest line of descent.*

agreement with the reference unit, though the 1.2kHz prominence seems to have become more pronounced over the years. This perhaps reflects a change in the B110, although it is still within specification. By modern standards the response looks a trifle lumpy, though in its time this system was regarded as a very smooth performer.

**CONCLUSIONS**

At risk of offending the BBC, we feel that the 3/5A is due for a revision; as a working broadcast tool it no doubt does its job, but as a piece of value engineering it is beginning to fall behind. Other speakers have shown a progressive reduction in price as well as an improvement in sound quality, but the LS3/5A has steadily increased in price more or less in line with inflation. Nevertheless, on the most recent listening tests the LS3/5A scores were sufficient to retain recommendation!

**TEST RESULTS**

Size (height × width × depth)	30 × 18.5 × 16cm
Recommended amplifier power per channel (for 96dBa minimum per pair at 2 metres)	(30)–50W
Recommended placement	open stands
Frequency response, within ±3dB at 2 metres	see text
Low frequency rolloff (–6dB point) at 1 metre	57Hz
Voltage sensitivity (ret. 2.83V or 1 watt into 8ohms at 1 metre)	81.5dB/W
Approximate max sound level (pair) at 2 metres	93dBa
Impedance characteristic (ease of drive)	excellent
Forward response uniformity	good
Typical price per pair, including VAT	From £220

*First reviewed: Rogers 1978, Goodmans and Spendor, 1983 (retested 1984, reassessed 1985/86). Rating: Recommended.*

**T**hree manufacturers are currently licensed by the BBC to produce LS3/5As, and all must stick to the Corporation's tight specifications. Designed as a miniature broadcast monitor for cramped spaces, by offering a fine sound quality in its own right it has stood up to much larger competition for more than 10 years. Mounting on high stands well clear of room walls at approximately ear level provides best results.

A sealed plywood box of 5½ litres volume, the 3/5A is a two way system employing selected KEF drivers, a 110mm Bextrene cone bass/midrange and a 19mm plastic dome treble unit. An elaborate and costly crossover is employed to equalise the drivers to a strict specification.

**SOUND QUALITY**

The LS3/5A has consistently done well in previous live-versus-recorded sessions and fairly well on analogue programme sources. However, with digital material, problems which were only hinted by analogue material were now clearly apparent, making the design sound more dated. Several areas attracted criticism — the bass lacked extension and sounded 'boomy' in the upper bass register, while the mid had a noticeably 'hard', 'nasal' quality and the treble seemed forward with a grainy, 'zitty' effect at the extreme top end. Some 'tubby', wooden and boxy colorations were also evident, with only moderate

rendition of stereo depth.

However, it continued to provide good voice detail and articulation, with a reasonably accurate tonal balance. Comparison between the Goodmans and Spendor versions showed great similarity while a much older model from Audiomaster (no longer in production) sounded slightly dimmer by comparison, with less mid nasality. However the difference was small by speaker standards.

**LAB REPORT**

Sensitivity was low, measuring 81.5dB/W and necessitating a minimum amplifier power of 30W per channel. A 50W maximum is suggested although with care 100W amps may be used. The bass rolloff –6dB point measured 57Hz, quite good for the size, while pair matching was very good (all three current makes). The impedance curve never dipped below 7.5ohms, so the design qualifies as an easy 10ohm load. Modest 96dBa maximum sound levels are possible.

Reference curves were taken for the Goodmans and Spendor samples and showed good



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Since its introduction the *HL1* has been subject to small detailed improvements culminating in the current Mk IV version reviewed here. The 50 litre enclosure, reflex tuned by a large 62mm diameter tunnel port, has a cabinet of thin-wall high quality veneered plywood, with bituminous panel damping and extensive seam battening. Front and back panels are well screwed down and a sculptured foam grille assists the cabinet diffraction. An exclusive polypropylene 200mm driver covers the bass/midrange, and a 25mm Audax soft dome tweeter the high frequencies, with a good quality crossover dividing the input at approximately 2kHz. Provision has been made for sensible matching of mid and high frequencies using an auto transformer to aid consistent frequency balance.

**SOUND QUALITY**

The original *HL1* proved to be of monitor quality, and survived comparison with live sounds very well. On complex recorded programme in stereo it was a little weaker with some sibilant and chesty effects on vocal.

Fully reauditioned in Mk IV form (this arrived too late for new measurements except a room curve, not shown), the *HL1* bettered its earlier result by offering a clearer, more dynamic sound. Improvements in mid clarity were heard leading to still greater transparency as well as more precise transient definition.

Our first samples were slightly bright, which Harbeth acknowledged, stating that the treble

level would be reset in production. Subsequent auditioning in 1986 confirmed that this had been done, and that the mid/treble integration was now first class. Overall the balance remained very good while the bass was somewhat underdamped in the reflexed area, more suited to classical than rock programme in this respect.

**LAB REPORT**

A useful above average sensitivity of 87.5dB was recorded, which is on target and not compromised by the impedance; this was judged to be a good amplifier load, typically of the order of 8ohms with a 6.6ohm minimum. While some high phase angles were apparent (for example, 70° at 2kHz), the impedance here was substantial enough to avoid censure. The -6dB rolloff point was noted at 46Hz, and with a 100W per channel amplifier limit, a good maximum sound level of 102dBA should be possible in a typical room.

The axial response at 1m was fairly uniform, and ignoring a 5kHz notch met ±3dB limits, 55Hz-18kHz. Third harmonic distortion levels were also very well controlled at 96dB, typically

measuring 0.5% or better above 150Hz. The less annoying second harmonic content peaked at 8% around 100Hz, and this might be audible on sustained bass notes. The system fared less well on a diet of 100W pulses despite the low 2Hz repetition rate: although perfect at 500Hz, a +0.3dB expansion occurred at 5kHz generating 5% of second and 1.8% of third harmonic distortion. Crossover saturation is the probable cause at this equivalent 100W programme level.

**CONCLUSIONS**

Reassessed, the *HL1 IV* was technically very similar to the *III*, except for the revised bass unit, this custom built by Audax on a cast frame, using the advanced TPX cone polymer. With notably improved midrange and fine overall mid/treble balance and integration, the design continues to stand the test of time, and carries a strong *Choice* recommendation.

**TEST RESULTS**

Size (height × width × depth)	63.5 × 32.5 × 30.5cm
Recommended amplifier power per channel (for 96dBA per pair at 2 metres minimum)	15-100W
Recommended placement	on stands away from walls
Frequency response, within ±3dB at 2 metres	6Hz to 18kHz
Low frequency rolloff (-6dB point) at 1 metre	46Hz
Voltage sensitivity (ref. 2.83V or 1 watt into 8ohms at 1 metre)	87dB/W
Approximate max sound level (pair) at 2 metres	102dBA
Third harmonic distortion (96dB at 1 metre)	v. good
	65Hz:-2%, 100Hz:-1%, 200Hz:-0.2%
	500Hz:-0.35%, typically 0.3%
Impedance characteristic (case of drive)	good
Forward response uniformity	v. good
Typical price per pair, including VAT	Teak or walnut £344
(Note: Measurements taken on Mk III)	
First reviewed: 1985. Rating: Recommended.	

**ROGERS LS6**

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**T**he LS6 slots in below the LS7, and offers a similar basic package in terms of size but at a lower price. A newly developed polypropylene cone is used for the bass/midrange unit, built on steel frame and fitted with a generous magnet. The treble is handled by a 19mm soft plastic SEAS dome unit, crossing over at around 3.5kHz.

Standing 51cm high, this speaker is suited to free space mounting on solid stands, like the LS7. The 23 litre enclosure is reflex-tuned to 50Hz by a 50mm diameter port; the internal section is slant-cut to an approximately 110mm length. Reflexing gives a fourth order bass response but in fact this system is fifth order, achieved *via* a 440µF series capacitor.

The high quality crossover network is essentially to a third order pattern and is built using excellent components.

Built from plain chipboard, the enclosure has an MDF driver baffle with a chamfered port opening and grille baffle.

The constructional quality and standard of finish is high. Electrical connection is *via* 4mm socket/binding posts.

**SOUND QUALITY**

Scored with great consistency by the panel, the LS6 achieved a very similar rating to the LS2, though with superior bass extension and power handling. The '6 was found to be very well balanced with a transparent, informative mid, and an open, 'airy' nature. Stereo depth was quite well developed, with good width and image focus.

Quite lively and dynamic, coloration was generally low. While the upper treble could sound 'grainy' on occasion, when re-auditioned for 1986 the overall midrange balance and the bass tuning were both significantly improved. It handled high powers well, showing a convincing superiority here over the LS2, but not quite reaching the standard set by the LS7.

**LAB REPORT**

At the reference 1 metre microphone distance, set on the median driver axis, this speaker pro-

vided a very uniform, well controlled response. There was no difficulty in establishing a sensitivity at a solid 87.5dB/W. With the grille off the response met very credible ±2dB limits from 55Hz to 16kHz, with a -6dB low frequency limit at 50Hz, about average for the price and size.

Out at 2 metres, this speaker's fine driver outputs are excellently integrated, producing a first class set of off-axis responses.

In the listening room the forward energy was finely balanced above 80Hz but bass was also up a few dB at the 50Hz system resonance, falling quickly at lower frequencies. A lower system tuning frequency could improve matters here.

Driven to 96dB sound pressure, the speaker offered moderate distortion levels, averaging a good 0.3 to 0.4%. At the 86dB level, the frequency range above 100Hz averaged a fine 0.25%.

With a 150W maximum power handling, this speaker will provide generous sound levels up to 104dBA in a typical room. Conversely, as little as 15W will produce enough volume for normal purposes. The sensitivity was not compromised by the impedance characteristic, which showed an easy 8ohm amplifier load.

**CONCLUSIONS**

This honestly built loudspeaker has achieved sufficiently high standards in both laboratory and listening tests to qualify for strongly recommendation. With its neutral balance, smooth response, fine stereo and a consistent off-axis uniformity, it also provided low distortion as well as good power handling into the bargain, and merits a Best Buy rating.

**TEST RESULTS**

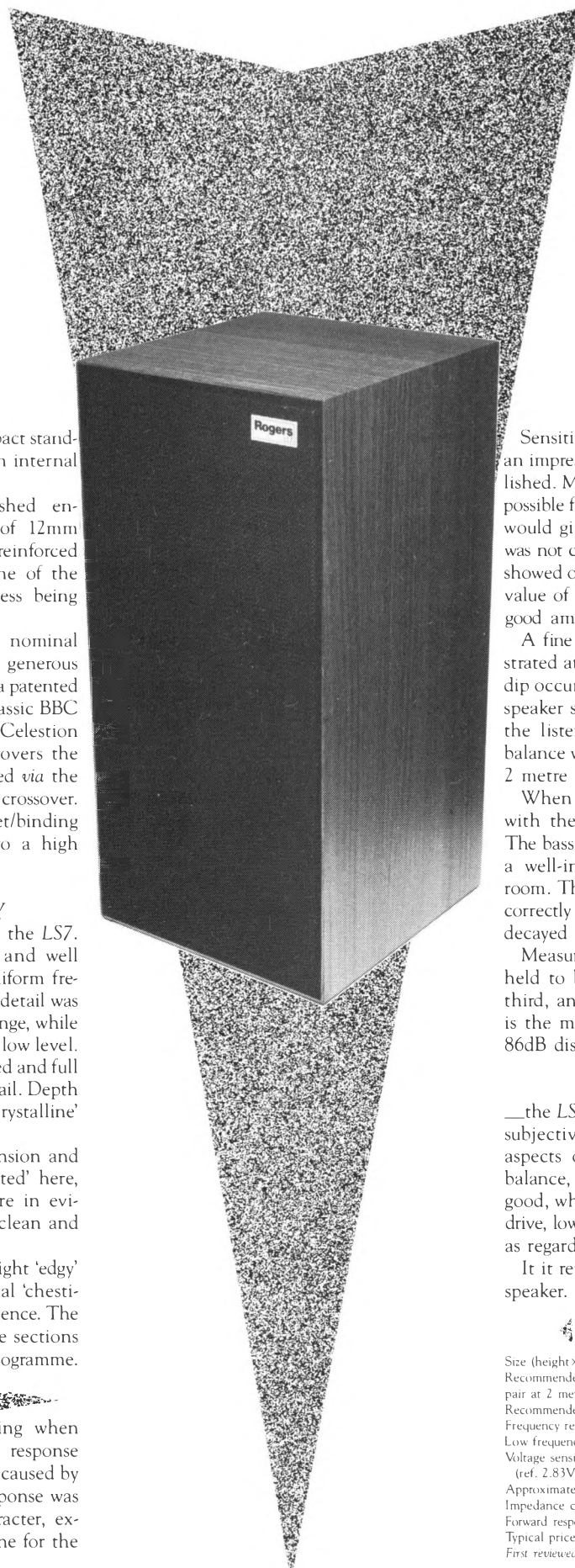
Size (height x width x depth)	51 x 27 x 28cm
Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres)	(15) - 150W
Recommended placement	open stands
Frequency response, within ±3dB at 2 metres	50Hz to 20kHz
Low frequency rolloff (-6dB point) at 1 metre	50Hz
Voltage sensitivity (ref. 2.83V or 1 watt into 8ohms at 1 metre)	87.5dB
Approximate max sound level (pair) at 2 metres	104dBA
Impedance characteristic (ease of drive)	very good
Forward response uniformity	excellent
Typical price per pair, including VAT	£227.50

*First reviewed: 1985 Rating: Best Buy*



**ROGERS LS7**

SWISSTONE ELECTRONICS LTD, 310 COMMONSIDE EAST, MITCHAM, SURREY.  
 TEL 01-640 2172



**R**ogers' LS7 is a fairly compact stand-mounted system, with an internal volume of 30 litres.

The excellently finished enclosure is constructed of 12mm bituminous damped MDF with a reinforced 19mm-thick MDF front baffle. None of the panels are removable, internal access being gained *via* the bass unit aperture.

The bass/midrange unit has a nominal diameter of 200mm, and uses a generous magnet, a high-power voice coil, and a patented polypropylene cone possessing the classic BBC profile. A selected version of the Celestion HF1001 soft-dome 25mm tweeter covers the remaining frequency range, integrated *via* the excellent-quality 13-element 3kHz crossover. External connection is by 4mm socket/binding posts and the internal wiring is to a high standard.

**SOUND QUALITY**

The panel were highly impressed by the LS7. It was felt to be tonally accurate and well balanced, with an extended and uniform frequency response. Good instrumental detail was preserved throughout the frequency range, while coloration was held to a consistently low level.

Stereo images were spacious, focused and full of the intended recorded-acoustic detail. Depth was impressive, with an almost 'crystalline' transparency.

The LS7 provided good bass extension and despite seeming slightly 'leaden-footed' here, powerful and clean articulation were in evidence. The sound was consistently clean and free of 'boxy' effects.

Very mild criticisms concerned a slight 'edgy' and 'sibilant' treble, with a mild vocal 'chestiness', but neither was of much consequence. The speaker gave fine results on analogue sections but clearly excelled on the digital programme.

**LAB REPORT**

The LS7 showed fine pair matching when measured at 1 metre, the axial response disfigured by a notch at 7kHz partly caused by the grille. The well-damped bass response was uniform and well balanced in character, extending to 48Hz, -6dB, which is fine for the size of enclosure.

Sensitivity was above average at 88dB/W, and an impressive 200W power handling was established. Maximum sound levels of 106dBA were possible from a stereo pair, while as little as 10W would give interesting results. The sensitivity was not compromised by the impedance, which showed only a minor dip at 8kHz, with a mean value of 10ohms, thus making the LS7 a very good amplifier load.

A fine set of off-axis responses were demonstrated at 2 metres. At 15° above a mild 4kHz dip occurred (still affected by the grille), so the speaker should be directed or elevated to face the listener. Panelists' observations that the balance was slightly 'rich' were confirmed by the 2 metre trend.

When room-averaged, very good correlation with the subjective findings was established. The bass was only marginally 'rich' and showed a well-integrated response extension in the room. The mid was quite uniform and married correctly with the treble register which smoothly decayed above 8kHz.

Measured at 96dB, low frequency distortion held to below 3% second harmonic and 1% third, and was very fine above 300Hz, which is the more critical range in this respect. At 86dB distortion improved greatly.

**CONCLUSIONS**

—the LS7 provides a remarkably well-balanced subjective and objective performance. All aspects of sound quality such as extension, balance, stereo clarity and coloration were very good, while technically speaking it was easy to drive, low in distortion, sensitive, and consistent as regards frequency balance.

It remains a strongly Recommended loud-speaker.

**TEST RESULTS**

Size (height x width x depth)	56 x 27 x 28cm
Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres)	(10)–200W
Recommended placement	open stands
Frequency response, within ±3dB at 2 metres	55Hz to 18kHz
Low frequency rolloff (-6dB point) at 1 metre	48Hz
Voltage sensitivity (ref. 2.83V or 1 watt into 8ohms at 1 metre)	88dB
Approximate max sound level (pair) at 2 metres	106dBA
Impedance characteristic (ease of drive)	very good
Forward response uniformity	very good
Typical price per pair, including VAT	£335.50

*First reviewed: 1983. Rating: Recommended.*

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## SPENDOR SP1

SPENDOR AUDIO SYSTEMS LTD, UNIT 47, STATION ROAD INDUSTRIAL ESTATE, HAILSHAM,  
SUSSEX BN27 2ER. TEL: (0323) 843474



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While the *SP1* is built in the classic *BC1* tradition, it uses a new grade of polypropylene exclusive to Spendor for the bass/mid unit. It is built on a die-cast chassis and energised by a massive magnet assembly. The cone is doped by hand, and has its front pole cavity filled by an alloy plug attached to the pole face.

Spendor's traditional radiometal-cored inductors and plastic-film capacitors are used for the high-quality crossover. Above 3kHz Spendor's own carefully selected version of the Celestion HF1300 dome tweeter takes over, and the final half-octave is filled in by the Coles 19mm plastic dome unit.

The excellently veneered 44 litre enclosure is built of thinwall multiply, heavily bitumen damped and lined with acoustic foam. The system is reflex-tuned by a large, offset ducted port, and is intended for free space mounting on open stands.

### SOUND QUALITY

The *SP1* did well on the *Choice* test programme, providing favourable results on analogue material and even better scores using digital masters. The balance was tonally accurate with very good reproduction of human voice, showing natural sibilants and character. The frequency response sounded wide and uniform, with good extension, albeit with a slight excess in output

at the lowest frequencies.

Mid coloration was generally low, the treble 'sweet' and clear, and stereo perspectives well constructed. Frontal focus, width and depth were all well presented. High sound levels were possible with low apparent distortion. While some mild lower-mid 'plumminess' was observed, plus a touch of 'BBC nasality' this was not considered to be very important.

### LAB REPORT

Measured at 1 metre on axis, the *SP1* delivered a smooth response except for a small 3.5kHz peak (improved on later production speakers). The bass was precisely tuned and well extended to 41Hz, -6dB. Sensitivity measured 87dB/W, about average and more than double that of the *BC1* (in decibel terms, an increase of more than 3dB). Pair matching was very close. The recommended power input range is 12-150W, and maximum levels of up to 103dB were possible, again rather higher than for the *BC1*.

The averaged response at 2 metres was very uniform, meeting  $\pm 2$ dB limits for 60Hz to 13kHz. The vertical dispersion was very satisfactory, and laterally was rather better than average. The integrated response in the listening room was very good indeed, only marred by the slight bass excess noted previously.

Fine distortion results were obtained at 96dB sound pressure level, measuring around 0.3% above 200Hz and holding to around 3% at lower

frequencies. With the sound level reduced to 86dB, a substantial improvement to 0.8% or better was recorded at low frequencies, with negligible midrange second harmonic and an average of 0.2% third. These are fine results. The impedance curve averaged 14ohms, with a momentary and pretty harmless dip to 5.3ohms at 20kHz, so the *SP1* is therefore classed as a very good amplifier load.

### CONCLUSIONS

The *SP1* has evolved into a subtle and musical sounding performer in the true Spendor tradition. It is expensive, but the good test results go quite some way towards justifying the price.

The *SP1* receives a warm recommendation and will probably slowly displace the *BC1* from its time-honoured position, especially where master-quality programme reproduction is concerned.

### TEST RESULTS

Size (height x width x depth)	63.5 x 29.5 x 30.5cm
Recommended amplifier power per channel (for 96dB minimum per pair at 2 metres)	(12) - 150W
Recommended placement	Floor stands
Frequency response, within $\pm 3$ dB at 2 metres	45Hz to 20kHz
Low frequency rolloff (-6dB point) at 1 metre	41Hz
Voltage sensitivity (ref. 2.83V or 1 watt into 8ohms at 1 metre)	87dB
Approximate max sound level (pair) at 2 metres	103dB
Impedance characteristic (ease of drive)	very good
Forward response uniformity	very good
Typical price per pair, including VAT	£640
First reviewed: 1983. Rating: Recommended	

**SPENDOR SP2**

SPENDOR AUDIO SYSTEMS LTD, UNIT 47, STATION ROAD INDUSTRIAL ESTATE, HAILSHAM, SUSSEX BN27 2ER. TEL: (0323) 843474



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**W**ith the original *BC1* and its virtual successor the *SP1* well established, Spendor has been researching a less expensive 30 litre alternative for a few years now. The *SA2* came first, to some degree then eclipsed by the superior and cheaper *Prelude*. Now, developed from the *SP1* and sharing that fine model's 200mm polypropylene coned bass-mid unit, we have the *SP2*. The treble is handled by a special version of the established Scan *D2008* tweeter, a 19mm soft dome offering a superior performance, and in this case, ferro-fluid damped. Optimum positioning is in free space, on 40-50cm high stands.

The finely veneered enclosure is critically balanced by an optimum choice of chipboard grade and thickness, the panels bitumen damped internally. This is a reflex loaded design, tuned to 33Hz, and the ducted port is internally damped by a foam lining absorbing the higher resonant modes in the duct.

**SOUND QUALITY**

On test the *SP2* achieved a very high ranking position, only a little behind that of the *SP1*. Stereo images were well focused, and showed very good width and depth. Well balanced tonally, the response sounded very uniform, though with a touch of 'softness' in the low bass despite good extension. In the upper mid, a hint

of 'hardness' was noted, plus slight 'wispiness' in the high treble.

In the Spendor tradition, the *SP2* offered a highly articulate, detailed midrange. Dynamics were presented well, the system sounding open and relatively uncoloured. Just a touch of 'boxiness' was present in the low midrange, but even this was much less than usual.

**LAB REPORT**

Reference sensitivity was about average at 87dB while the axial frequency response showed a highly uniform characteristic,  $\pm 2.5$ dB 50Hz to 15kHz. The bass was well extended, reaching 45Hz, -6dB.

A minimum power rating of 15W was indicated, while the *SP2* coped with up to 150W peak programme, generating decent sound levels of 104dBa from a pair in a typical room. The impedance curve showed an easy load.

At 2 metres, the  $\pm 3$ dB response was a wide 48Hz to 20kHz, with the set of forward responses showing quite excellent uniformity. The slightly down-tilted response is typical of subjectively

well balanced compact box systems. In the listening room the speaker showed an even, well balanced characteristic with good power down to 30Hz. Integration was very good through the frequency range.

At the high 96dB sound level, the distortion above 150Hz held to a moderate 0.4%, bar some minor clutter above 100Hz. With level reduced to 86dB, third harmonic averaged 0.25%, second 0.1%, both fine results.

**CONCLUSIONS**

Spendor now have their compact 30 litre monitor. Offering great consistency and accuracy, it slots in neatly below the *SP1*, conceding little to that respected, larger model. With its natural, extended response, low coloration, wide dynamic range, easy amplifier loading and very fine stereo, the *SP2* is a class winner and may be strongly recommended.

**TEST RESULTS**

Size (height x width x depth)	50 x 26 x 30cm
Recommended amplifier power per channel (for 96dBa minimum per pair at 2 metres)	(15) - 150W
Recommended placement	rigid open stands
Frequency response, within $\pm 3$ dB at 2 metres	48Hz to 20kHz
Low frequency rolloff (-6dB point) at 1 metre	45Hz
Voltage sensitivity (ref. 2.83V or 1 watt into 8ohms at 1 metre)	87dB/W
Approximate max sound level (pair) at 2 metres	104dBa
Impedance characteristic (ease of drive)	very good
Forward response uniformity	excellent
Typical price per pair, including VAT	£420

*First reviewed: 1985. Rating: Recommended.*

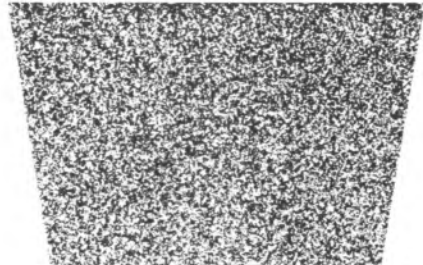




## APOGEE SCINTILLA

ABSOLUTE SOUNDS, 42 PARKSIDE, LONDON SW19.

— TEL. 01-947 5047 —




*Panel speakers are expensive and inconveniently large. But they have unique qualities that conventional boxes cannot match, so for many the sacrifices will be judged eminently worthwhile.*

**A**rguably the most technically interesting speaker, the *Scintilla* is certainly one of the most expensive on the market at £4,995 a pair. However, there are certain special problems. First, the impedance of this speaker falls below 1ohm. Its loading is essentially resistive in nature by virtue of a simple crossover, but it does require a very powerful amplifier — one capable of supplying substantial current. At present this can be satisfied by another line imported by the *Scintilla* UK agents, the Krell KSA100, and the later addition of a second KSA100 would allow double mono operation, with bi wiring and biamping to each system, a technique which optimises the performance.

When this speaker was originally tried on the 4ohm tap of an ARC amp, the resulting sound, while of excellent quality, proved quite inadequate with regard to the maximum volume level attained. The Quicksilver mono valve amps are unusual in that they have a 1ohm tap which will drive the *Scintilla* to modest levels, but since this inefficient speaker requires both volts and current, only a transistor amplifier with a high muscle factor is really appropriate here. On test we used a KSA100 with great success, while the loan of a pair of KSA200 monoblocks produced really effortless high sound levels. Originally obtainable in either 1ohm or 4ohm form, the *Scintilla* now comes in 1ohm form only, so many amplifiers are ruled out.

A second problem concerns the open panel design. While this is a great strength in terms of freedom from box colorations, it does generate a 'back wave' which reflects from the rear walls; such open panel speakers are highly critical with regard to room placement, and do not work well at all in some rooms. At this price level both dealer and listener must be prepared for a decent home trial, and consider an alternative if the *Scintilla* doesn't work out.

This speaker comprises a large scale, substantially built panel, essentially two-way and using a massive bass/midrange panel of semi-ribbon construction coupled with a vertical line mid/tweeter — a true ribbon 1.9m wide and running for much of the considerable 1.5 metre height of this visually striking system. Each speaker measures 88cm wide at the base, tapering to 74cm at the top. Flanking the main



ribbon element is a group of four 0.5m 'super-tweeter' ribbons, two at the front and two at the rear.

The bass element is of plated aluminium foil reinforced by specially placed strips of Kapton film. The diaphragm is not self-supporting and is suspended on compliant mountings to decouple the resonance modes via the mechanism of differential tuning and also to endow the system with the additional freedom of partial pistonic motion. It is driven by an array of bar magnets bonded to the perforated back steel plate. The bass system represents a considerable radiating area, comparable with eight 12in woofers, and is also capable of a respectable excursion.

This is an extremely heavy and awkward product — it takes two people to unpack and place the systems (180lbs each). Their relatively shallow 9cm depth is stabilised by an aluminium plate foot, secured by strong diagonal struts at the rear.

All components used are of the highest quality while the panels are rigid and inert.

### SOUND QUALITY

Here is a speaker that has some extraordinary qualities. Seemingly quite devoid of subjective panel resonance or coloration, it offered a seamlessly broad frequency range of almost unparalleled definition. From 50Hz upwards, the bass/midrange was superbly natural. Piano was reproduced with a strong sense of the instrument actually being in the listening room and it also seemed to avoid the 'mechanical' quality so prevalent in the hi-fi reproduction of piano. The left hand playing was a revelation in terms of tonality and in the discrimination of subtle intonation and style of playing. This astonishing performance was maintained throughout the midrange to the treble, providing an exceptionally lifelike rendition of human voice. Singing was delightful, with exceptionally good focusing and a strong feeling of dimensional solidity.

The treble was 'sweet', lacking sibilance or 'edge' and with excellent transparency. Furthermore this vital 'high end' quality was held through the midrange right down into the mid-bass. Low frequency localisation was heard as if for the first time.

Stereo images showed fine width, height and depth over a wide frequency range regardless of the complexity of the programme scoring. No trace of audible distortion could be heard at any conceivable power level, the system possessing all the hallmarks of very low distortion.

The bass performance was very powerful extending to a solid 20Hz in my room, though I found the overall bass level below 40Hz to be a little on the heavy side. Such a response is better suited to larger than my 19ft 6in room, and its correct low frequency balance was confirmed subsequently in rooms 26 to 36ft long.

Tonally, the speaker's character was marginally 'rich', with an audible presence depression that is kind to matching solid state amplifiers and helps to produce a pleasing overall balance. Properly set up, this speaker was capable of a supremely musical and authoritative performance.

### LAB REPORT

Due to the difficulties in visiting any anechoic chamber with such a weighty example, some tests were carried out in my listening room.



Sensitivity was rather low at 79dB/W, and the watt referred to here is a nominal 8ohms reference, so in truth the *Scintilla's* efficiency is very low indeed.

Measured close up, the bass panel showed a pretty uniform response which extended down to 20Hz, albeit with a gentle rolloff. Similarly smooth results were obtained in the higher frequency range up to 16kHz. Between 16 and 17kHz, some interference occurred between the ribbons and the slot aperture in which they are mounted, but no real evidence of related subjective effects were noted during the auditioning. Good integration was shown by the off-axis set of responses, corresponding with the wide driver bandwidths.

The computed listening area in-room response was better than expected in view of the known effect of back wave cancellations. From 40Hz to 16kHz the response was quite uniform, if gently downtilted, with the slight rich tendency we noted. Below 40Hz the bass rose by some 8dB as seen in the 25Hz and 30Hz third-octave bands. How this sounds depends largely on placement and the size of the room.



The impedance curve showed a loading of typically 0.9ohms up to 1.8kHz, above which point it improved to around 2.5ohms. Very low resistance speaker cable is essential for best results and to minimise power losses in the connection.

Some sample tests were made for distortion and showed that in the bass, even with a substantial 96dB sound level, the distortion was low at around 1%. At higher frequencies, 0.05% to 0.1% distortion was typical; these are excellent results.

## CONCLUSIONS

The Apogee *Scintilla* is not perfect — for my taste at least it is a mite bass heavy and is mildly

recessive in the presence region — but it nonetheless offered a superbly coherent, wide-range sound which was at times surprisingly lifelike. Piano and voice reproduction was a revelation while a fine stereo image focus and exceptional level of transparency is held over a very wide frequency range. No subwoofer need be contemplated. In real terms coloration is very low and although it is a beast to drive well, the reward is a sound stage of great scale and authority. A true audiophile system, it is well worth the effort and expense needed to obtain the excellent results that are possible.

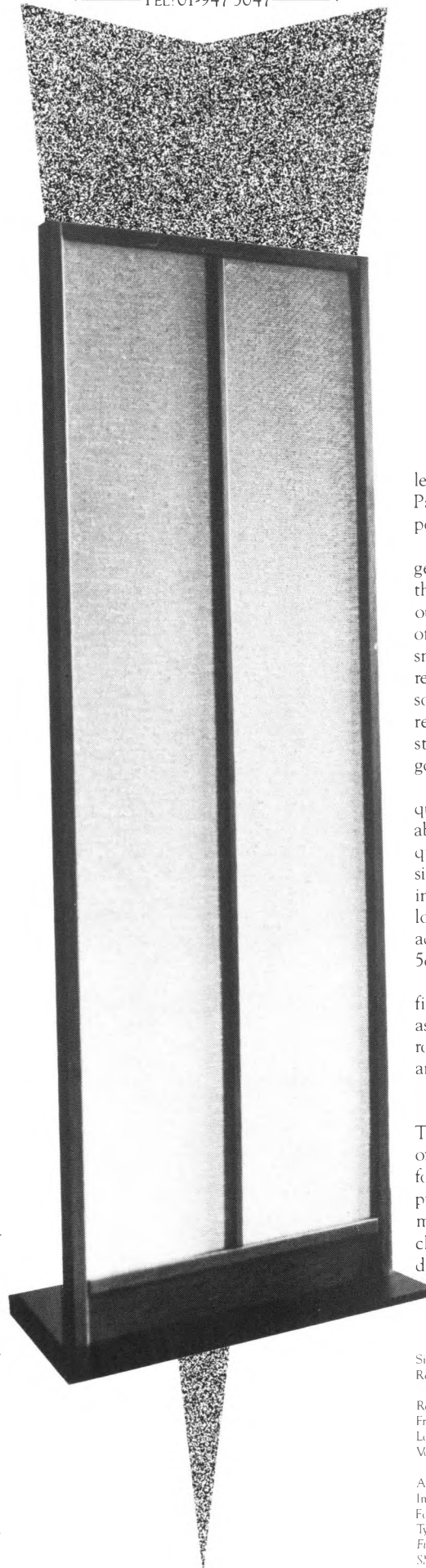
## TEST RESULTS

Size (height x width x depth) \_\_\_\_\_ 145 x 88 x 9cm deep  
 Recommended amplifier power per channel (for 96dBA per pair at 2 metres minimum) \_\_\_\_\_ high current, 100 to 200W  
 Recommended placement \_\_\_\_\_ on floor, free space  
 Frequency response within  $\pm 3$ dB at 2 metres \_\_\_\_\_ 40Hz to 16kHz  
 Low frequency rolloff ( $-6$ dB point) at 1 metre \_\_\_\_\_ approx 20Hz  
 Voltage sensitivity \_\_\_\_\_  
 (ref. 2.83V or 1 watt into 8ohms at 1 metre) \_\_\_\_\_ approx 79dB/W  
 Approximate max sound level (pair) at 2m \_\_\_\_\_ 103-105dBA\*  
 Impedance characteristic (ease of drive) \_\_\_\_\_ very poor  
 Forward response uniformity \_\_\_\_\_ very good  
 Typical price per pair, including VAT \_\_\_\_\_ £4,995  
 \*Higher than expected due to forward 'throw' and directivity  
 First reviewed: 1986 Rating: Recommended.

# MAGNEPLANAR MGIIIa

ABSOLUTE SOUNDS LTD, 42 PARKSIDE, LONDON SW19.

TEL: 01-947 5047



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Still one of the largest and most expensive models in this survey, the MGIII is one of the US-made Magneplanar range of open-back planar speakers. One distinction is a line source tweeter almost the full height of the speaker, nearly two metres. The current III, now entitled the IIIa, features changes in diaphragm mounting and damping, and a different crossover.

In this three-way model, the mid is handled by a high definition film element covering approximately 300Hz to 6kHz. Below 300Hz, the bass radiator takes over, a more robust film element occupying more than 50% of the considerable radiating area. Being bi-directional, like panel electrostatics, it is also sensitive to room acoustics and will benefit from a large room, standing well clear of the rear wall — 1.5 to 2.0 metres is a starting point.

During the tests I found the system a little bright and replaced the treble fuse with a 1.8ohm 10 watt resistor, an alternative now approved by the manufacturers.

## SOUND QUALITY

Auditioned using the 1.8ohm resistors, the MGIII excelled. With a fine sense of scale and perspective, it also handled dynamic contrasts well, and was liked on both simple and complex material. Detail was extremely good, the treble clear and open, the mid sweet and natural, while the bass was articulate, informative and almost 'tactile' on percussion. Low bass was pretty good if not outstanding.

Stereo focus was surprisingly good for a large panel and the loudspeaker seemed uncritical of either listening position or vertical axis. It gave a spacious, relaxed impression, free from the usual 'wooden', 'horny' or other speaker colorations. Tonally a touch 'heavy' in the upper bass, it remained very tuneful even here, and was consistently faithful to a wide variety of sources.

## LAB REPORT

The MGIIIa, like other large panel speakers, does not obey the inverse square law and hence the 1 metre sensitivity, averaging around 85dB, was not too helpful. At 3 metres it sounds more like an average 88dB/W sensitivity. Power handling was up to 300W program allowing

levels for a stereo pair up to a substantial 107dB. Pair matching was very good, and the -6dB point was estimated at 35Hz.

The axial frequency response suggested a gently falling output with rising frequency, though this did not fairly represent the perceived output at the listening distance. Response limits of  $\pm 2.5$ dB sufficed for 80Hz to 18kHz, a pretty smooth result. The 2 metres family of off-axis responses were surprisingly good, and while some variation appeared at each axis, a fair representation of the speaker's overall output was still apparent. Treble dispersion was particularly good from the narrow ribbon tweeter.

Moderate distortion was evident at low frequencies, but distortion was particularly good above 150Hz, especially third harmonic, and was quite exceptional at the 86dB level. Compression measured a very low 0.03dB, with negligible intermodulation. The impedance was uniformly low and did not fall below 4ohms with 1.8ohms added in place of the treble fuses, averaging a 5ohm load, mainly of a resistive nature.

Room averaged, the MGIIIa demonstrated a fine overall balance, though the bass was not as uniform as some box systems, partly due to room reflections. The treble rolloff was smooth and gradual, as it should be.

## CONCLUSIONS

The MGIIIa is a true audiophile loudspeaker, of excellent sound quality. It sets high standards for stereo performance, clarity and depth for the price, while its generous acoustic scale and dynamic range helps to convey much of the original character of the recorded performances it reproduces. It must be recommended.

## TEST RESULTS

### MAGNEPLANAR MGIIIa

Size (height  $\times$  width  $\times$  depth) \_\_\_\_\_ 180  $\times$  62  $\times$  38cm  
 Recommended amplifier power per channel \_\_\_\_\_  
 (for 96dBA per pair at 2 metres minimum) \_\_\_\_\_ (25)–300W  
 Recommended placement \_\_\_\_\_ well clear of walls  
 Frequency response, within  $\pm 3$ dB at 2 metres \_\_\_\_\_ 70Hz–19kHz  
 Low frequency rolloff (-6dB point) at 1 metre \_\_\_\_\_ 35Hz  
 Voltage sensitivity \_\_\_\_\_  
 (ref. 2.83V or 1 watt into 8ohms at 1 metre) \_\_\_\_\_ 84–86dB/W  
 Approximate max sound level (pair) at 2 metres \_\_\_\_\_ 106dBA  
 Impedance characteristic (ease of drive) \_\_\_\_\_ an easy 4ohm load  
 Forward response uniformity \_\_\_\_\_ very good  
 Typical price per pair, including VAT \_\_\_\_\_ £2882  
 First reviewed: MGIII, 1984; SMGII, 1985. Rating: MGIIIa, Recommended;  
 SMGII: Worth Considering



## (OF PRESENCE AUDIO)

### ANNIVERSARY — PRESENCE AUDIO IS THREE YEARS OLD THIS FEBRUARY

**AUDIOSTATIC — GETS “STONED”** These Dutch-designed electrostatic speakers are fit for the eighties — slim, elegant and in a choice of colours. They can also be improved a touch with Cliff Stone Foundation supports. LAB. Easy amplifier load. Why three transformers? ES 300 now excellent value at new lower price (£1,995). SOUND. Superb imaging, treble and mid-range. Bass depends on room matching. CONCLUSION. Good alternative to the four-letter word electrostatics and more domestically acceptable. PS. We believe there's a pair of ex-dem Monolith IIs going at a special price (if you have a very understanding wife). Are they indoor cricket screens darling?

**DECCA — DELIGHTS IN STORE** Down under doesn't dabble in Decca cartridges any more — so there's no longer any argument. The British-built Decca Super Gold is the best cartridge in the world — so say its supporters. It, plus the Gold and Maroon models, are now readily available and quality control is now excellent (well let's settle for good!). LAB. Funny old design — wonder how it works? SOUND. Absolutely unbeatable in many respects. CONCLUSION. Ignore the past and the so-called experts. Just try one for yourself. PS. Decca carbon-fibre record brushes are still among the best. PPS. Bargain-hunters should enquire about the London ribbon speakers, 8 pairs only (£195), London International tonearm (£49) and the Sweep Arm (£3.95).

**ENSEMBLE — KEEPS MARRIAGES TOGETHER** The Swiss Ensemble PA1 loudspeakers are arguably the world's best small box speakers. Some say they are among the greats regardless of size. If you want big sound, but your wife wants small boxes, divorce can be avoided for a mere £1,395. LAB. Easy to drive. What's that oval thing on the back? SOUND. Like a big speaker. CONCLUSION. At last a small speaker with no compromise and not fussy about positioning. PS. The Rosewood is cheaper than the black!

**GLANZ — IS GOOD FOR YOU** There are three reasons why Glanz cartridges are good. They have: 1. good construction. 2. good sound for the price. 3. replacement styli for all models. The enthusiast on a budget should hear these. The best models are at the two extremes £23.95 and £129. LAB. Detachable stylus normally ruins the sound. Wonder how they've avoided that? What is this flux that's moving? SOUND. Too good for mass production cartridges. Unfair to competitors. CONCLUSION. If you're short of money, love is just a Glanz away. PS. Presence Audio has bread and butter as well as esoterica!

**GRYPHON — KING BEAST OF HEADAMPS** Some people's pre-amps still need a headamp for low output moving coil cartridges. The Gryphon is Denmark's effort at the best-ever in both sound quality and appearance (24 carat gold plating). Some say they've succeeded. LAB. Dual mono, class A, no feedback, low noise design (it says here). SOUND. Tremendous depth and size of image. No degradation. CONCLUSION. Worth buying just to look at on the shelf! PS. Nothing to do with the Midland Bank!

**INTERFACE — STICK IT!** If you thought turntable mats don't make much difference — you're wrong. Using the Record Interface Mat sounds like a big upgrade in cartridge on most turntables — including the four-letter word. LAB. They say it's a sandwich. Tastes tough to us. SOUND. Clearer, more detailed, more stable. CONCLUSION. If you aren't convinced, stick it — then you will be! PS. CD Interface Mats do similar things for compact discs, and they're not expensive £4.99 for 10).

**JECKLIN — BEST SOUNDING SAFETY HELMET** At first glance (not Glanz please!) the Swiss Jecklin headphones cause comment. At first listening they cause further comment. Either way there's nothing like them. More like loudspeakers for ears. With the Japanese four-letter word headphones no longer available in Britain, the Jecklin Electrostatics have little competition for the best available. Originally designed for long periods of studio use, these amazing headphones are still used by top recording companies. LAB. Electrostatic model needs a good amp. SOUND. A new dimension in out-of-the-head imaging. CONCLUSION. Very comfortable to use. The ultimate headphones experience? PS. Latest models have further small improvements.

**KISEKI — MOST EXCLUSIVE CARTRIDGES** The most exclusive cartridge in the world is the Kiseki Lapis Lazuli, costing £3,500. Less than 100 have ever been made, and even the UK distributor has not yet seen one! But the Agate Ruby at £695 is quite rare and also very beautiful — in both sound and appearance. Other Kiseki models also delight the senses at even lower prices. A rare range. LAB. Higher than average output so step-up device often not needed. Sun glasses are needed. SOUND. Better than others price for price. Some say the Purple-heart Sapphire is the best regardless. CONCLUSION. Must be heard. PS. Cartridge exchange scheme means your old Kiseki is always worth 45% of current new cost.

**MILLTEK — POOR MAN'S KISEKI?** Made in the Kiseki factory, the Milltek Aurora and Olympia high output moving-coil models require no step-up device and offer amazing sound quality for the price. LAB. Made like Kiseki — funny that. SOUND. Like Kiseki — funny that. CONCLUSION. Only the body colour isn't like Kiseki. PS. What a bargain at £198 or £298.

**MDM — COST EFFECTIVE CABLES** These solid core, co-axial cables in red or blue with matching, high quality, gold-plated insulated phono plugs look like £30 worth, but cost around £10. LAB. Well-made. SOUND. Good. CONCLUSION. Good appearance and value. PS. Cable and plugs now available separately.

**NUANCE — PRE-AMP PAR EXCELLENCE** Frogs, Yanks and Poms co-operated to design what some say is the best sounding solid state pre-amp yet produced for moving-coil cartridges, yet it only costs £795. Name droppers please note — Malcolm Hawksford and Yves Bernard Andre. The moving magnet version (also takes MC) is great value at only £595. LAB. Very simple design, but expensive components. Funny people — fancy putting LEDs inside the pre-amp. SOUND. Very detailed, clear and low noise. Must be warmed up. CONCLUSION. You'll have to spend a lot more to better this one. PS. Champagne finish available if you're fed up with black. Also see Plenitude below.

**ODYSSEY — LAST GREAT CARTRIDGE** Would you believe a new cartridge manufacturer in these days of digital? Odyssey of Hong Kong has come up with a winner. The MCI is a moving coil cartridge of simple design and low output (pass the Gryphon please!). If dealers can be believed (no comments please) this £995 model could be the best ever cartridge. Decca and Kiseki fans please be quiet until you've heard it! LAB. Looks perfectly ordinary. SOUND. Perfectly extra-ordinary. Could be the best. CONCLUSION. If you have a grand for a cartridge, hear it. PS. It comes in a lovely wooden presentation box, for what that's worth.

**OMEGA POINT — LAST WORD IN TURNTABLES** Not only is the turntable not dead but Tom Fletcher's £895 Omega Point turntable shows fresh, innovative, creative thinking plus good engineering, distinctive looks and outstanding sound quality. LAB. Why's that there? What's that stuff? Why no on/off switch? And no bouncy bouncy? Funny thing. SOUND. That's something else. Hearing is believing. CONCLUSION. Four-letter words beginning with L, P or G don't compare. This could be the last turntable you'll buy. PS. The Omega Point Black or Silver unipivot arms at £295 and £695 are equally impressive. PPS. Distributors sought worldwide.

**PLENITUDE — GARLIC POWER AMPLIFIER** Made in France, by an American with help from England and Italy this 80 wpc power amp will drive difficult speakers and has sound quality to compare with others at twice the price. Has two sets of speaker terminals for bi-wiring. LAB. 80 wpc claimed. We measured 100 wpc. What about trade descriptions act? Should we complain to advertising standards people? SOUND. Indecently good for the price (£795). Very detailed. CONCLUSION. — Another value for money audiophile product from Presence Audio. PS. It matches the Nuance Pre-Amps (see above).

**SAE — SMART AND EXCITING?** Yes. But the letters really stand for Scientific Audio Electronics of USA. If you like high tech equipment (computer controlled) with lots of facilities SAE has a 50 wpc receiver, cassette deck and CD player all matching. The ultimate stacking system? LAB. The construction quality is excellent. They really do have little computers, and the cassette deck is so shallow due to a horizontal motorised loading drawer. SOUND. Good. CONCLUSION. Looks good and all the buttons keep the boys happy for hours! PS. For US speakers to suit, see Spica below.

**SPICA — IN BRITAIN AT LAST** Spica speakers from the States have had rave reviews for years in other countries, but have only now become available in the UK (£595). They offer remarkable performance (including good bass response) from a small box, and offer serious competition to those certain small British speakers. What's more they don't need a 100w amplifier to drive them. LAB. Funny shape. SOUND. Maybe that's why they sound so good. CONCLUSION. Maybe the US reviews were right. PS. For bass freaks with big rooms, a sub-woofer is available too.

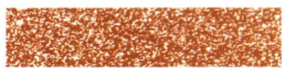
**STAD — ROCK STEADY** This is Presence Audio's own four-letter word. The French solution to turntable vibrations is to fill the plinth with concrete and lead. The latest model (the Beta £499) probably beats similar priced turntables in both sound and appearance (mirror-black piano-type finish). LAB. Ain't 'arf 'eavy. Smells of garlic. SOUND. Clear and precise (but French accent). CONCLUSION. Gives other four-letter words a hard time and owners big muscles. PS. We don't know what Stad stands for — except heavy.

**VECTEUR — YOUR CABLE DIRECTION** Vecteur now makes three types of cable — all using solid core, oxygen-free linear crystal wire. Normal Vecteur can be used for inter-connect or speakers. The 'S' version is only for awkward speakers. The new 'R' version is a less expensive type for speakers or mains cable application. LAB. Thin ain't it? SOUND. Clear and detailed reproduction. CONCLUSION. Cost effective cabling. You must spend many times these prices to better them. PS. Vecteur also makes good moving coil step-up transformer and a range of sound-improving liquids. Watch for the launch of their £12,000 turntable and £7,500 loudspeakers.

**ZYP — INVISIBLE ACCESSORIES** Presence Audio's own accessories will appear — sooner or later. Don't hold your breath! PS. We don't handle PS. That other chap does.

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## QUADESL-63

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Development work on this design started, as the model number suggests, as long ago as 1963, though it did not go into production until 1981. In the '63, the old *Electrostatic's* problem areas, namely directivity, bandwidth sensitivity, power handling and amplifier loading, have all found at least partial solutions, albeit at a high price.

A single large-area damped plastic film diaphragm is electrostatically energised to operate as a phased array of eight concentric elements, so the emerging wavefront is an approximate simulation of the radiation from a theoretical point source 30cm behind the centre of the panel. A high voltage delay line feeding the multiple elements incorporates compensation for the clamped boundary of the diaphragm, and equalisation for the axial frequency response. The size and apportionment of frequency range and delay to the elements allows control of directivity, which is adjusted to give a smooth and uniform decay at increasing off-axis angles. But it should still be borne in mind that distribution from the '63 is poor by comparison with the best moving-coil designs, and that the speaker remains rather critical of listening angle.

The latter characteristic presented a problem on tests, since in the modest confines of my listening room only two of the six panels could be in the optimum zone, and when used as suggested on the floor at our typical 3-3.5m listening distance, the main axial treble response was directed nearer to chests than ears. Accordingly, the speakers were elevated by about 20cm on open stands and tilted marginally backwards. Further auditioning was also conducted with solo listeners to augment the panel's subjective data.

The Quad 63 is a bipolar design which generates regions of acoustic power fore and aft that are suppressed in the sideways directions. This results in a rather different room drive and reverberation compared with considerably more omni-directional small box speakers. So even if the Quad did provide an identical axial frequency response to a low coloration moving-coil model, it would not sound the same due to the significantly different room reverberation tonal balance. Furthermore, the different manner of 'throw' into the room produces a more even spread of intensity compared with dynamic loudspeakers.

### SOUND QUALITY

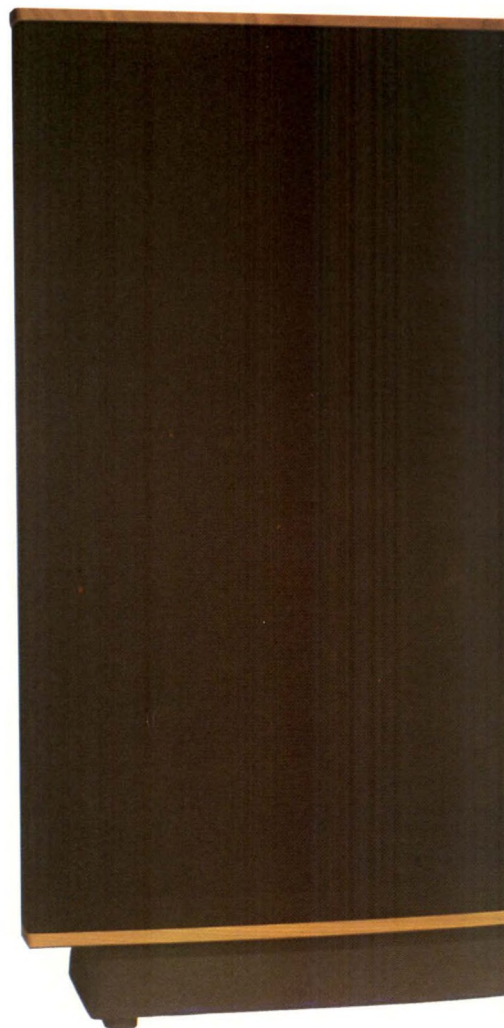
At risk of appearing to make excuses for the 63, the subjective data did partly reflect its directionality, and side positioned listeners were not well served. Prolonged solo listening suggested that to some extent the sound was something of an acquired taste, and that if its particular qualities appealed, these could assume such overriding importance that no other model would suffice. On first hearing however it can sound somewhat 'dead' and 'clothly', due in part to the loss of reverberant energy in the upper frequencies when compared to a conventional speaker. A trace of a 'whistly' quality in the extreme treble was audible to a few keen-eared listeners, while the sweetness and integration of the mid/treble band at first lends a dim impression until experience shows that the necessary treble detail still exists but in an unusually natural form.

Listeners accustomed to a dynamic and punchy bass of good power handling, particularly on rock-oriented programme, found the 63 disappointing since it could not play very loud, and the bass power, though more extended than an *LS3/5a*, was little greater. Without the 'liveness' and 'excitement' of some of the better box systems, the '63 at first appears to lack detail and transparency. But prolonged listening showed that this was due to the misleading frequency balance, and that superb image depth as well as detail were apparent on-axis.

### LAB REPORT

The sensitivity reading was not comparable with a normal speaker due to the doubler directivity. Furthermore, the 1 metre reference response was theoretically too close. Approximation or not, the reading was below average at 84dB/W, though as with all panel speakers intensity is maintained well at a distance from the speakers. The reference response met  $\pm 2$ dB limits between 50Hz and 9kHz, outside of which some irregularities were charted which could not be wholly blamed on proximity.

Averaged in  $\frac{1}{3}$ -octave bands at 2m, the speaker demonstrated a superbly even mid and low range response, with some mild 'lumpiness' above 5kHz. The response sensitivity to axis was shown by a measurement just  $7.5^\circ$  off-axis vertically, which revealed a more than 5dB loss above 12kHz. The output decayed much more than







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average off-axis, but the decay pattern was exceptional in terms of consistency and evenness. In practice the bass rolloff point was indeterminate, depending on the listening room boundaries and in particular the distance to the rear wall (with zero bass when placed against the latter). In open air or in large rooms 34Hz, -6dB is possible, but at a modest acoustic level.

While not as kind a load as Quad suggest, with dips to 3.5ohms recorded at 50Hz and 10 kHz, the speaker should not cause amplifiers too much trouble. But when the speaker is heavily overloaded it protects by a short-circuit 'crowbar' which may damage some amplifiers. Above 60Hz, even at a full 96dB, the distortion performance was superlative, though the '63 would not accept inputs over 30W or so below this frequency without diaphragm rattling. Above 100Hz the distortion was 10-100 times better than usual, but compression occurred at a 100W peak input, due to the speaker's protection circuit; however, at 50W, just 3dB less, the pulse reproduction was simply too perfect to register measurements.

### CONCLUSIONS

Since our original review minor improvements have been made to this speaker, notably considerably revised protection circuitry, allowing louder and better reproduction of bass transients. While not a powerhouse, it does at least now do respectable justice to the bass on rock material, particularly if this is digitally derived and hence free of overhang or subsonic excitation. Fully re-auditioned for recent editions, it achieved very respectable scores, especially on digital master programme.

The Quad has uniquely musical qualities through the vital mid registers, and deserves auditioning on high quality material if its blend of strengths and weaknesses are to be fairly assessed by the intending purchaser.

### TEST RESULTS

Size (height x width x depth)	93 x 66 x 27cm
Recommended amplifier power per channel (for 96dB/A per pair at 2 metres minimum)	(25)–100W
Recommended placement	on open stands clear of rear wall
Frequency response, within ±3dB at 2 metres	40Hz to 18kHz
Low frequency rolloff (-6dB point) at 1 metre	34Hz
Voltage sensitivity (ref. 2.83V or 1 watt into 8ohms at 1 metre)	84dB/W
Approximate max sound level (pair) at 2 metres	99dB/A
Impedance characteristic (ease of drive)	fairly difficult
Forward response uniformity	good*
Typical price per pair, including VAT	£1390

\*see text  
First reviewed: 1981 (reassessed for each subsequent issue). Rating: Recommended.



# TANNOY WESTMINSTER

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**H**i-Fi Choice has never before reviewed a full-range horn loudspeaker, so the Collection is an overdue opportunity to put matters right. Accepted as the norm thirty years ago, when sources were mono and valve amplifiers had little power, the march of technology appears to have left the horn behind. But their virtues are still appreciated by cognoscenti — particularly in Japan where sales are quite brisk.

The *Westminster* is a comparatively recent design (1983), but designed and built within the philosophies of the originals. This purely subjective review was written around that time, but is no less relevant today, and provides a further example of the apparently infinite imagination of the loudspeaker designer.

The key characteristic of the *Westminsters* is that they are entirely different to anything else on the market. They make no concessions whatever to domestic discretion, each being a little larger than two three-drawer filing cabinets bolted together — about the size of two stacked Victorian writing desks — and each weighing 2¼ cwt! The reaction of most visitors could be plotted along a scale which extended from 'horror' to 'hysteria', partly because of the sheer size, but also because of the currently unfashionable ('40s/'50s) styling. Yet the same people would enthusiastically fill their front rooms with similar-sized '50s Wurlitzer juke box *objets d'art*, filled with 45s from their years of lost innocence, so I suspect a double standard of taste and aesthetics.

On practical grounds a minimum room size of 20 × 30ft is indicated, and a corner horn rather than free-standing design would be a much more practical proposition for those without stately homes to fill. Corner horns, particularly the *GRF* and *Autograph* designs, were what made Tannoy famous.

Whatever the aesthetics and practicalities, the standard of craftsmanship in the cabinetwork is exceptional, as well as highly complex. One complaint was directed against the 'horrible smell of putty', which lingered for some weeks after delivery, but to me this was but a timely (June) reminder of Cricker Pavilions (lost innocence again?), Linseed oil clearly being part of the finishing process. The finish was impeccable, but the embellishments definitely OTT, with a scribed brass plaque, gold key for securing the grille, a gold Coat of Arms on the driver cone, and (more practically) a jar of special polish for the cabinet.

## ▼ THE TECHNICAL BILL ▼

Why so big? What is a compound horn? What is a dual-concentric driver? Those who have no wish to know, or already know the answers can skip this bit; the others will have to bear with explanations which may be too simple or too complex.



In essence a horn-loading system improves the energy conversion between the drive unit diaphragm and the air. The horn acts as an 'air transformer', loading the diaphragm of the speaker and reducing the mechanical impedance mismatch between the heavy (-ish) diaphragm and the very light air molecules. This dramatically improves the efficiency of the speaker, so you get much more sound output for the same electrical input.

Attendant disadvantages include the huge physical size needed to reproduce bass frequencies from a horn. Even a large folded horn like the *Westminster* does not offer particularly extended low frequencies, and the most successful horns in this respect are those which are built in as part of the fabric of the listening room.

To construct any sort of folding horn within the confines of even a large loudspeaker cabinet requires very complex and expensive carpentry. This confers advantages in making the whole structure rigid, but provides plenty of different pieces of wood to vibrate and produce colorations. Horn theory itself is sufficiently complex that all practical solutions involve significant compromises.

This notwithstanding the mass-loading effect of the air on the drive unit cone is most useful in damping and controlling unwanted cone

movement. It is therefore obvious that a working horn design will offer a quite different set of compromises to those found with more conventional loudspeakers.

The term 'compound horn' merely means that in fact the speaker system is built up from three separate horns, analogous to using three drivers for a conventional direct radiating system. The big bass horn is taken from the rear of the driver, the shorter midrange horn can be seen coming from the front of the driver, while the tweeter actually uses the flare of the drive unit cone as its horn. Though straightforward enough in concept, this is complicated in practice, requiring the careful integration of acoustic and electrical crossovers.

The *Westminster* superficially appears to possess only one 15in. drive unit, but in fact this is one of Tannoy's famous and unique 'dual concentric' designs, which cleverly incorporates a horn tweeter down amongst the magnet assembly, the horn-loading being partly provided by the main cone.

This drive unit concentricity is very ingenious, and does offer certain benefits, giving a symmetrical dispersion pattern aiding driver integration.

The published specification (not checked for practical reasons) makes fascinating reading, particularly when compared with more conven-



tional loudspeakers. The fundamental justification for this design lies in a sensitivity rating of 96dB/W, which Tannoy suggest is 8dB better than comparable conventional designs, a claim that would appear substantially justifiable. Couple this with power handling of 120W RMS/500W peak and you have a maximum SPL of 117-123dB, giving similar or even bigger advantages in maximum loudness over practically everything else on the market. Tannoy's spec. for the conventional *Classic Monitor* shows the latter loses 4dB of sensitivity compared with the horn, plus perhaps a little low frequency extension as well.

Comparing the Westminister's spec. with Colloms' results in *Hi-Fi Choice: Loudspeakers* offers some perspectives. His data for Tannoy's SRM 12X 'Super Red Monitor' Professional model, which uses a 12in. DC driver without horn-loading, confirms that the Westminister offers substantial sensitivity gains, and (assuming Tannoy's frequency response graphs are correct) significantly improved bass extension. Indeed the bandwidth of the Westminister seems roughly comparable with the big reflex-loaded JBL 150A. The Tannoy costs two and half times as much as the JBL (in the UK!), but occupies five times the volume to give 6dB+ more sensitivity for an equivalent bandwidth! A fair enough exchange when one considers that the

Tannoy requires only one quarter of the amplifier power for the same loudness, and a positive plus for those who prefer to use low powered (voltage swing) amplifiers, such as Mark Levinson, Electrocompaniet, Krell and other Class-A designs, the Naims, and of course various venerable but valued valve designs. In this instance the quote attributed to Chrysler: 'There's no substitute for cubic inches' applies as well to loudspeaker sensitivity as to motor engines.

### ❖ SETTING UP AND USE ❖

One thing about speakers of this size is that they take the decision-making and experimentation out of siting. The former because there probably is only one possible configuration in many rooms, at the most two, and the latter for health reasons. Naturally enough these are free-standing designs, and stands are neither expected nor available. Castors extend fractionally below the plinth 'skirt', but these are sufficient to clear quite ordinary foam-backed domestic carpeting. It was a pity to note that the loudspeaker was all too easily rocked when standing on carpet, a situation which can certainly mar performance, so perhaps Tannoy might investigate methods of improving carpet/floor coupling.

One minor practical disadvantage is that amplifiers are designed with less efficient speakers

in mind. Unless you plan to use the enormous headroom offered by the *Westminsters* most of the time, you may find that your volume control remains close to its low end-stop. Depending upon the design and quality of in the components, practical problems may arise: some amplifiers produce more residual noise at low volume settings, which can be annoying with highly efficient speakers. The 'law' (rate of change) of a volume control is never constant, and sometimes making small adjustments at the very bottom of the range may be fiddly, may cause balance shifts, or in the case of a 'stepped' control may not be possible at all. And it would be nice to have a bi-amp option, as on some of Tannoy's professional models.

### SOUND QUALITY

Enough of these footling minor, practical considerations. What do these monsters sound like, and do they in any way justify their size, price, and elaborate construction? Seeing those massive cabinets and drive units, I suppose I expected a 'big', 'blowsy', somewhat 'coarse' sound. In fact quite the reverse was true, bass in particular showing excellent control. The overwhelming impression left by these speakers was effortlessness. At anything like normal listening levels they had so much in reserve, and were working so gently, that one set of loudspeaker distortions seemed notably absent. I am sure that this is a major contributing factor to the impression of superior real dynamic range which this speaker gives.

Another major strength of this design lies in the high standard of drive unit integration — the only speakers which perhaps behave better as a 'point source' are the Quad ESL-63 and Technics RX50. Therefore, despite their vast size, the Tannoy's are able to provide pinpoint-sharp stereo images, provided one is carefully seated in a favourable position. And again coincidentally like the Quad, one of the prices paid for this precision is that choice of listening position: ensuring that one is seated at a similar angle to the axis of, and at a similar distance from each speaker, becomes critical. Constraints of this sort unfortunately, always seem to apply in direct proportion to the precision of the stereo performance, and the Tannoy's are of course less suited than most models to being shifted around for the benefit of the listener's seat; the reverse is more likely!

While the *Westminister* offers extraordinary loudness capabilities, splendid dynamics and driver integration, it does also have its weak spots, which some may find easier to accommodate than others. Levels of coloration in different parts of the spectrum are somewhat worse than in many competing hi-fi speakers, though to my ears this is a pretty acceptable sacrifice for some of the benefits offered.

Specifically, the treble does have a certain 'spirchy' quality, and this tends to exaggerate

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TANNOY WESTMINSTER  
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surface noise effects from disc, for example. I am inclined to suspect that the non-ideal nature of the square-section midrange horn contributes some of the 'honk' and 'wooden' type colorations of the midrange. Though these are by no means insignificant in degree, I did not find them difficult to accommodate. The mid-bass is both somewhat prominent and coloured, the latter I suspect due to the contribution of the many panel resonances. The low bass does not have quite the clarity or extension, 'weight' or 'authority' that I had expected from the pedigree, size and specification. That said, I suppose I had perhaps expected too much, anticipating that the *Westminsters* would comprehensively destroy any competition rather than merely acquitting themselves with considerable honour. I wonder to what extent the poor floor coupling may have taken the edge of definition and weight from a bass which is powerful, extended and substantially even — quite lacking the usual 'resonance corner' which colours many simple closed box designs — but with a general 'warmth' and 'richness' probably provided by the cabinet itself.

It so happens that while the Tannoys were with me I attended one of those few exceptional rock concerts where the PA was actually working, with a vengeance. The splendidly polyrhythmic Robert Palmer used his equipment to the best advantage, turning in a memorable performance. But the less artful support band went a little over the top, and I had the rather less pleasant experience of feeling what appeared to be my sternum happily resonating along with the bass at one position in the hall. Interestingly I was able to reproduce a similar effect with the Tannoys (after ensuring that the area was cleared of family and neighbours of course). Like the PA, one of the Tannoy's big strengths is its sheer

capability of delivering energy through the mid and upper bass. However, this seemed to have been achieved somewhat at the expense of the low bass power which may only have a marginal effect upon actual instrument timbre, but which does appear to play a role in defining the overall level of realism and degree of information transmitted by the system. The *Westminsters* do have some of the characteristics and character of an excellent PA system, but they work as hi-fi speakers too, so this is an extra bonus which lends an unusual degree of realism to rock material, whatever the philosophical implications of such a statement.

One further subjective aspect of the *Westminsters* is their very revealing nature. It is no accident that Tannoys are popular as monitoring loudspeakers, and it's not just a matter of the high levels they can produce. These speakers do give a ruthlessly honest account of the recording, which from the user's point of view may be either fascinating or a blasted nuisance. The fact that a substantial slice of the rock catalogue is likely to have been mixed down on some form of Tannoy loudspeaker, is in itself some justification for choosing them for replay.

### CONCLUSIONS

It is difficult to make any dogmatic value judgements on a loudspeaker such as this, or indeed to put it into any sort of market context. Certainly the *Westminster* is unique amongst products with any real availability on the UK

market, though there are a few rarities like *Klipschorns*, *Vitavox* and (so I believe) *Lowther* designs available in some markets. The UK price of £3,110 is by no means excessive in terms of the sheer volume or mass of the speaker though it must be a debatable point whether any design is worth this sort of money.

For the fortunate few for whom £5,000 plus for a system is an acceptable level of expenditure, the *Westminsters* are a very viable option, with certain unassailable advantages which in my opinion more than compensate for the few weak points. Plus points are the wide dynamic range, extraordinary sensitivity and loudness, generally good bass control, and well focused stereo. On the minus side there is a degree of coarseness and coloration present, and subjectively the bass could be a little more extended.

The rather directional character and slight 'fierceness' of the horn-loaded tweeter means that each speaker is best listened to slightly off-axis. To give the widest area for reasonable stereo imaging, it is preferable to point speakers inward so their axes cross a little in front of the listener. This cannot really be aesthetically compatible with a design like the *Westminster*, whereas a revival of the corner horn like the *GRF Autograph* would be more practical for many listening rooms, and rather less visually dominating.

*Current typical price: £3110.*



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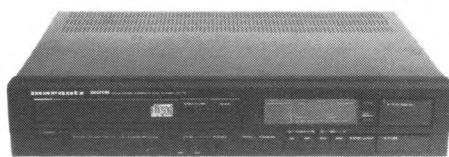
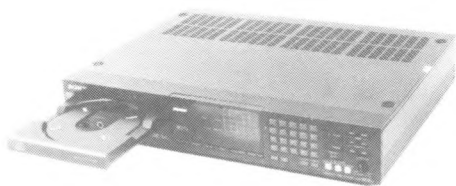
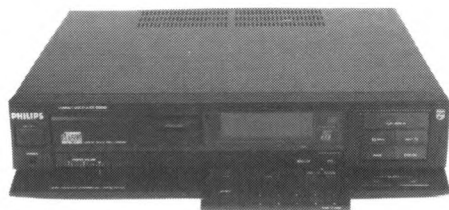
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# Compact Disc Players



This nearly new hi-fi source has only been around four years, so many enthusiasts still consider CD as an 'optional extra' — bearing in mind the extravagant prices being charged for the discs themselves in the UK. Others are enthusiastic fans, building up collections already reaching into the 100s. Try it for yourself before you decide whether or not you like what it does, bearing in mind that opinion amongst enthusiasts is still deeply divided over merits and demerits.

CD players can be purchased for as little as £100 nowadays, though we wouldn't really recommend such a hair shirt route if it can be avoided. The cheapest players do sound generally inferior, whatever anybody tried to say about 'perfect sound forever' — and they don't necessarily track the discs too successfully either, as we discovered when assessing the cheaper CD Midi Systems last Autumn. And in any case, if you're contemplating assembling a system from the components covered in this volume, you're going to need to look a bit further up the scale to stand a chance of avoiding disappointment.

It is painfully clear that the learning curve amongst hardware manufacturers is still very steep. Model changes are currently so frequent that when we came to assemble the Cream of the Crop for this *Collection* from our *CD Players* issue, published only nine months ago, we found that nearly all the models had changed — in the case of some manufacturers, more than once — and those that hadn't had been improved.

We therefore ended up starting from scratch or re-auditioning most of the models included, and for this reason the selection is not as wide as we would have liked. A number of interesting 'state of the art' contenders will just have to wait

until next summer's A5 edition, though we have assembled a pretty interesting group all the same. The top Sony models have both been updated to Mark II status necessitating re-auditioning. Cambridge's *CDI* is superficially the same, but internal tweaks have successfully kept this one the 'leader of the pack'.

Technics, Philips and Marantz have all introduced at least three new 'high tech' machines in recent months, so we've had to ration them to one each. Technics' semi-pro '1200 was the obvious choice for this 'high end' edition. Philips' and Marantz' ranges are related, though the latter are usually slightly more expensive with extra tweaks to improve sound quality: reviewing the former's new '960 and the latter's recent '75 should therefore also give some indication of each other's corresponding machines.

Mission's latest player has only been in the shops a short while, but long enough to have established a good reputation amongst specialist dealers. And we finally managed to get hold of

a full production sample of that most exciting of the newest entries, the Meridian 207. To add a little US spice we have also included the Conrad Johnson *Sonographe* — a budget model by their standards, but amongst the more expensive models around nevertheless.

It is nice to see that the CD player market is steadily becoming more diverse. There are at least three other US exotics nominally available in the UK at present, including one with valve amplification and another with some very peculiar ideas. Another eagerly awaited contender which we haven't got around to yet is Nakamichi. And hopefully Cambridge might have their new 'cheap' model around in time for next summer's *Choice: CD Players* (June publication).

## GETTING TO GRIPS

Connecting and using a CD player is such child's play that I'm surprised there isn't a larger catalogue of children's discs available. Those wishing to get the best out of the medium would do well to bear a few points in mind, however, particularly when connecting them up to a high resolution system. Decent interconnects and proper spiked stand/bracket mounting are both likely to produce some benefit. And some enthusiasts much prefer to connect a CD player direct to power amplifiers via a passive high quality volume control. Some amplifiers already take a measure of this into account by by-passing internal stages on their CD input. (One advisor suggested that a valve pre-amplifier may be the best way to 'tame' this new medium!)

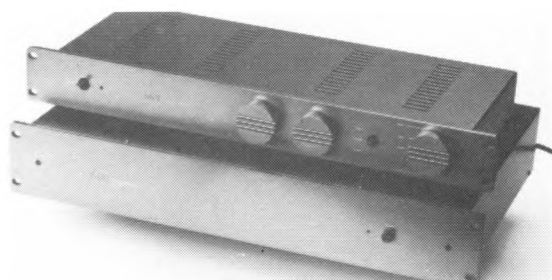
A final warning: keep your discs clean and free from scratches. This helps to keep the error correction activity as low as possible, which in turn will assist the sound quality.

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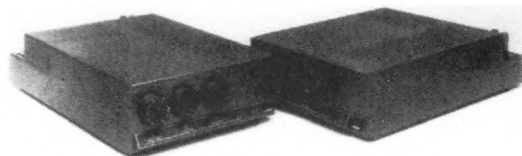
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# CAMBRIDGE AUDIO CD1

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**N**ow firmly established as a reference CD player, the Cambridge design is founded on the Philips system with its four times oversampling and digital filtering. The Philips '104 chassis is the main building block, a solid cast metal structure with horizontal drawer loading mechanism. From this point onwards, however, the design of the CD1 diverges from other machines. For example, while the D/A convertors are physically 14 bit Mullard Philips integrated circuits, no less than 6 are used, three per channel. On each channel two operate essentially in parallel, increasing the dynamic range, while the third acts as a high speed ranging element, assessing bit errors and offering correction. Before oversampling the theoretical resolution is some 18 bits, which is enhanced to 20 bits by oversampling. Dither is specifically applied to suppress high order errors, improve resolution and end up with a true 16 bit performance.

As with the Meridian, changes have also been made to the Philips disc transport, notably to the laser head servo and to the tracking. The actuator responses have been adjusted to minimise the error rates, a factor held to affect sound quality.

The dual power supplies are located in the upper unit with the main digital circuitry and of course the transport. The isolating suspension has also been modified, with an additional anti-vibration mounting which involves lead beams tuned to 1Hz. Two interconnect leads fitted with DIN plugs link the upper and the lower units, and the latter draws its power from the former. Specially selected components are used in the filtering and output circuitry to maximise audio quality.

Operating facilities are basic Philips '104 including that machine's small fluorescent display illuminated in green. However, the pushbuttons are of instrumentation quality and should give a long life.

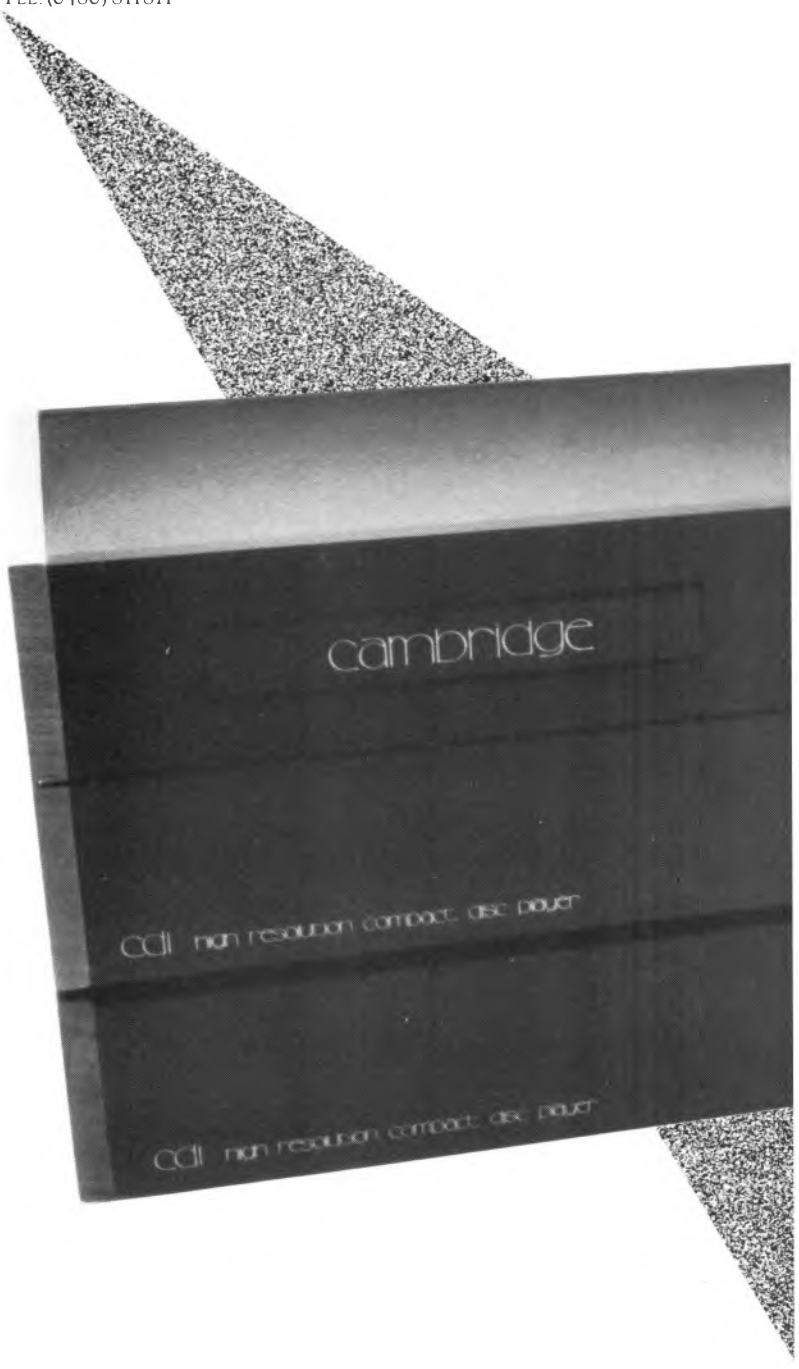
Three additional buttons can be used singly or in combination to offer a selection of seven audio filters. These filters provide subtle modifications to the upper frequency characteristic, altering amplitude and phase, being designed to complement some of the upper range characteristics of available digital programme. On test these filters were experimented with and it was found that different settings could indeed improve some of the brighter and edgier recordings, moderating them to a more musical balance.

## LAB REPORT

The adjustable variations in filter response only

affected the upper treble, and the primary response fitted the Philips pattern with the usual minor ripples in the upper range. These are harmless and amount to 0.2dB giving a mild loss of output where they were present. A small loss in output was noted at low frequencies (some 1dB down at 20Hz) but this related to the 10kohm loading of the pen chart recorder used for the measurements. With most pre-amplifiers, the input impedance is rather greater than this, and the low frequency rolloff will move to a correspondingly lower frequency. For example, with a typical 50k input impedance, the -1dB low frequency point will appear at 4Hz. In

theory CD players can respond down to DC, and several models in fact specify frequency responses down to 2Hz. Fine channel separation was shown, together with very good channel balance. Even at 20kHz, the separation still averages 106dB. As a true dual-convertor deck the phase difference between channels was zero. At full level, distortion figures were good rather than excellent, but quickly improved at lower modulation levels. The low distortion at -80dB coupled with the excellent result for level offset at -90dB confirmed the manufacturer's claims of genuine 16 bit performance. On high frequency inter-



attributes of the superior machines tested so far.

In basic character it could be said to resemble the Meridian *Pro MCD*, demonstrating a similarly musical tonal quality. As CD goes, the Cambridge showed this most clearly on orchestral strings, managing to avoid the tendency to brittle 'wiriness' so often heard. In the bass it gave an excellent performance, showing an impressive feeling of extension and power allied to excellent control on percussion. It could portray depth to a surprisingly high degree over the entire frequency range, here rivalling the exceptional transparency of the Sony '702 decoder unit.

In the treble the *CDI* remained sweet and musical over a wide range of sources. Some discs which had appeared vague in treble imaging or unduly sibilant seemed to be tamed by the *CDI*, bringing them into clear focus. Stereo images were very stable and well formed, showing very good width and considerable depth.

Still better results were obtained when we bypassed the pre-amplifier and connected the *CDI* direct. For an audiophile CD enthusiast, this mode provides the best sound of all, a rating that was fully confirmed with a current production sample auditioned in 1987.

### CONCLUSIONS

The advanced design and circuitry of this top class CD player have clearly paid off in its exceptional performance. With such a machine, compatibility with upper grade audiophile electronics is assured, and the intrinsic merits of CD as a medium, such as silent surfaces, and inaudible wow and flutter, can make themselves felt. I enjoyed listening to the *CDI*, and consider it to be the best-sounding machine *Hi-Fi Choice* has so far tested.

### TEST RESULTS

	20Hz	1kHz	20kHz
Channel balance	0.18dB	0.07dB	0.12dB
Stereo separation	-114.6dB	-108.8dB	-106dB
Channel phase difference	0°	0°	0°
Total harmonic distortion, 0dB	-82.6dB	-83.2dB	-83.9dB
Total harmonic distortion, -10dB	-	-74.7dB	-
Total harmonic distortion, -60dB	-	-43.6dB	-
Total harmonic distortion, -80dB	-	-26.5dB	-
Intermodulation, 19kHz/20kHz, 0dB	-	-82.3dB	-
Intermodulation, 19kHz/20kHz, -10dB	-	-72.2dB	-
Frequency response, left channel	+0.31dB	-0.43dB	-
Frequency response, right channel	+0.30dB	-0.43dB	-
Signal-to-noise, 20Hz-20kHz unweighted	-	-113dB	-
Signal-to-noise, CCIR/ARM, 1kHz ref	-	-113dB	-
Output level, 0dB, left/right	-	4.25V/4.25V	-
Output impedance	-	108 ohms	-
De-emphasis	5kHz, -4.63dB; 16kHz, -9.25dB	-	-
Error correction capability	-	>900µm gap, >800µm dot	-
Mechanical noise	-	very low	-
Spurious up to 100kHz	-	-52.4dB	-
Resolution at -90dB	-	+0.38dB	-
Headphone socket	-	no	-
Dimensions (wxdxh)	-	45x37x19cm	-
Estimated typical purchase price	-	£1500	-

First reviewed: *The Collection* 1986 Rating: Recommended.

### SOUND QUALITY

For reference purposes the *CDI* was set to filter 'one', its nominally flat position. One complication concerned its relatively high output level of 4V for full modulation, which is double the usual figure, and intended to allow the *CDI* to be coupled directly to a power amplifier by making use of the high quality passive volume fitted to the lower deck.

Once correct levels had been established, accurate listening could begin. In fact, this machine showed its true mettle right from the opening bars of the first disc we played, James Newton Howard. It seemed to combine the best

modulation it was fine while the de-emphasis operation was correct. A maximum of 4.25V was available from a low 108ohm output impedance. Mechanical noise was very low, while the track access time was just satisfactory at 9 seconds. No problems occurred with error correction and it easily met the top test disc standards here.

Electrical noise levels were exceedingly low, with the recorded figures for this machine being at the threshold of measurement; in fact all met or beat -112dB, whether weighted or unweighted.

# MARANTZ CD75

MARANTZ AUDIO (UK) LTD, 15-16 SAXON WAY INDUSTRIAL ESTATE, MOOR LANE,  
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TEL: 01-897 6633



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This is a typical mid-priced CD player — black, standard size, standard search and programming facilities, with remote control included at £375. Until the 1987 launch of the Japan-sourced CD94 (which has some common ground with the Philips CD960, see review) it was therefore a 'flagship' model for their range. There is much in common with the non-remote Marantz CD65, and its nearest Philips equivalent is the CD650, but these two ranges are increasingly establishing separate identities. Manufactured in the Philips factory in Belgium, it shares much tried and tested common technology with most other Marantz and Philips models, not to mention a number of the players which are modified, branded and marketed by small specialist manufacturers. But Marantz see themselves as hi-fi specialists too — though owned by Philips they operate autonomously to a great extent. They brand and sell only audio equipment and are not in the business of flogging lightbulbs and toasters, so they like to distinguish their models from those of the parent company.

The CD75s that are sold in the UK market have therefore been mildly 'tweaked' at Marantz UK by changing certain output and power supply capacitor grades, in an attempt to enhance sound quality and give them an edge — a little like the specialist-branded machines though not to the same degree.

The technology includes the latest 16-bit 4X oversampling technique, with dual D/A converters giving essentially linear phase, and digital

filtering. This latest chip set has more on board memory and therefore more powerful error correction than earlier models, and indeed those of many competitors.

## LAB REPORT

Though there is still a trace of high frequency ripple under great magnification, the frequency response is essentially flat. Channel balance is indicative of normal commercial tolerances, with the twin converters providing zero phase error at high frequencies. Results for harmonic and intermodulation distortion were very good, albeit with some vibration between channels. White noise at 0dB showed slight clipping asymmetry, and resolution at -90dB does show room for improvement.

Error correction is to the highest standards, and the player acquitted itself well on the 'fingerprint' test. The unit is mechanically quiet in operation and behaved itself well under vibration or shock excitation. Track access times were quite rapid and output met the 2V spec. from a comfortably low source impedance.

## SOUND QUALITY

Despite its comparatively modest price, the CD75 turned in a very fine performance on the listening tests, comfortably bearing its '65 sibling and coming close to several highly rated machines costing considerably more. Though falling a little short of the very best in terms of detail and dynamic resolution, the overall balance is particularly finely judged and the limitations

very evenly spread. Lacking a little in bass 'speed' and 'weight', depth and space were also slightly curtailed, but the mid/treble balance is sweet, even and open.

## CONCLUSIONS

The CD75 must surely be the best bargain around in CD players at the moment, and it is on this machine that Marantz UK's own special touches appear to have had the most telling effect. Delivering a sound quality that can rival machines twice the price even though it may lack some of their luxury touches, the CD75 is an obvious Best Buy that fully merits inclusion in the Collection besides.

## TEST RESULTS

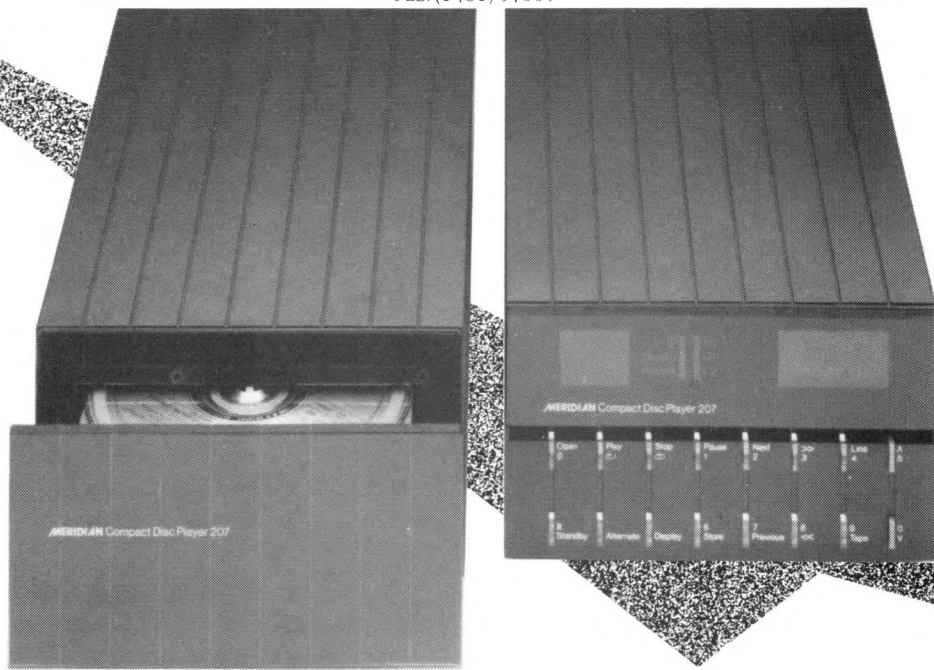
	20Hz	1kHz	20kHz
Channel balance	0.14dB	0.15dB	0.13dB
Stereo separation	117dB	106dB	103dB
Channel phase difference	0°	0°	0°
Total harmonic distortion, 0dB	-92.7dB	-89dB	-86dB
Total harmonic distortion, -10dB		-83dB	
Total harmonic distortion, -60dB		-45dB	
Total harmonic distortion, -80dB		-18dB	
Intermodulation, 19kHz/20kHz, 0dB			-90dB
Intermodulation, 19kHz/20kHz, -10dB			-92dB
Frequency response, left channel	0	0	-0.09dB
Frequency response, right channel	0	0	-0.08dB
Signal-to-noise, 20Hz-20kHz unweighted			-110dB
Signal-to-noise, CCIR/ARM, 1kHz ref			-104dB
Output level, 0dB, left/right			2.03V
Output impedance			200 ohms
De-emphasis	-0.38dB(1kHz),	-4.63dB(5kHz),	(-9.1dB(16kHz))
Track access time			3.5secs
Error correction capability			gap > 900µm, dot > 800µm
Mechanical noise			very low
Spurious up to 100kHz			-87.3dB
Resolution at -90dB		L -97.9dB, R -108dB	
Headphone socket			variable, 150 ohms
Dimensions (w x d x h)			42 x 32 x 8.5cms
Estimated typical purchase price			£375



# MERIDIAN 207

BOOTHROYD STUART LTD, 13 CLIFTON ROAD, HUNTINGDON, CAMBRIDGESHIRE PE18 7EJ.

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After the success of their Philips-derived MCD and *Pro-MCD* players, Meridian have gone a substantial step further than most specialists in designing this new 207. Not only is it indisputably the most elegant looking CD player around, it also has capabilities only matched by B&O in providing full 'round the house' remote operation. And where the earlier MCDs (based on the early Philips 100 chassis) were sparse, the 207 is much better endowed with automatic/programming facilities.

This is a two-box player, consisting of separate transport and electronics sections which can be sited side by side or stacked to taste. A pinstripe motif provides attractive visual distinction which is reflected in the layout of the chassis controls and remote unit. The control keys are straightforward in the main, but contain a shift-key system for less commonly used functions which takes a little learning — this is really just a matter of getting used to a new approach.

This electronics section also contains a simple inbuilt pre-amplifier which provides electronic volume control and switching for two other line level inputs. In this sense the 207 can therefore be connected directly to a power amplifier or a pair of Meridian's active loudspeakers, while also accepting and switching additional signals from tuner and tape sources. Both these functions will be controllable from the optional 209 remote control unit, itself a substantial casting allowing, ultimately, armchair control throughout the house from different independent sources. A more elaborate 201 pre-amplifier is due on the market imminently, providing more sophisticated system control than those available with just the CD player, plus a 204 FM tuner/timeswitch.

The transport section is a Philips' die-cast chassis adapted as a substantially built slide-out drawer system, giving the stacking advantages of a front loader. The metal sleeve and glass front plate provide a measure of acoustic isolation during play, reducing vibration at the disc.

Meridian continue to rely upon the 14-bit 4X oversampling technology that they used in the *Pro-MCD*, an approach which they share with several other notable upmarket designs. Considerable care has been taken over the various power supplies needed, separating analogue from digital and running the transport separately as well.

## LAB REPORT

Originally measured in pre-production form but giving essentially the same results when a production model was checked, the frequency response showed a mild, gentle rolloff above 1kHz, amounting to -1.5dB at 20kHz, overlaying the high frequency ripple characteristic of this chip set. Channel balance was very close, with zero HF phase error and fine stereo separation. Distortion results were generally good, while 0dB white noise and -90dB resolution both gave excellent results — 14-bit notwithstanding. Error correction and shock/vibration sensitivity were very good, while mechanical noise was low. Track access was a reasonable 4secs.

The fixed output met the standard, while the output via the electronic volume control gave up the 9V, both from low source impedances. This volume control showed good channel tracking down to low levels and had a variable law to retain normal 'feel'.

The pre-amp section was also checked out. The line input response showed a sensible HF rolloff to -3dB at 45kHz. Sensitivity was sensible for most sources, though overload margins could have been a little better, and the impedance was a little on the low side, particularly for interfacing some valve equipment. Distortion, noise and other measured parameters were all fine.

## SOUND QUALITY

Re-auditioned in production form to confirm the fine prototype results, Meridian seem well able to maintain standards. Highly rated on the listening tests, the sound was lively yet without hardness. Depth was considered very good rather

than exceptional, and stereo width was marginally less than the best too. The perceived mid-range balance was particularly liked, and the bass was crisp and articulate. The upper treble showed a touch of exaggeration, and transparency and 'air' were a trifle constrained.

There was a mild loss of quality when used via the pre-amp section rather than from the fixed output, but this is in the context of a conventional system, where the Meridian may be used to drive active speaker systems directly, providing an effective compensation.

## CONCLUSIONS

The 207 delivered a sound quality in the very top class, comfortably ahead of more mass produced products and bettered only slightly by significantly more expensive models. Not only arguably the prettiest model around, it is also one of the most capable with its on-board pre-amp, while Meridian's plans indicate that it is future-ready to an unusual degree. Clearly deserving strong recommendation, it is now up to Meridian to make this hitherto scarce model widely available.

## TEST RESULTS

	20Hz	1kHz	20kHz
Channel balance	0.01dB	0.01dB	0.01dB
Stereo separation	120dB	102dB	78dB
Channel phase difference	0	0	0
Total harmonic distortion, 0dB	-91.2dB	-84.3dB	-85dB
Total harmonic distortion, -10dB		82.4dB	-
Total harmonic distortion, -60dB		43.8dB	-
Total harmonic distortion, -80dB		19.7dB	-
Intermodulation, 19kHz/20kHz, 0dB			-86.2dB
Intermodulation, 19kHz/20kHz, -10dB			-86.3dB
Frequency response, left channel	+0.07dB	0	-1.53dB
Frequency response, right channel	+0.07dB	0	-1.48dB
Signal-to-noise, 20Hz-20kHz unweighted			95.5dB
Signal-to-noise, CCIR/ARM, 1kHz ref			-96dB
Output level, 0dB, left/right	2.09V fixed, 9.06V variable		
Output impedance	58ohms fixed, 19ohms variable		
De-emphasis	-0.52dB(1kHz), -5.52dB(5kHz), -9.7dB(16kHz)		
Track access time			4secs
Error correction capability		gap>900, µm dot, >800µ	
Mechanical noise			very low
Spurious up to 100kHz			-87.6dB
Resolution at -90dB	L -2.02dB, R -4.62dB		
Headphone socket			3.5mm miniature
Dimensions (w×d×h)			(16×38×10)×2 cms
Estimated typical purchase price			£850

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**Manticore Systems Engineering Ltd.**

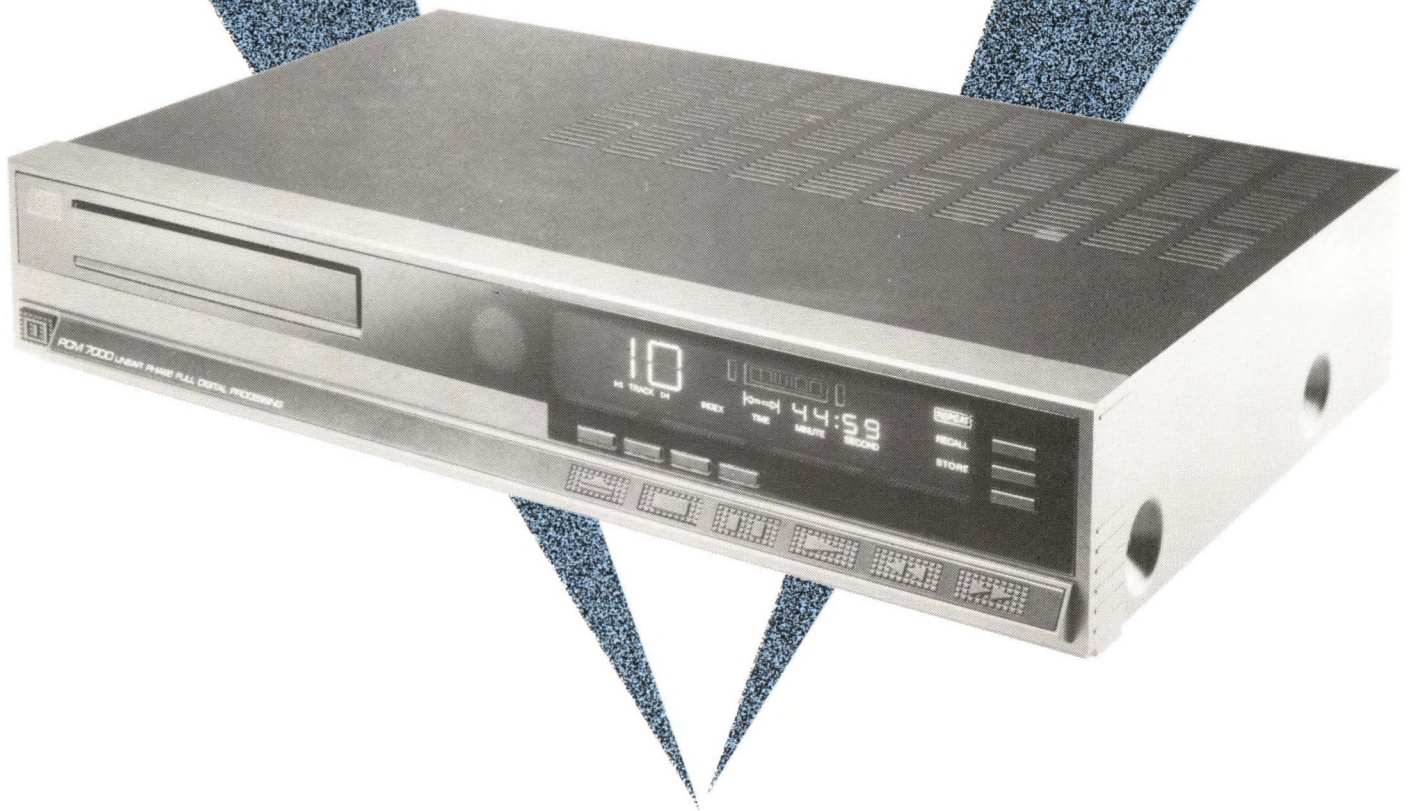
The Courtyard, 56c Shortmead Street, Biggleswade, Beds. SG18 OAP.

Telephone:(0767) 318437



# MISSION PCM7000

MISSION ELECTRONICS LTD, STONEHILL, HUNTINGDON, CAMBRIDGE PE18 6ED.  
TEL: (0408) 57477



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Like other manufacturers relying upon the Philips 16-bit chip set, Mission's PCM series were subject to some delay, but eventually reached the shops in Autumn 1986. The two models are both based on the Philips 450/650 chassis, the 4000 logically costing around £400, but the 7000 £600. They are distinguished from the Philips models by an unusually large proprietary display, and from each other by D/A convertor selection and complex additional circuitry that includes remote volume control on the more expensive 7000 assessed here.

The extra electronics includes additional power supplies and analogue filtering, plus a special electronic volume attenuator operating in 1dB steps down to -6dB and claimed to sound superior to others of the breed.

The large display may be a little obtrusive for some, but it does at least facilitate remote operation by being easily legible from a distance. And it disappears entirely from view when the machine is switched off, whereupon the machine looks neat and sparse, with minimal operating legends. When powered up the display gives comprehensive information in response to the remote control.

The Philips 16-bit 450/650 chassis shows improvements in tracking error processing over earlier models, and continues to use four times oversampling, with digital filtering and dual converters. Mission select the D/As used in the 7000. The chassis is constructed from plastics mouldings while the optics use a single beam

laser.

## LAB REPORT

The frequency response showed the expected very mild high frequency rippling and a slight rolloff at very high frequencies, amounting to around 1dB at 20kHz — probably inaudible to many listeners, and possibly marginally beneficial besides. Channel balance was close enough, while high frequency phase difference is eliminated by the dual D/A converters. The variable output degraded stereo separation marginally, but inconsequentially, and showed fine channel balance tracking. Distortion results were good throughout, though 0dB white noise showed a trace of compression and -90dB resolution showed room for improvement.

Error correction is to the highest standards, coping with all the tests with ease and also proving very good in resisting the effects of shock and vibration. Track access times were adequate enough at 5secs, and mechanical noise was low. Output met the format specification for level and source impedance.

## SOUND QUALITY

The PCM7000 sounded clearly better than its DAD predecessor by a substantial margin, but perhaps shows less model-to-model improvements than that achieved elsewhere. The sound was attractively 'bouncy' and dynamic, with good bass 'speed' and a well balanced spacious midrange, but also a touch of treble 'brightness' and 'grain'. Space, 'air' and transparency were

all good, though somewhat less than the best, and some slight muddling was also noted.

## CONCLUSIONS

The PCM7000 is a fine sounding CD player, with some nice ergonomic touches, particularly in the large informative display. Deserving recommendation on the basis of its sound quality alone, it is also true to say that the delays in getting this product to market have dulled its competitiveness a trifle, such is the steepness of the learning curve and rate of progress in CD player design.

## TEST RESULTS

Channel balance	20Hz: 0.2dB	1kHz: 0.26dB	20kHz: 0.19dB
Stereo separation	103dB	102dB	100dB
Channel phase difference	0°	0°	0°
Total harmonic distortion, 0dB	-92dB	-88.7dB	-85.3dB
Total harmonic distortion, -10dB		84dB	
Total harmonic distortion, -60dB		-47.1dB	
Total harmonic distortion, -80dB		-21.6dB	
Intermodulation, 19kHz/20kHz, 0dB			-90.5dB
Intermodulation, 19kHz/20kHz, -10dB			-82.8dB
Frequency response, left channel	+0.03dB	0	-1.15dB
Frequency response, right channel	+0.02dB	0	-1.01dB
Signal-to-noise, 20Hz-20kHz unweighted			-105dB
Signal-to-noise, CCIR/ARM, 1kHz ref			-100dB
Output level, 0dB, left/right			2.1V
Output impedance			200 ohms
De-emphasis			correct
Track access time			5 secs
Error correction capability		gap>900µm dot, >800µm	
Mechanical noise			low
Spurious up to 100kHz			-100.6dB
Resolution at -90dB		L -6.8dB, R -10.6dB	
Headphone socket			none
Dimensions (w×d×h)			43×32×9cm
Estimated typical purchase price			£600



# PHILIPS CD960

PHILIPS ELECTRICAL LTD, CITY HOUSE, 420-430 LONDON ROAD, CROYDON, SURREY CR9 3QR.  
TEL: 01-689 2166



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**B**rand new for 1987, the remote-control CD960 is completely different in appearance, construction and price from Philips' previous CD players, though the technology at the heart of this prestige player is still fundamentally familiar. It is manufactured in Japan at a factory which Philips acquired when purchasing Marantz some years ago, and is conceived as a new 'flagship' for their audio range, offering deluxe build quality and certain features designed to enhance sound quality. A CD94 Marantz equivalent shares many components, but differs significantly in cosmetics and has other component changes.

Much of the reason behind the £700 pricetag can be identified by lifting the carton. It is much heavier than other current Philips' and incorporates a number of expensive metal diecastings in place of the plastics mouldings used extensively in the Hasselt range.

Out of the box, the styling has been carefully arranged to promote ease of use, separating the controls into three groups. The main operational controls are on the vertical front panel, secondary facilities are placed on an angled ledge which is distinctly reminiscent of Aiwa's cassette decks, and compulsive button pushers can access a sliding drawer which provides still further program/timing complexities. The only disadvantage of this layout is the tendency of ledges to accumulate dust.

Special features include full remote control which can be interlinked in the future with other compatible system components, optical and electronic digital data outputs, and Philips' 'favourite track selection' (FTS), which enables the machine to play any of the discs in a collection in any permanently stored pre-programmed track order of so desired.

The extra build quality undoubtedly promotes confidence in use. The main frame and the disc playing chassis are both substantial metal diecastings, with the latter spring-decoupled for vibration suppression. The top cover has been damped and the heatsink at the rear likewise

designed to be inherently non-resonant. The internal technology is the familiar Philips 16-bit 4X oversampling, with separate D/A converters, powerful error correction and digital filtering. Additional attention here is paid to power supplies and audio circuitry, with extra internal screening.

## LAB REPORT

The frequency response was ruler flat, with the merest suggestion of HF ripples under large scale magnification. Channel phase difference was zero due to the twin D/A converters, while channel balance was held to normal commercial tolerances. Separation and distortion figures were truly excellent, and -90dB resolution was also very good, but there was slight asymmetric compression with 0dB white noise.

Error correction was very good on all tests, and resistance to shock or vibration was excellent. Mechanical noise was very low, and track access times about average. The output level met the format specification, from usefully low source impedance.

## SOUND QUALITY

The listening tests confirmed the success of

Philips' efforts in improving the sound over their standard — already good — players. The rating was only bettered by a handful of 'audiophile' models, reflecting significant improvements in dynamics and control. Bass was powerful and dynamic, albeit a trifle softened at the extreme low end, while the midrange was pure and relaxing, showing good depth, convincing perspectives and no gain. The treble sounded unforced, the generally fine string tone accompanied by slight 'sheen'

We auditioned the similar Marantz CD95 at the same sessions, finding the two machines very close indeed, the more expensive Marantz showing a very slight advantage.

## CONCLUSIONS

This new Philips machine has fine build quality and presentation, with excellent 'graded' ergonomics that were simple to use. The lab results were exemplary, with no sign of weakness, while the sound quality improvements over Philips' 'mainstream' models more or less justifies its premium price. The machine as a whole is very satisfying and well balanced, deserving recommendation.

## TEST RESULTS

Channel balance	20Hz	1kHz	20kHz
_____	0.13dB	0.12dB	0.05dB
Stereo separation	107dB	110dB	120dB
Channel phase difference	0	0	0
Total harmonic distortion, 0dB	-92.4dB	-89.6dB	-85.9dB
Total harmonic distortion, -10dB	_____	-81.4dB	_____
Total harmonic distortion, -60dB	_____	-49.8dB	_____
Total harmonic distortion, -80dB	_____	-24.1dB	_____
Intermodulation, 19kHz/20kHz, 0dB	_____	_____	-93.9dB
Intermodulation, 19kHz/20kHz, -10dB	_____	_____	-92.3dB
Frequency response, left channel	0	0	0
Frequency response, right channel	0	0	-0.1dB
Signal-to-noise, 20Hz-20kHz unweighted	_____	_____	110dB
Signal-to-noise, CCIR/ARM, 1kHz ref	_____	_____	108dB
Output level, 0dB, left/right	_____	_____	2.1V
Output impedance	_____	_____	56 ohms
De-emphasis	-0.4dB(1kHz), -4.7dB(5kHz), -9.3dB(16kHz)	_____	_____
Track access time	_____	_____	3.5secs
Error correction capability	_____	_____	>900µm dot, >800µm
Mechanical noise	_____	_____	very low
Spuriae up to 100kHz	_____	_____	-87.4dB
Resolution at -90dB	_____	L -93.5dB, R -94.7dB	_____
Headphone socket	_____	_____	variable (207ohms)
Dimensions (w×d×h)	_____	_____	42×38×10cm
Estimated typical purchase price	_____	_____	£700



# SONOGRAPHE SD1 (by Conrad Johnson)

AUTOMATION SCIENCES CO, 20 LITTLE GADDSDEN, BERKHAMSTED, HERTS HP4 1PA

TEL: (044284) 2786



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The Sonographe (by Conrad Johnson) SD1 CD player has recently become available in the UK, and may be seen as something of a US equivalent to the UK specialist machines. A basic Philips (in the US Magnavox) chassis has had customising touches here and there, plus 'audiophile' analogue pre-amp circuitry. The price of £799 is unusually low by C-J standards, hence the Sonographe identity, a US turntable brand which C-J acquired quite recently and which makes a suitable identity for good quality products at more modest prices than their normal amplification equipment.

The styling changes consist of a substantial metal fascia plus oak end-cheeks. The result looks satisfyingly substantial and distinctively American, though one might question the overall elegance. An additional simple internal circuit board substitutes the normal output filter with a Bessel filter with different Q and rolloff point. The analogue output uses an FET stage reminiscent of the *Motif* pre-amp, and further modifications include a good quality dual-rail power supply and the replacement and use of high quality C-J specified capacitors.

The basic machine is similar to the familiar drawer-loading Philips 350, and can be upgraded to remote control operation using the Philips remote/receiver kit. All the usual search, program and timing features are included. The conversion circuitry is the 14-bit four times oversampling which is still used in some of the best players around. The chassis is a plastic moulding, using a single beam laser.

## LAB REPORT

The frequency response showed the same mild high frequency ripples as other related machines: they can look a little alarming under high scale magnification but there is no evidence of an adverse effect upon sound quality. Phase difference at high frequencies was zero, due to the two D/A converters. Stereo separation was satisfactory, but rather poorer at high frequencies than the standard models which use the same chassis. Similarly, distortion results were rather poorer than the standard achieved by other machines, both for harmonic and intermodulation. Despite the evidence of some distortion, white noise at 0dB was handled fine, and resolution at -90dB was quite good.

Error correction was very good on all tests, while mechanical noise was low and the unit showed generally good resistance to shock and vibration. Track access took a satisfactory 4.5secs, while output was a little below the standard, and further hampered by a highish source impedance — a little care may be needed to ensure amplifier compatibility here.

## SOUND QUALITY

Highly rated in auditioning, the SD1 is bettered by very few, mostly more expensive, competitors. Effectively confirming its illustrious heritage, its great strength was sheer 'listenability' in a top class replay chain, the sound described as engagingly sweet and unfatiguing, if slightly 'soft' and lacking 'attack'. The midrange, vocal regions were particularly good, but the treble showed a little grain and was a trifle 'shut in'. Bass

sounded slightly 'heavy', lacking a little 'grip' and 'slam'.

## CONCLUSION

Despite the cost penalties inevitably incurred by shipping a unit halfway round the world, the Sonographe still delivers a fully competitive sound quality that comes very close to our reference yardsticks irrespective of price. Conrad Johnson's engineers have come up with a sonic recipe that gives an attractively relaxed 'musical' result, the only penalty being facilities and presentation which are rather mundane when compared with the immediate competition.

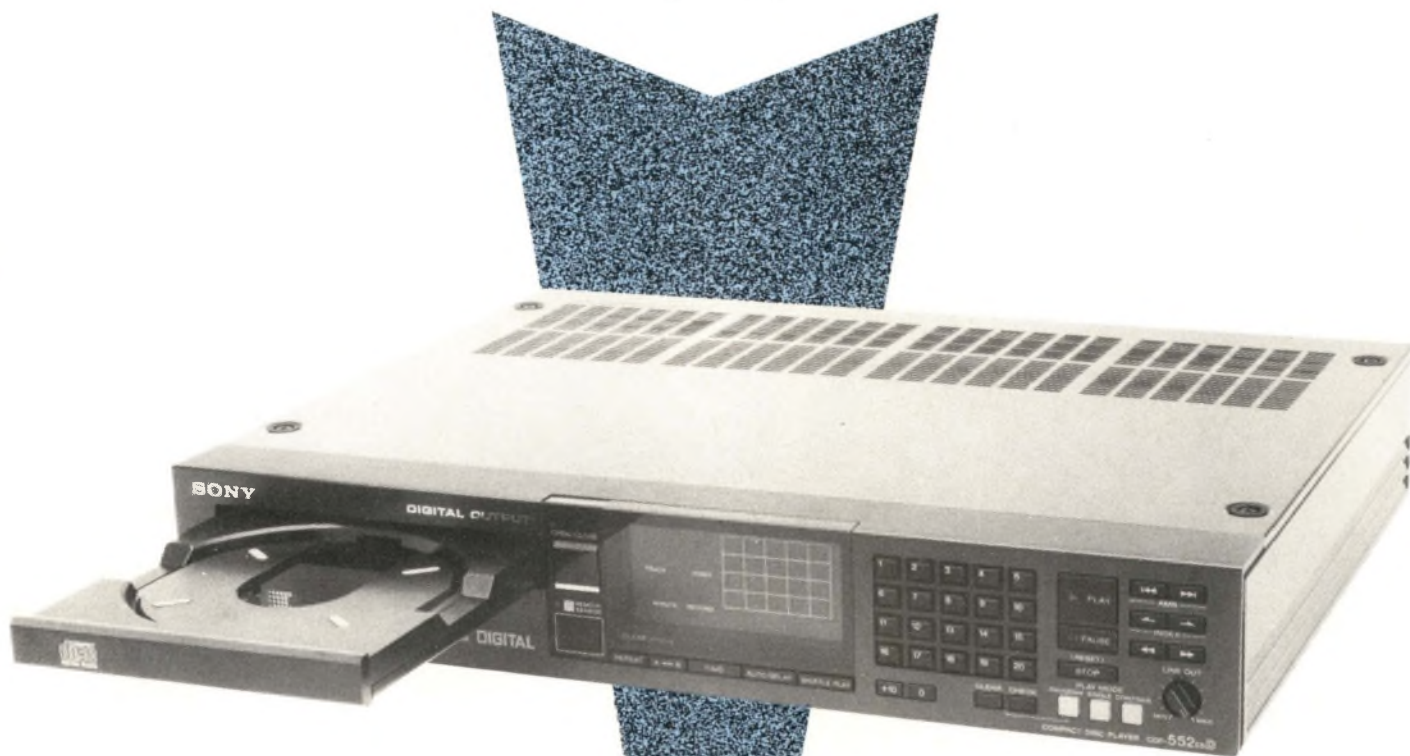
## TEST RESULTS

Channel balance	20Hz	1kHz	20kHz
	0.18dB	0.17dB	0.19dB
Stereo separation	95.2dB	89.1dB	66.5dB
Channel phase difference	0°	0°	0°
Total harmonic distortion, 0dB	-62.3dB	-62.8dB	-78.6dB
Total harmonic distortion, -10dB	-	-71.2dB	-
Total harmonic distortion, -60dB	-	-38.7dB	-
Total harmonic distortion, -80dB	-	-20.2dB	-
Intermodulation, 19kHz/20kHz, 0dB	-	-	-52.7dB
Intermodulation, 19kHz/20kHz, -10dB	-	-	-61.6dB
Frequency response, left channel	+0.03dB	-	0 -1.05dB
Frequency response, right channel	+0.02dB	0	-1.08dB
Signal-to-noise, 20Hz-20kHz unweighted	-	-	93dB
Signal-to-noise, CCIR/ARM, 1kHz ref	-	-	90dB
Output level, 0dB, left/right	-	-	1.87V
Output impedance	-	-	2.6 kohm
De-emphasis	-0.4dB(1kHz), -4.74dB(5kHz), 9.5dB(16kHz)	-	-
Track access time	-	-	4.5secs
Error correction capability	gap>900µm, dot>800µm	-	-
Mechanical noise	-	-	very low
Spurious up to 100kHz	-	-	-78.9dB
Resolution at -90dB	L -87.9dB, R -93.1dB	-	-
Headphone socket	-	-	fixed, 150ohms
Dimensions (wxdxh)	-	-	46x39x9cm
Estimated typical purchase price	-	-	£799



# SONY CD-P552 IIES/DA-S702ES

SONY HOUSE, SOUTH STREET, STAINES, MIDDLESEX TW18 4PF  
TEL: STAINES 61688



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Sony's CD flagship is the elaborately engineered CD-P552 IIES/DA-S702ES combination.

The CD-P552 IIES is a complete stand-alone player, basically similar to the 502II but with a higher performance as well as an additional digital data bus output via a single co-axial cable. When used in combination, the '552 II is merely a transport, since full high-quality signal demodulation is carried out by the DA-S702ES digital processor.

The '702 uses an oversampling technique with a 96th order digital filter as well as separate high speed digital to analogue converters.

In use, the '552 II is linked to the '702 via a single cable, with the '702 automatically registering the incoming sampling frequency (the '702 will also operate on the 32kHz and 48kHz standards). All the normal facilities on the '552 II remain operative, including the comprehensive remote control, the latter including power operated level, although this is only available via the lower quality variable level socket.

## LAB REPORT

The lab testing included both the '552 II proper and the '702. The former showed an amazingly

flat frequency response; almost ruler flat, it was +0.05dB -0.06dB, 20Hz to 20kHz. The '702 showed a mild treble lift of +0.24dB resulting from its need to operate over a range of sampling frequencies. Channel balance was excellent for both sections at typically better than 0.1dB. Channel separation was very good on the '552 II but the separate converters of the '702 allowed it to reach 108dB of separation even at 20kHz. Interchannel phase shift is now zero degrees for both models. Downband noise and distortion were very good at 20kHz, reaching -90dB for all outputs and similar for both machines. At lower modulation levels, the performances were quite similar, showing improvements over the previous machines. The '552 II gave a -90dB signal error averaging zero while the '702 was slightly worse at -2dB. These figures suggest 15.8 bit resolution for the '552 II and 15.6 bit for the '702.

Both outputs demonstrated very good figures for high frequency intermodulation, the '702 again slightly poorer than the '552 II. The latter's spectrogram showed a 89.2dB result at

the 10dB below peak modulation level. Excellent clarity was shown, with spurious components excellently rejected, both up and down band of the fundamental signals. Ultimate spurious rejection was consistently good at about -100dB.

While both units use two times oversampling, their phase response was not quite as linear as the Philips system, which is truly linear phase within the audible bandwidth. The Sony does however come very close to linear phase, as pulse responses testified. All the fixed outputs provided a nominal 2V, useful for comparative tests, though the '702 could provide up to 2.5V via its variable output, possibly helpful in studio applications. For the '702 the output impedance was low and constant at 10 ohms, while the '552 II offered 100 ohms on its fixed output, and via its useful variable output an impedance up to a high 1 kohms via its adjustable output. The latter is not really suited to direct power amp connection.

The transport was amazingly fast, reaching chosen tracks almost as one's finger left the button. Mechanical noise was very low. With their new range, Sony now comfortably meet the error correction targets and these units easily covered the worst test error. Signal-to-noise





ratios were very similar for both units. The transport proved very resistant to shock, a mark of the fine servo design.

### SOUND QUALITY

Listening tests were dominated by the '702, via its fixed output, although additional tests were made on the '552 II via its fixed and variable outputs as well. In rank order, the '552 II's variable came last, its fixed output came second, but the '702 was a handsome first. The separate decoder clearly provides a worthwhile improvement.

The '552 II showed a decent level of bass precision and extension, and it produced well focused stereo images with satisfactory depth. At times it could sound a touch larger than life, this coupled with rather close perspectives on some programme sections. It proved to be lively and open with a high resolution of detail as well as a generally civilised tonal balance.

The '702 improvement was striking. The tonal balance was slightly lean but remained natural sounding, with an impression of weight and power. Stereo images were sufficiently solid

to provide a near tactile quality, and depth planes were beautifully resolved. The bass was 'quick' and excellently articulate, mid transients were deceptively clear and the treble was both sweet and subtly detailed. The 702/552II ranks amongst the best CD players available.

### CONCLUSIONS

This luxury combination was excellently made and finished, offering every conceivable feature and facility. Error correction was superb, the track access almost spontaneous, while the transfer response was highly accurate and virtually linear phase. Reinforcing these qualities the sound quality was very good.

The CD-P552 IIES/DA-S702ES gains a solid recommendation — price is no constraint here, if the product really delivers the goods, as this one so obviously does.

### TEST RESULTS

	20Hz	1kHz	20kHz
Channel balance	0dB	0.01dB	0.07dB
Stereo separation	-121dB	-114dB	-108dB
Channel phase difference	0°	0°	0°
Total harmonic distortion, 0dB	-91.4dB	-89.3dB	-83.8dB
Total harmonic distortion, -10dB	-82dB	-	-
Total harmonic distortion, -60dB	-43dB	-	-
Total harmonic distortion, -80dB	-16.2dB	-	-
Intermodulation, 19kHz/20kHz, 0dB	-	-85.1dB	-
Intermodulation, 19kHz/20kHz, -10dB	-	-82.4dB	-
Frequency response, left channel	+0.1dB	-0.05dB	-
Frequency response, right channel	+0.09dB	-0.12dB	-
Signal-to-noise, 20Hz-20kHz unweighted	-	-101dB	-
Signal-to-noise, CCIR/ARM, 1kHz ref	-	-94dB	-
Output level, 0dB	-	2.5V (also variable)	-
Output impedance	100 ohms (variable up to 5.8 kohms)	-	-
De-emphasis	-	correct	-
Track access time	-	1.3 secs	-
Error correction capability	>900µm gap	>800µm dot	-
Mechanical noise	-	very low	-
Spuriae up to 100kHz	-	-100dB	-
Resolution at -90dB	-	-2dB	-
Headphone socket	-	yes (variable)	-
Dimensions (w×d×h)	-	43×44×11cm	-
Estimated typical purchase price	-	£2000	-

First reviewed: 1985, II revision 1987 Rating Recommended



# SONY CD-P502ES II

SONY HOUSE, SOUTH STREET, STAINES, MIDDLESEX TW18 4PF.  
TEL: STAINES 61688



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The '502 II is a large machine finished in satin black and has a headphone socket with volume adjustment available under remote control. Changes over the earlier '502 are minor, so only the auditioning ratings have been revised, lab performance referring to the original '502.

A full 0-20 numeric keyboard is incorporated plus decades to 99. The infra-red control is fully equipped and matches the front panel. Tracks can be accessed directly and programmed in random order for single play or the normal continuous mode. Repeat includes total and 'A-B' programme modes, while the start of tracks is automatically cued and index access is also provided. Fast audible music cueing is available, almost too fast with this deck, and an oddly randomised 'shuttle' play is possible.

The large fluorescent display gives full read-out of all selected tracks plus the usual track totals, timings, elapsed time and so on. Mechanical noise levels are low, and track access is particularly quick.

Internally, Sony use a 16 bit D/A convertor at a twice oversampled rate plus a 96th order digital noise shaping filter. Compromising somewhat on the full linear phase response, multipole analogue output filtering is employed here.

## LAB REPORT

At first the extremely flat frequency response was unbelievable — I thought the recorder pen had stuck! It measured +0, -0.1dB from 20Hz to 20kHz, and the channel balance was excellent. Channel separation was modest, held at around 90dB, while a mild interchannel phase shift developed with increasing frequency, reaching 45° at 20kHz.

Total harmonic distortion was 0.001% at

medium frequencies and this excellent result was maintained even to 20kHz. The error at 90dB modulation, with the overall linearity, indicated a resolution virtually at 16 bits.

The remarkable high frequency performance was also seen on the two tone intermodulation results, which were extraordinary. A -104dB difference tone was established at peak level, which held to -97dB at 10dB below peak. The matching system analysis confirmed the clean output with related spurious present at -76dB or better. Overall the rejection lay at -110dB.

Output level was on target at 2.03V, both fixed and variable, the latter a discrete potentiometer with a motorised control. Source impedance was 429ohms via the fixed output, and a rather weaker 330ohms to 60hms via 'variable'.

De-emphasis equalisation was correct, while the track access times were very rapid — difficult to measure, but estimated at 1.9 seconds. No problems were encountered with error correction, and the '502 easily met the full limits of the test disc.

Signal to noise ratios were fine; for example, -93dB for the non de-emphasis CCIR ARM (1kHz) weighted result, the most pessimistic figure of the set. On all important aspects, the results for the '502 matched or bettered the '701 it replaces.

## SOUND QUALITY

The '502 II offers an easy relaxed quality which made for extended, fatigue free listening. Nevertheless transients were reproduced with fair definition and reasonable depth was also present in the well focused stereo images. The bass was pretty firm, with good articulation, while the treble was rather clearer than average. The

midrange tonal quality was quite neutral, but with a hint of nasality nonetheless.

## CONCLUSION/UPDATE

The '502 II is an expensive player, with a wealth of features and functions plus excellent build quality. The sound achieved a very respectable standard but this is matched by several rather less expensive models. In consequence the value rating is not particularly high; but in view of the high overall standard attained, it would be churlish not to recommend it.

## TEST RESULTS

	20Hz	1kHz	20kHz
Channel balance	0.1dB	0.1dB	0.1dB
Stereo separation	-90dB	-90dB	-89dB
Channel phase difference	0°	1.5°	45°
Total harmonic distortion, 0dB	-103dB	-98dB	-99dB
Total harmonic distortion, -10dB	-	-87dB	-
Total harmonic distortion, -60dB	-	-48dB	-
Total harmonic distortion, -80dB	-	-24.5dB	-
Intermodulation, 19kHz/20kHz, 0dB	-	-104dB	-
Intermodulation, 19kHz/20kHz, -10dB	-	-97dB	-
Frequency response, left channel	+0dB	-0.1dB	-
Frequency response, right channel	+0dB	-0.1dB	-
Signal-to-noise, 20Hz-20kHz unweighted	-	-98dB	-
Signal-to-noise, CCIR/ARM, 1kHz ref	-	-93dB	-
Output level, 0dB, left/right	2.03V (also variable)	-	-
Output impedance	429ohms (variable 390ohm-1kohm)	-	-
De-emphasis	correct	-	-
Track access time	1.9secs	-	-
Error correction capability	>900µm gap, >800µm dot	-	-
Mechanical noise	low	-	-
Spurious up to 100kHz	-110dB	-	-
Resolution at -90dB	+0.5dB	-	-
Headphone socket	yes (variable output)	-	-
Dimensions (w×d×h)	43x33.5x8cm	-	-
Estimated typical purchase price	£700	-	-



# TECHNICS SL-P1200

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



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Technics have enjoyed considerable success in the market for professional and semi-professional record playing turntables — everywhere from broadcast stations to mobile discos — so when it came to designing a 'flagship' CD player, it is not surprising that they have done so with more than half an eye on this established stamping ground.

Despite the provision of remote control, the overall layout has been designed for hands on operation, more like a mini mixing desk than the more normal stackable component, and some of the features are outrageously different from any other machines around. Yet there has also clearly been a serious attempt to produce the highest sound quality as well, with a number of innovations designed to keep down error rates and improve tracking.

This machine makes most others feel flimsy and lightweight, paying great attention to excluding unwanted vibration. The top plate is a substantial die-casting, the base a heavy loaded rubber, and the whole unit is mounted on large insulating feet; the optical transport is separately decoupled within this outer shell. Technics 'class AA' hybrid IC amplifiers are used in both the output and the sample-and-hold circuitry.

The most obviously unusual feature is the 'search dial cueing', whereby a large knob electronically locked to the spinning disc can be spun, stopped and reversed, preserving audio output at whatever speed in the forward direction. This provides precise frame-by-frame cueing and also gets halfway towards creating DJ

'scratch' effects. Other useful semi-pro features include a most comprehensive display (to 0.1s timings), while the lightweight, advanced, single beam laser assembly gives remarkably fast access times under linear motor servo control. And this is in addition to all the usual functions carried by CD players, which in this instance are more numerous than most.

## LAB REPORT

The frequency response is ruler flat. Despite high scale magnification it was impossible to distinguish from the rule on the graph paper below 5kHz. Channel balance too is remarkably close, with zero phase error at high frequencies. Harmonic and intermodulation distortions are both under closer control, and 0dB white noise showed no evidence of clipping. Resolution at -90dB showed some room for improvement.

Error correction was very good, with the gap, dot and 'fingerprint' tests passed without trouble. General mechanical noise from the player is well suppressed, and immunity from shock or vibration was exceptionally good. Track access was a very rapid 2secs, and the output level met specification, with an additional variable output from the headphone socket.

## SOUND QUALITY

Though falling short of more audiophile-oriented players at a similar price, the '1200' still gave a decent account of itself. Nice and 'bouncy', the sound was rather 'up-front' and relentless. The treble attracted some criticism of 'glare' and 'grain', giving a rather 'hi-fi-ish' sort

of sound, lacking the depth and space available elsewhere and showing some loss of air and transparency.

## CONCLUSIONS

This Technics model provides a wealth of interesting and clever facilities that are quite unique, and therefore should have a particular appeal to the creative recordist and semi-pro user. Furthermore it is built like a brick water closet to an exceptional standard of finish. Though it did fall a little short of audiophile standards, it nevertheless still sounded pretty good, sufficient to merit serious consideration for those who value its particular range of features.

## TEST RESULTS

	20Hz:	1kHz:	20kHz:
Channel balance	0.01dB	0.01dB	0dB
Stereo separation	90.7dB	107.3dB	85dB
Channel phase difference	0°	0°	0°
Total harmonic distortion, 0dB	-90.9dB	-86.4dB	-85.7dB
Total harmonic distortion, -10dB		-85.9dB	
Total harmonic distortion, -60dB		-38.5dB	
Total harmonic distortion, -80dB		-18.7dB	
Intermodulation, 19kHz/20kHz, 0dB			-85.6dB
Intermodulation, 19kHz/20kHz, -10dB			-93dB
Frequency response, left channel	0	0	-0.01dB
Frequency response, right channel	-0.02	0	-0.02dB
Signal-to-noise, 20Hz-20kHz, unweighted			106dB
Signal-to-noise, CCIR/ARM, 1kHz: ref			100dB
Output level, 0dB, left/right			1.99V
Output impedance			190 ohms
De-emphasis	-0.33dB(1kHz), -4.4dB(5kHz), -9dB(16kHz)		
Track access time			2secs
Error correction capability	gap>900µm, dot>800µm	dot	
Mechanical noise			very low
Spurious up to 100kHz			-100.8dB
Resolution at -90dB		-84.2dB, R	-83.8dB
Headphone socket		variable,	120 ohms
Dimensions (w×d×h)			43×38×17cm
Estimated typical purchase price			£800

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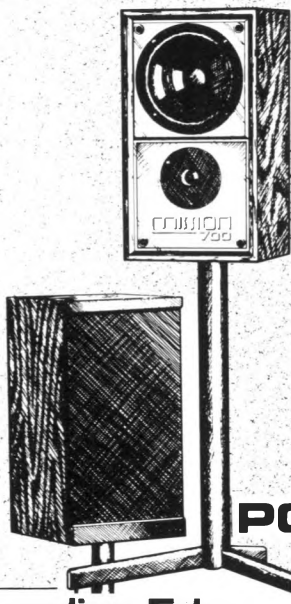
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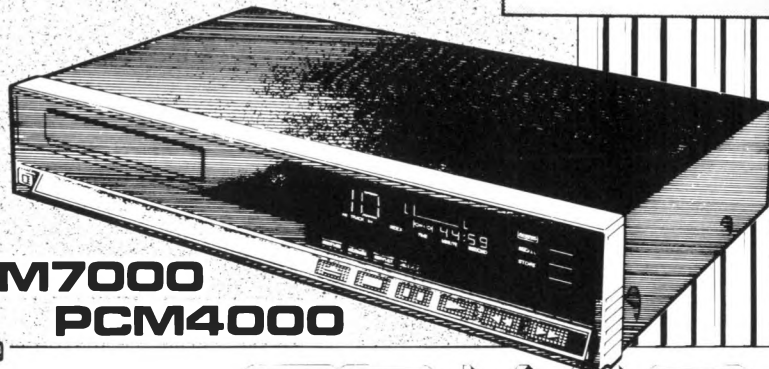
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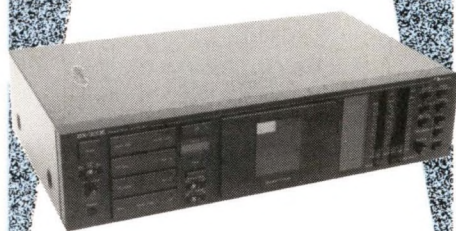
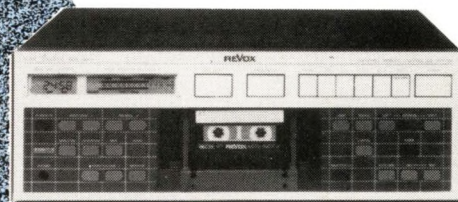
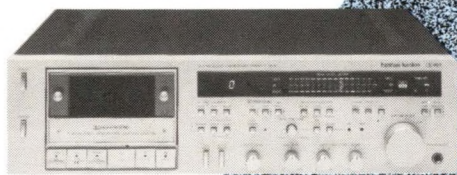
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# Cassette Decks



Two decades of discussion have still not finally resolved the question of whether the Compact Cassette is a 'genuine' hi-fi medium, but have not prevented this highly convenient format from sweeping all before it in terms of widespread compatibility and operational flexibility. From an enthusiast perspective one would not necessarily regard a cassette deck as a prime source — the pre-recorded material is frankly not good enough, taken overall — but the versatility and record capability makes a good quality deck an attractive addition to any hi-fi system. An obvious role is in preserving or time-stretching some of the unique classical music programming of Radio 3 — a service many overseas hi-fi listeners would give their eye-teeth to be able to receive.

High quality cassette decks are still largely the province of overseas consumer electronics manufacturers, and tend to be designed first and foremost to provide elaborate user facilities and excellent measured performance, rather than sound quality *per se*. That doesn't mean that they necessarily sound bad, but their complexity does tend to mitigate against achieving transparency comparable with, say, the finest pre-amps.

Accepting this mild clash of philosophy, modern decks do achieve a remarkable performance compared with their predecessors, and standards continue to improve, as do the tapes themselves. However, there does seem to be a slowing down in the rate of progress: it was both surprising and significant to note that not a single obvious new contender for inclusion in *The Collection* has been announced since we finished our Cassette Decks issue last Autumn.

Rumours continue of possible decks from UK specialists, but there is no product as yet, while the Japanese cassette deck manufacturers are presumably devoting most of their energies to getting ready for R-DAT. The Tokyo Show of October '86 showed how much effort had already gone in here.

The prospect of a Digital Audio Tape equivalent to Compact Disc is getting a lot of people highly excited at the moment, but their reaction is premature. Japan will see an up-market launch in Spring '87, but Europe will be at least a year behind. The prospect of combining two hours playing time with compact disc quality and access/programming capabilities is attractive to many, but it will take many years to build up anything like the universality of compact cassette — recording your music at home for replay in the car and suchlike.

The standard cassette looks safe for a good ten years yet, and there seems no reason why analogue and digital cassettes can't co-exist anyway — analogue will always remain more compact and versatile, and cheaper to boot. The current crop of machines offer great variety at different price points, and the best machines selected for inclusion here are the very *crème de la crème*.

The odd one out is Sony *ProWalkman*, which is fast building up a cult reputation within the high end trade. (Dealers with Sony agencies have suddenly become popular with their rivals!) Comparatively spartan facilities have their own attraction, along with the go-anywhere flexibility and real quality performance.

Denon continue the evolution of their dual-capsule machines, so this threesome remains a logical choice for those seeking superior performance without damaging the bank balance too severely. At the real top end of the market where Nakamichi are undoubtedly the dominant force, two of their best machines contrast with rivals from Harman Kardon, Pioneer and Revox.

## CASSETTE TAPES

Space prevents coverage of cassette tapes in this compendium edition, but close matching of tape and machine is one of the keys to getting good results. We therefore advise referral to *Hi-fi Choice No 47: Cassette Decks & Tapes* for the full lowdown. The best bet for high quality results would appear to be amongst the latest top 'chrome' types (Type II), where premium brands like TDK SAX and other manufacturer's equivalents can give exceptional performance. (The editor is currently much taken with Memorex CDXII.)



# DENON DR-M20/DR-M33HX/DR-M44HX

HAYDEN LABORATORIES LTD, HAYDEN HOUSE, CHILTERN HILL, CHALFONT ST. PETER, BUCKS.

TEL: (0753) 888447



**T**he DR-M20 replaces the DR-M22, which gathered a fine reputation for offering impressive quality at a reasonable price. Like its predecessor, the 'M20 has a dual capstan transport, and independent (siamesed) record and replay heads enable it to monitor a recording as it is made: this makes tape tuning much easier, since one can switch directly between source recorded and recording, directly comparing quality. The inclusion of adjustable bias is therefore all the more worthwhile, but unfortunately this facility does not operate on metal tape, so non-standard metals (of which there are an increasing number cannot be tuned in.

It was immediately noticeable that the DR-M20 is much quieter in operation than the 'M22 and its light-touch logic controlled transport accepts all unusual commands, like reverse direct from record and 'punch-in' record.

Making life much easier is an automatic tape type selector system with clear, illuminated legends on the fluorescent display panel. Clear indicators also monitor Dolby operation, record mode, tape/source monitoring, etc.

## LAB REPORT

Nearly every aspect of measured performance was impressive, just as with the DR-M22 before. However, one surprising blemish was capstan wow in the transport, hopefully confined to this early sample from Japan. This measured 0.1%, and was clearly visible as side spikes to the main test tone on the right hand side of the flutter analysis. Otherwise, negligible drift, wow and flutter are obvious properties of the twin-capstan transport design, fully validating its use.

Replay frequency response has been slowly improving in the Denon models, and here measured  $-1.5\text{dB}$  at  $10\text{kHz}$ , which is a great improvement on earlier machines. The treble roll-off above  $10\text{kHz}$  is, however, likely to be audible as a loss of 'sparkle' when playing pre-recorded tapes.

Hiss in the replay amplifiers was adequately, though not exceptionally low, and hum was not a problem. However the DR-M20 doesn't have sufficiently low noise to exploit TDK's fully new ultra-quiet SA-X chrome tape, returning  $-73.5\text{dB}$  noise with Dolby C, compared to values a few dB better from other machines. Despite not possessing Dolby HX PRO, the DR-M20's head gave astonishing overload figures, right up in the top class, with  $+6\text{dB}$  onto metal tape, a level virtually unmatched by other machines.

## SOUND QUALITY

As expected, recordings made on the 'M20 reached a superbly high standard, with a

naturalness and clarity not often encountered. However, there were some blemishes. Metal tape (TDK MA-X) was over-bright, albeit clean and inoffensive. Furthermore, piano notes were quite strongly modulated by capstan wow, giving them too much character and occasional 'shakiness'.

Negligible drift ensured a wonderfully 'tight' sound, quite as obvious with pre-recorded tapes as it was with recordings. A good dual-capstan mechanism like that in the M20 really makes its abilities known. Pre-recorded tapes did have slightly soft upper treble, but elsewhere clarity was fine and definition superb. Ample dynamic 'punch' ensured a lively, entertaining sound.

## CONCLUSION

The DR-M20 is one of the most obviously attractive tape decks on the market, providing a near perfect balance between price and performance, and offering a level of sound quality matched by few other decks. Capstan wow marred the purity of piano notes on our early review sample, but hopefully this problem will not affect models which reach the marketplace.

## DENON DR-M33HX

**N**ot surprisingly, the DR-M33HX sits in Denon's range between the DR-M20 and DR-M44HX, borrowing features from each. It uses the dual capstan drive of the '20, without the '44's direct drive motor. The independent but siamesed record and replay heads are employed here to good effect and the '33HX has Dolby HX Pro to enhance recording quality, as well as Dolby B and C noise reduction. The HX Pro circuit modulates bias according to signal conditions, in theory to increase treble overload headroom. However, manufacturers have a lot of leeway to determine

what they want from this system, and it appears that Denon have increased standing bias to improve midband headroom too, trading off some potential treble benefits in the process. Bias is also user-adjustable.

The cassette compartment is usefully backlit and tape type selection remains automatic; the latter facility, along with logic control, makes this deck very easy to use. Denon include their familiar bright blue fluorescent display panel, with its warnings and status legends, long record-level indicators, and a tape counter which reads elapsed time and has a zero-stop. Microphone inputs are not fitted.

## LAB REPORT

The 1985 Denon had more accurate replay frequency response, giving better sound quality with musicassettes as a result. The graph for the '33HX shows treble output level up to  $10\text{kHz}$ , after which a roll-off occurs. Hiss in the replay amplifiers was adequately low at  $-58\text{dB}$ , or  $-68\text{dB}$  with Dolby B, and there was negligible hum. Replay speed was correct and speed stability fine.

A small amount of wow (0.07%) affected recordings, analysis showing equal  $4\text{Hz}$  and  $6\text{Hz}$  components. A small flutter peak exists at  $40\text{Hz}$  too, but there was little energy in it, flutter-band energy measuring a good  $-29\text{dB}$ . The analysis spectra clearly showed the usual low-flutter benefits of twin capstan drive. At a low  $-43\text{dB}$ , modulation noise further confirmed the value of dual capstan drive on this series of decks.

The graphs clearly showed perfectly flat frequency response with IEC-type blank tapes, at centre-bias. Bias adjustment range was just sufficient to accommodate very awkward tapes like BASF LH-MI (ferric) and CR-MII (superchrome), both needing full bias for flat response.





tape was at an extremely low  $-45\text{dB}$ , due to freedom from high rate flutter and excellent tape-to-head contact.

The tape tuning system can now cope with BASF CR-MII — a super-chrome tape with very high treble output — and gave an almost-flat frequency response (though with an inevitable extreme-treble peak due to the nature of the tape). All other 'difficult' tapes were successfully tuned in, frequency response being adjusted to flatness from 30Hz to 20kHz within very fine 1dB limits. Record-gain was adjusted too, giving perfect Dolby tracking. Bias altered little.

Possibly due to claimed improved head alignment on the 'HX model, we found less to criticise in the replay-only frequency response than previously; it gets the response ruler flat to 8kHz, after which upper treble falls away to  $-6\text{dB}$  at 18kHz. Replay noise and hum, and transport speed were all beyond serious criticism.

Dolby tracking was excellent with all tape types. Midrange overload levels were very high, especially on chrome. For treble, they were good, if not exceptional (see the MOLs in the test results). Coupled with low hiss and hum, these characteristics give the '33HX an excellent dynamic range.

### SOUND QUALITY

Musicassette sound quality was extremely good, with a rigid grip kept on tempo. Piano had slight 'wateriness', but this was slight. Rock and classical musicassettes benefitted equally, displaying little of the rhythmic vagueness so common with cassette generally. Upper treble softness was noted and the sense of razor-sharp definition was lost from images and transients.

Maxell MX metal gave very smooth and clear recordings, again with near perfect pitch stability. BASF CR-MII super-chrome (bias set near maximum) retained inner and transient detail better than the metals, but had some bass emphasis and lost some of the solidity and sparkle of cymbals.

Hiss became a bit of a nuisance with ferrics (TDK AD and BASF LH-MI), so Dolby C was used here. Quality was outstanding for ferric tape, being clearer, easier and more stable to listen to than most decks with metal tape.

### SUMMARY

A high performance dual capstan deck, the '33HX has a few extras compared with the DR-M20, most notably Dolby HX Pro. User adjustable bias gave the deck broad tape matching, and recording performance measured well in all areas. This deck delivered excellent record/replay sound quality and, equally, it played musicassettes unusually well. Since the '33HX is also a delight to use, it rates very highly indeed.

### DENON DR-M44HX

Denon's very successful DR-M44 has now been updated by the inclusion of Dolby HX Pro, and a number of other improvements, to become the DR-M44HX. Linear crystal, oxygen-free copper cable now joins the independent (siamesed) record and playback heads to the amplifiers and there is an improved head block and positioning assembly. The counter now shows elapsed minutes and seconds, while both the range and resolution of the auto-tune circuits have been improved.

Otherwise, the DR-M44HX remains the same easy to use, gadget free, high-specification machine as before. It has automatic tape-type selection and high speed tape tuning to optimise performance for any blank tape.

A large fluorescent display panel houses the record level meters, the illuminated tape counter, and a variety of warning legends. Dolby B and C are included, plus a switchable MPX filter to allow response to reach 20kHz with Dolby operating, if desired. Microphone inputs are absent, as is now common with expensive decks; their manufacturers expect specialised mikes to be used, which usually have their own dedicated pre-amps.

### LAB REPORT

Denon's dual capstan drive, fitted with a direct drive motor on the '44HX, isn't of Nakamichi calibre, but is clearly superior to single capstan types. Low rate flutter (0.08%), in the range 10Hz to 24Hz, and a trace of capstan wow (0.04% at 6Hz) did exist, but these effects were at a lowish level. However, spectrum analysis clearly showed that the '44HX had more low rate flutter than the non-direct drive '33HX. Modulation noise with BASF CR-EII chrome

### SOUND QUALITY

Maxell MX gave a wonderfully smooth, silky sound, free of the edginess so common to metals. Some loss of clarity and insight were noticed against digital originals. Piano was not as solid as hoped; there was some pitch diffuseness. Sony ES gave a clearer, more up-front sound but with some slight top-end 'sizzle'. Both metals gave impressive results, all the same.

BASF CR-MII reached 'metal standards' easily, except on crescendos, where slight 'muddying' of the sound occurred. Otherwise, it combines the smoothness and confidence of MX with the clarity of Sony ES. BASF LH-MI exhibited excellent clarity for a ferric tape, suffering mainly hiss — or treble splash at high levels if level was increased to minimise the hiss. Maxell XL-IS gave very similar results.

On musicassette, a piano (Ashkenazy, Decca digital) didn't have quite the solidity and impact expected. Pitch 'diffusion' was again noted and felt to be the cause. Transients were softened out and imaging could have been better. Quite a lot of inner detail was lost too. The '44HX is now very good with musicassettes — much better than the earlier '44.

### CONCLUSION

The DR-M44HX has a broad range of features assisting good sound quality from cassette. Sensible design and layout make it easy to use as well. Automatic tape type selection and tuning ensures perfect tape compatibility with all types. Dual capstan drive successfully keeps wow, flutter and modulation noise down to low levels. Recording quality was excellent, musicassette sound quality reached a very high overall standard too, though there is still room for improvement here.

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## TEST RESULTS

### DR-M20

#### Replay of pre-recorded musicassettes

Frequency response \_\_\_\_\_ 30Hz-11.0kHz good  
 Speed accuracy \_\_\_\_\_ +0.5% good  
 Noise \_\_\_\_\_ -58dB average

#### Record/replay using blank tape

Frequency response, ferric \_\_\_\_\_ 20Hz-18.0kHz very good  
 Frequency response, chrome \_\_\_\_\_ 20Hz-20.0kHz very good  
 Frequency response, metal \_\_\_\_\_ 20Hz-19.0kHz very good  
 Stereo separation \_\_\_\_\_ -51dB good  
 Distortion \_\_\_\_\_ 0.7% good  
 Noise \_\_\_\_\_ -53dB good  
 Speed variation \_\_\_\_\_ 0.10% very good  
 Modulation noise \_\_\_\_\_ -42dB good  
 Flutter energy (band level) \_\_\_\_\_ -34dB very good  
 MOL, ferric, 315Hz/10kHz \_\_\_\_\_ +4.0dB/-8.0dB good  
 MOL, chrome, 315Hz/10kHz \_\_\_\_\_ +2.8dB/-8.5dB average  
 MOL, metal, 315Hz/10kHz \_\_\_\_\_ +6.0dB/+0.5dB average

#### Input/output performance

Line in (sensitivity/overload) \_\_\_\_\_ 100mV/>3V  
 Mic input (sensitivity/overload) \_\_\_\_\_ None  
 Output \_\_\_\_\_ 750mV  
 Typical price inc VAT \_\_\_\_\_ £260

First reviewed 1986. Rating: Best Buy.

### DR-M33HX

#### Replay of pre-recorded musicassettes

Frequency response \_\_\_\_\_ 20Hz-11.0kHz good  
 Speed accuracy \_\_\_\_\_ +0.1% very good  
 Noise \_\_\_\_\_ -58dB average

#### Record/replay using blank tape

Frequency response, ferric \_\_\_\_\_ 22Hz-18.0kHz very good  
 Frequency response, chrome \_\_\_\_\_ 22Hz-18.0kHz very good  
 Frequency response, metal \_\_\_\_\_ 22Hz-19.0kHz very good  
 Stereo separation \_\_\_\_\_ -50dB good  
 Distortion \_\_\_\_\_ 0.5% very good  
 Noise \_\_\_\_\_ -53dB good  
 Speed variations \_\_\_\_\_ 0.07% good  
 Modulation noise \_\_\_\_\_ -43dB very good  
 Flutter energy (band level) \_\_\_\_\_ -29dB good  
 MOL, ferric, 315Hz/10kHz \_\_\_\_\_ +4.7dB/-3.5dB very good  
 MOL, chrome, 315Hz/10kHz \_\_\_\_\_ +3.0dB/-6.0dB very good  
 MOL, metal, 315Hz/10kHz \_\_\_\_\_ +6.0dB/+0.5dB average

#### Input/output performance

Line in (sensitivity/overload) \_\_\_\_\_ 80mV/>3V  
 Mic input (sensitivity/overload) \_\_\_\_\_ -mV/-mV  
 Output level \_\_\_\_\_ 700mV  
 Typical price inc VAT \_\_\_\_\_ £330

First reviewed 1985. Rating: Recommended.

### DRM44HX

#### Replay of pre-recorded musicassettes

Frequency response \_\_\_\_\_ 20Hz-11.0kHz good  
 Speed accuracy \_\_\_\_\_ +0.2% very good  
 Noise \_\_\_\_\_ -59dB average

#### Record/replay using blank tape

Frequency response, ferric \_\_\_\_\_ 20Hz-20.0kHz very good  
 Frequency response, chrome \_\_\_\_\_ 20Hz-18.0kHz very good  
 Frequency response, metal \_\_\_\_\_ 20Hz-20.0kHz very good  
 Stereo separation \_\_\_\_\_ -51dB good  
 Distortion \_\_\_\_\_ 0.7% good  
 Noise \_\_\_\_\_ -53dB good  
 Speed variation \_\_\_\_\_ 0.04% very good  
 Modulation noise \_\_\_\_\_ -45dB very good  
 Flutter energy (band level) \_\_\_\_\_ -31dB very good  
 MOL, ferric, 315Hz/10kHz \_\_\_\_\_ +4.5dB/-4.5dB very good  
 MOL, chrome, 315Hz/10kHz \_\_\_\_\_ +2.5dB/-7.0dB good  
 MOL, metal, 315Hz/10kHz \_\_\_\_\_ +6.0dB/+0.5dB good

#### Input/output performance

Line in (sensitivity/overload) \_\_\_\_\_ 80mV/>3V  
 Mic input (sensitivity/overload) \_\_\_\_\_ None  
 Output \_\_\_\_\_ 700mV  
 Typical price inc VAT \_\_\_\_\_ £400

First reviewed 1985. Rating: Recommended.

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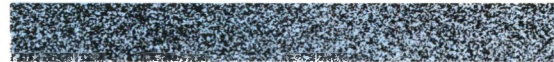
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# HARMAN-KARDON CD491

HARMAN (AUDIO) UK LTD, MILL STREET, SLOUGH, BERKS SL2 5DD.

TEL: (0753) 76911



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**H**arman-Kardon's '491 is a large, sophisticated and button-covered deck. The transport uses dual capstan drive for improved speed stability and independent (siamesed) record and replay heads provide off-tape monitoring when recording. Manual bias adjustment provides tape tuning, but tape type selection was not automatic.

The record level meters set 0VU close to Dolby level and two wide-range LED displays cover -30dB to +10dB with good resolution. The meters also have selectable peak hold and treble equalisation emphasis options.

## LAB REPORT

Well set bias (detent position) and the presence of HX Pro ensured respectable recording tape overload figures at low/middle and high frequencies respectively. Metal tape in particular took a lot of level, at +6dB above 0VU. This performance allows the CD491 to minimise the muddling and dullness that occurs with high recording levels, especially with ferric tape.

Record equalisation wasn't quite right for IEC tapes, necessitating a bias increase to suppress rising treble. This affected treble overload (saturation) little and successfully 'flattened' most tapes — but not awkward super-tapes like Maxell XL-IS and BASF CR-MII, which still have excessive treble and are not really compatible.

Replay frequency response was flat to 10kHz and then shelved downward slightly at higher frequencies. Obviously, the latest (1981) replay

characteristic has been used, resulting in even tonal balance and healthy treble from musicassettes. Some Dolby B replay tracking error will dull low level music.

The replay amplifier had acceptably low hiss, but hum (and its harmonics) hovered around -60dB, which is not especially low. It was just audible at high gain with low level recordings. Speed accuracy was fine and speed stability excellent, on replay only and in record-replay. Flutter was well suppressed by the dual capstan transport, analysis revealing a trace of capstan wow at 6.5Hz.

## SOUND QUALITY

Choice of tapes for the CD491 is more critical than usual, because of its record-equalisation peculiarities. Sony ES metal gave fine results without bias tuning. TDK SA and Maxell XL-IIS both proved compatible in the 'chrome' position, suffering very little treble 'softening' compared to metal. Fine detail was well preserved. A non-Dolby recording on BASF CR-EII (chrome) tape proved quiet to the point where only slight and very even background hiss was audible and not annoying. Fine transient definition was obtained on tests carried out with noise reduction circuits switched out.

Ferric tapes generally sounded brighter and less fluffy in treble quality than usual. They performed relatively well in subjective terms and we felt the CD491 made unusually good use of them.

## SUMMARY

Quality of musicassette reproduction and recordings reached a very high standard, but some super-tapes are not compatible and most European IEC-aligned tapes need bias tuning. Otherwise, thanks to its broad range of facilities, this deck balances flexibility in use with an impressive level of performance. Now also available in black, it is certainly recommended.

## TEST RESULTS

Replay of pre-recorded musicassettes		
Frequency response	30Hz-20.0kHz	very good
Speed accuracy	+0.5%	good
Noise	-58dB	average
Record/replay using blank tape		
Frequency response, ferric	20Hz-20.0kHz	very good
Frequency response, chrome	20Hz-16.0kHz	very good
Frequency response, metal	20Hz-20.0kHz	very good
Stereo separation	-53dB	good
Distortion	1.0%	good
Noise	-53dB	good
Speed variation	0.04%	very good
Modulation noise	-41dB	good
Flutter energy (band level)	-32dB	very good
MOL, ferric, 315Hz/10kHz	+3.0dB/-1.0dB	good
MOL, chrome, 315Hz/10kHz	+1.0dB/-5.0dB	good
MOL, metal, 315Hz/10kHz	+6.0dB/+1.5dB	good
Input/output performance		
Line in (sensitivity/overload)	40mV/>3V	
Mic input (sensitivity/overload)	1.3mV/64mV	
Output	450mV	
Typical price inc VAT	£695	

First reviewed 1985. Rating: Recommended.



# NAKAMICHI CR-7

NAKAMICHI B&W (UK) LTD, MARLBOROUGH ROAD, CHURCHILL INDUSTRIAL ESTATE, LANCING,  
WEST SUSSEX. TEL: (0903) 750750



**C** As one of the world's most renowned manufacturers of high performance cassette decks, Nakamichi can rely on a flurry of excitement when they introduce a new top model. They have to their credit some innovations of astonishing complexity, so one never quite knows what mysteries are about to be revealed by the launch of a new product.

**A** The CR-7, it transpires, is evolutionary rather than revolutionary. Most importantly, it retains the *Dragon's* motor-driven replay head that tilts left or right in order to align itself to any recording. However, it discards the *Dragon's* automatic sensing system, relying on the listener's ears instead. In other words, azimuth is user-adjustable. This might seem inferior to the *Dragon*, but in practice I find it preferable, even though the CR-7 is not a *Dragon* replacement or update.

**S** The mechanism takes electrical commands from a front panel adjustment control knob or from 'left' and 'right' buttons on a remote control unit. Yes, this is a remote control cassette deck too. As the head approaches correct alignment there is an audible increase in treble content. This adds clarity and makes percussion, such as cymbals and triangles, sound bright, natural and well defined. Further fine adjustment then focuses stereo images and positions the stereo sound stage. The final result with a good recording is a sense of focus in stereo imaging that is rarely heard from pre-recorded cassettes, plus significantly enhanced treble quality.

**S** Recordings made on the CR-7 do not require azimuth adjustment. In fact when the deck is put into record mode, the replay head receives an internal command to return to its central position. If it didn't do this, sound quality monitored from the independent replay head would be deceptively dull, even though the recordings were perfect. This azimuth adjustment system applies only to recordings made on other decks, and in particular to commercially pre-recorded tapes (musicassettes).

**E** Tape duplicating plants and engineers will love the CR-7 for its ability to show azimuth errors so graphically. And it is this ability to display error and allow aural assessment of misalignment that makes the CR-7's manual adjustment system preferable, in my opinion, to the *Dragon's* completely automatic system.

**E** For the first time a Nakamichi incorporates automatic tape tuning. The simple, fast, high resolution technique trims frequency response to within 0.3dB limits (at 15kHz ref. 400Hz) by altering bias, and then sets sensitivity. This is not an ideal way of going about things, but what it concedes in performance is more than made up for by the inherent quality of the deck's high

performance independent record and replay heads (almost all other manufacturers use siamesed twin-heads, which have drawbacks).

**T** Under test, Nakamichi's tuning system consistently achieved the quoted 15kHz value of 0.3dB and had enough range to cope with awkward tapes like BASF CR-MII. However, due to the high test frequency of 15kHz used, a few tapes with peaky treble, like BASF CR-MII and Sony ES, don't tune flat and sound a bit warm and bass heavy. Otherwise, the system provides an almost ruler flat frequency response from 20Hz right up to 20kHz.

**T** Like all expensive Nakamichi decks, the CR-7 has a dual capstan transport mechanism. The main capstan is directly driven from a smooth-running motor which, Nakamichi claim, exhibits no cogging action or vibration. Tests of speed stability, using spectrum analysis, confirm this. The second capstan is belt driven off the main capstan and runs 0.2% slower, to provide constant back-tension. This largely eliminates jerking and uneven running, reducing flutter (high rate speed instability) in particular.

**E** Two capstans can end up producing twice as much wow (low rate speed instability), unless the system is dimensioned so that drive line resonances don't correspond in frequency. This Nakamichi do, calling it a 'diffused resonance' transport. Again, high resolution spectrum analysis confirms that what little wow remains is distributed and not discrete. The overall wow and flutter figure I obtained was a quasi-peak reading of 0.04%, which is very low. Nakamichi claim 0.027%, which proved accurate when a long term average wow was computed from spectrum analysis.

**A** At last, Nakamichi have adopted automatic tape type selection on one of their decks, together with manual over-ride for those who have their own ideas about what equalisation to use. The tape counter, part of the bright yellow fluorescent display panel, provides either a four-digit count or playing time remaining and playing time elapsed.

## SOUND QUALITY

Perversely, perhaps, I got most excited about the CR-7's sound quality with musicassettes. New internal electronic circuitry, I suspect, gives a better balanced sound than the *Dragon*. There was stronger low frequency content, a better feeling of tonal neutrality, and less 'thinness' in the treble. All the *Dragon's* qualities of excellent imaging and a high degree of insight are retained though.

With Maxell MX recordings were so like the original that for all intents and purposes they were identical. Tests showed that the CR-7 gets massive levels on to metal tape before overload occurs. Using BASF CR-MII, there was some slight bass emphasis and warmth due to the tuning error, but otherwise an extremely clear, smooth sound with a trace of treble 'softening' at high levels. TDK SA and Maxell UD-II both sounded very balanced, but with an almost subliminal sense of unease at high frequencies due to their relatively unsteady output compared with BASF chromes and Maxell MX.

As is often the case with very good decks, the CR-7 made ordinary, good ferric tapes like TDK AD sound as good as metals can on a lesser machine. The independent record and replay heads have much to do with this, since they raise the overload ceilings of ferric tape substantially.

## SUMMARY

Making the CR-7 easy to operate and providing remote control has made Nakamichi know-how more palatable to the man in the street, providing he has a very deep pocket and an equally deep love of cassettes. This deck is far less of a high-technology wrestling match than a *Dragon* or ZX-9, but it improves on their sound quality and still has the sort of innovatory ideas that make a Nakamichi cassette deck a product with a legend in front of it.

## TEST RESULTS

<b>Replay of pre-recorded musicassettes</b>	
Frequency response	25Hz-18.0kHz
Speed accuracy	+0.7%
Noise	-63dB
<b>Record/replay using blank tape</b>	
Frequency response, ferric	20Hz-20.0kHz
Frequency response, chrome	20Hz-20.0kHz
Frequency response, metal	20Hz-20.0kHz
Stereo separation	-53dB
Distortion	-0.25%
Noise	-54dB
Speed variation	0.04%
Modulation noise	-45dB
Flutter energy (band level)	-33dB
MOL, ferric, 315Hz/10kHz	+4.8dB/-4.5dB
MOL, chrome, 315Hz/10kHz	+2.0dB/-6.5dB
MOL, metal, 315Hz/10kHz	+6.8dB/-1.0dB
<b>Input/output performance</b>	
Line in (sensitivity/overload)	43mV/>3V
Mic input (sensitivity/overload)	None
Output	variable, 1000mV max.
Typical price inc VAT	£1,350

First reviewed The Collection 1986. Rating: Recommended.

CR-7E Discrete Head Cassette Deck

26:09

Power

Auto Calibration/Playback Azimuth Fine Tuning  
Discrete 3 Head - Direct Drive - Double Capstan - Microprocessor Control

Counter Reset	Memory Stop	Auto Repeat	Counter Pause
Play	Stop	Play	Play
Fast	Stop	Play	Play
Reverse	Stop	Play	Play

ER11

Manual Tape/EQ Selector

EQ

Type Length

0-48  
0-60  
0-90

Playback Azimuth

Auto Calibration

Monitor

Auto Pause

Subsonic Filter

MPX Filter

C  
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S



# NAKAMICHI BX-300E

NAKAMICHI B&W (UK) LTD, MARLBOROUGH ROAD, CHURCHILL INDUSTRIAL ESTATE, LANCING,  
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Listening tests and lab tests consistently show that speed stability is a major problem on cassette decks, responsible for distortion, pitch slurring, diffuseness and many other obscure subjective phenomena. Closed-loop, dual capstan decks eliminate virtually all these degradations in one go and also isolate cassette tape from cassette mechanics, which can themselves produce severe flutter. Nakamichi use this drive system on all their more expensive decks, starting with the BX-300E.

Three heads have also been fitted, to allow off-tape monitoring, and user-adjustable bias for tape tuning. Nakamichi fit a single control for all tape types, so settings will have to be memorised when changing between types.

## LAB REPORT

As expected speed stability was unusually good. Flutter measured 0.07%, wow 0.04% and there was virtually no drift. Flutter sideband analysis showed there were none! Some wow was measurable, but it was minor. The deck gave an amazing performance in this area.

Bias adjustment finely trimmed metal frequency response by a few dB at 20kHz, but this is all that is needed, because metal cassette tapes are much alike.

Chrome adjustment range was much larger, chrome and ferric tapes being more sensitive to bias change than metal. It was just sufficient, at maximum, to give perfect results with BASF

Chrom IIS (superchrome) and therefore TDK SA-X as well. The deck can therefore be matched to the best 'chrome' tapes available.

As usual with current Nakamichi decks, replay frequency response had a -1dB or so dip at 2kHz, but treble rose steadily above this frequency to +2.2dB at 18kHz. However, by normal standards replay response was very flat and extended — something that is plainly audible we find. Replay speed accuracy was perfect at the pitch control's central setting, and adjustment range was a large 7%.

## SOUND QUALITY

Metal tape (TDK MA) gave very neutral tonal balance, tinged by a slight extreme-treble lift. Increasing bias brought this under control and sound quality was considered excellent. There was solid imaging, good, clean treble and delightful clarity. Reducing bias resulted in treble splash and was nasty. Some low rate speed instability was still just detectable, but we were being extremely critical here and expecting Compact Disc stability from our recordings — something the BX-300E nearly achieved.

Chrome tape (TDK SA) needed some bias increase to keep treble under control, but it was then difficult to be certain which was source and which was tape at times. These were astonishing results.

With ferric tape we found that there was a compromise to be made between best treble control (increased bias) and best treble level (de-

creased bias), using TDK AD. In the end, some 'softness' was accepted in return for good control. Other tapes would alter these observations though.

The BX-300 replay quality with pre-recorded cassettes achieved much of the image stability and cleanliness that encourages close listening.

## SUMMARY

The BX-300E was a pleasure to listen to, both with recordings made on the machine and with pre-recorded musicassettes, and remains one of the few really excellent machines we have tested.

## TEST RESULTS

### Replay of pre-recorded musicassettes

Frequency response \_\_\_\_\_ 50Hz-17.0kHz good  
Speed accuracy \_\_\_\_\_ +0.1% very good  
Noise \_\_\_\_\_ -61dB good

### Record/replay using blank tape

Frequency response, ferric \_\_\_\_\_ 20Hz-20.0kHz very good  
Frequency response, chrome \_\_\_\_\_ 20Hz-20.0kHz very good  
Frequency response, metal \_\_\_\_\_ 20Hz-20.0kHz very good  
Stereo separation \_\_\_\_\_ -53dB good  
Distortion \_\_\_\_\_ -0.5% good  
Noise \_\_\_\_\_ -66dB average  
Speed variation \_\_\_\_\_ 0.04% very good  
Modulation noise \_\_\_\_\_ -41dB good  
Flutter energy (band level) \_\_\_\_\_ -36dB very good  
MOL, ferric, 315Hz/10kHz \_\_\_\_\_ +4.9dB/-7.0dB good  
MOL, chrome, 315Hz/10kHz \_\_\_\_\_ +3.0dB/-8.2dB good  
MOL, metal, 315Hz/10kHz \_\_\_\_\_ +6.6dB/-2.8dB poor

### Input/output performance

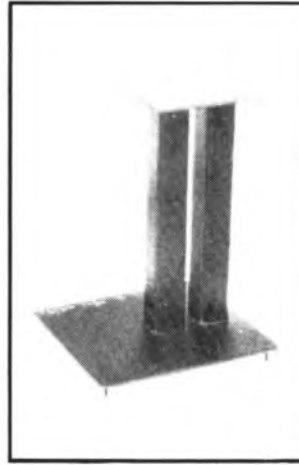
Line in (sensitivity/overload) \_\_\_\_\_ 65mV/>-V  
Mic input (sensitivity/overload) \_\_\_\_\_ None  
Output \_\_\_\_\_ 930mV  
Typical price inc VAT \_\_\_\_\_ £595

First reviewed 1984. Rating: Recommended.





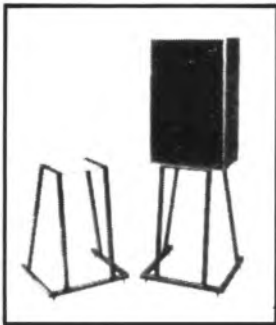
**AT1 Table**



**Challenger 2**



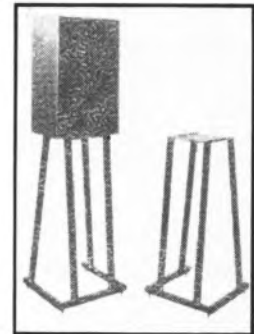
**4 Shelf Table**



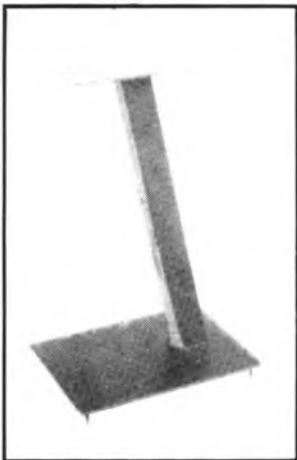
**APPOLO 8**



**AT3 Floor Turntable Table**



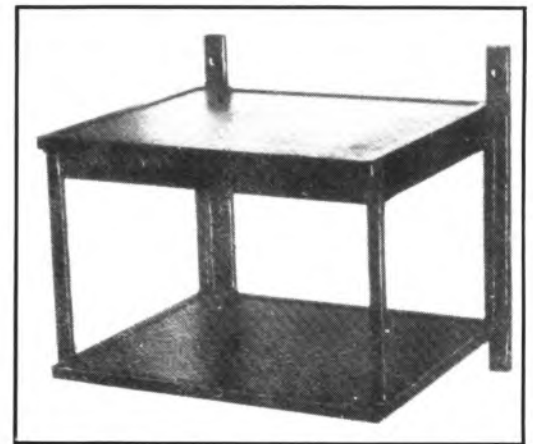
**APPOLO 9**



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# PIONEER CT-A9X

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**N**ow in fashionable black finish and given an 'X' suffix, this deck was originally tested as the CT-A9. Pioneer have largely resisted the temptation to load the deck with gadgets, instead going for performance features, such as closed-loop dual-capstan drive. To this end the deck has three heads for off-tape monitoring whilst recording, a tape tuning system with standard, under- and over-bias conditions available, and the system also adjusts sensitivity and record equalisation.

Tape type selection is automatic, which prevents selection error. The record level displays are very bright green and read peaks accurately, but OVU has been set 2dB below Dolby flux, which is a bit low. In their handbook, though, Pioneer do say that peaks can run up to Dolby level.

The cassette window is back lit and the tape counter also shows time remaining. Logic control allowed 'punch-in' recording and immediate fast rewind out of record mode. A 'tape return' button would stop play or recording and start rewind back to zero on the counter. This was simple and useful.

## LAB REPORT

Factory-set bias, obtained by not using the auto tape tuning facility, gave very high treble saturation levels, but slightly reduced mid-band overload. Consistency of performance between tape types suggested Pioneer have adjusted this deck carefully and deliberately to obtain better treble performance, at the expense of mid-band headroom — a sensible approach. Standard auto-bias ('peak') set bias even lower, giving ferric tape almost metal performance in treble saturation headroom. All mid-band overload levels (MOLs) were above OVU, +3dB to +7dB with ferric, chrome and metal, so adequate headroom is maintained if advised maximum record levels are used.

Record/replay frequency responses proved flat with all tape types. Especially notable was lack of rising treble with metal tape; this avoids nasties like 'spitching' and hardness. Pioneer's tape tuning system was more accurate than many in this respect, but Dolby action increased treble loss at low levels.

We had to be impressed by the transport. There were virtually no flutter side-bands, resulting in an extremely low equivalent band level value of -38dB flutter distortion. This is 1.2%, compared with around 10% from most decks and up to 30% from the worst. Equally, modulation noise was an exceptionally low -43dB, compared with a typical -38dB. Wow was virtually eliminated too. Spectrum analysis of the demodulated wow signal showed only 6Hz and 12Hz components and these were at an extremely low level. Wow measured 0.02%, flutter 0.06% and drift 0.03% — amazing results! Note that this deck is more speed stable than any turntable can ever hope to be and almost as stable as a CD player!

Replay frequency response was almost ruler flat from 30Hz up to 18kHz, divergence being 0.5dB or less; the test tape isn't guaranteed more accurate than this. Replay speed was correct, but head height a bit out of adjustment. There was 1dB-2dB more Dolby B treble loss at low levels than expected.

## SOUND QUALITY

TDK MA tape ('peak' auto-bias) gave an exceptionally smooth, stable sound — even on difficult orchestral peaks. It was totally relaxing, but some detail and insight was missing from violin, in comparison with the CD original. The natural sibilance in vocals and speech was slightly muted too. Piano reproduced with astonishing freedom and naturalness, apparently unrelated to background tape hiss, due in no small part to lack of modulation noise. Pitch stability was perfect, although some 'wiri-

ness' was just discernible with organ.

Chrome tape (TDK SA) gave similar results, but was a bit blander, woollier and soft. Fine treble detail was confused or lost, partly from falling treble due to Dolby action. BASF SuperChrom IIS, under-biased, gave results as good as metal.

Ferric tape (TDK AD) gave astonishing results. Less soft and woolly than chrome (TDK SA), the ferric tape's treble detail was maintained as if saturation was not occurring at all. Hiss was not a problem.

Musicassette replay quality was extremely good, but fell well short of the musical insight and image solidity of our reference Nakamichi ZX-9, which was a surprise. Tonal balance was correct, but there was a vagueness to the sound that made it uninvolving.

## SUMMARY

The CT-A9X may not look beautiful, but it was easy to use and produces startling recordings with ferric and metal tape in particular. Fidelity with pre-recorded cassettes was excellent, even though not reaching the highest standards.

## TEST RESULTS

Replay of pre-recorded musicassettes		
Frequency response	25Hz-20.0kHz	very good
Speed accuracy		+0.3% very good
Record/replay using blank tape		
Frequency response, ferric	30Hz-20.0kHz	very good
Frequency response, chrome	25Hz-16.0kHz	very good
Frequency response, metal	25Hz-20.0kHz	very good
Stereo separation		-52dB average
Distortion		1.4% average
Tape hiss, ferric		-66dB average
Tape hiss, chrome		-68dB average
Tape hiss, metal		-67dB average
Speed variation (wow and flutters)		0.02% very good
Modulation noise		-43dB very good
Flutter energy (band level)		-38dB average
MOL, ferric, 315Hz/10kHz	+1.2dB/-4.4dB	poor
MOL, chrome, 315Hz/10kHz	+0.2dB/-6.4dB	average
MOL, metal, 315Hz/10kHz	+1.8dB/-0.6dB	poor
Input/output performance		
Line in (sensitivity/overload)		50mV/>-V
Mic input (sensitivity/overload)		None
Output		580mV
Typical price inc VAT		£700

First reviewed: CTA9 - 1984. CTA9X - 1985. Rating: Recommended.



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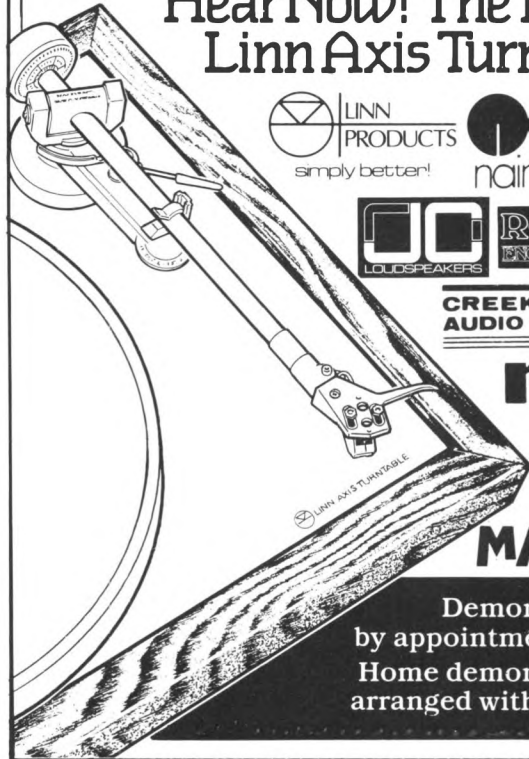
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# REVOX B215

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## LAB REPORT

Like its predecessor the *B710 MkII*, this machine has been designed as much for studio as for home use. It is a no-compromise machine at a no-compromise price, solidly built and incorporating some uniquely useful features. The automatic tape tuning properly adjusts bias, record equalisation and record-gain, holding the values in non-volatile memories for instant recall when changing between tapes. Tests showed that all tapes are tolerated, including awkward ones like BASF *CR-II* (super-chrome). Automatic tape sensing is used too, but with manual override so, for example, chrome tape can be recorded with 120µS equalisation.

A sophisticated tape 'counter' in fact measures reel speeds and computes elapsed time, allowing time points to be found with reasonable accuracy on any cassette, without the need to reel back to the start. Allied to this system is the ability to memorise two time location positions (called LOC1 and LOC2) which can be returned to, or the machine can be asked to find a specified time point.

Full logic control of the transport is provided, allowing 'punch-in' record. Revox use their own twin capstan mechanism which has no fewer than four motors — there are independent speed-controlled direct-drive motors for each capstan and separate motors for each reel. Siamesed independent record and playback heads give off-tape monitoring. Dolby HX Pro improves on the limited treble overload (saturation) performance of the *B710 MkII* which we noted in 1984. Dolby B and C are provided.

Infra-red remote control is available, and there is a serial link for wire-transmitted commands. No mike sockets are provided though, dedicated external units being necessary. After careful manual-reading and some acclimatisation, the *B215* proved easy to use, but its operating sequences are not necessarily self-evident, because of strong internal logic. It was a case of 'easy — once you know how'. The transport mechanism, which is an engineering masterpiece, moves with the speed and quiet precision of the best.

Revox take the same view of IEC replay response as Nakamichi, ignoring the tape as a standard and using a theoretical curve instead. This results in rising treble above 14kHz. Subjectively, the effect is slight but beneficial, as pre-recorded musicassettes acquire good transient definition and sharp imaging — all other things being equal.

Speed accuracy proved adequate at 0.5% fast, and replay speed stability was extremely good at 0.03% wow and flutter (DIN weighted). At -58dB the replay amps had a bit more hiss than some, but tape hiss will exceed this figure so it is acceptable. There was some hum, measuring -64dB at 100Hz and -66dB at 150Hz, and this could be heard under critical conditions. Dolby B replay tracking was excellent.

The LCD record level meters have 0VU at Dolby level. Recordings to this level were unaffected by hiss from either the record or replay amps, Dolby C giving -19dB of noise reduction, reducing hiss to -72dB with BASF chrome, for example. Hum performance was mediocre, being identical to the replay-only results. Record overload levels (MOL and saturation) are now very good. The computer tuning system gave a high degree of repeatability in its settings and we couldn't fault it. As a consequence, tapes always gave the same performance, even after repeated running; some systems are erratic. Dolby tracking was near-perfect and frequency response with all tapes ruler-flat. This was a fine and consistently repeated performance. Spectral analysis showed negligible flutter with BASF's latest chrome tapes, but slight capstan wow at 5Hz and 10Hz.

## SOUND QUALITY

Much like the previous *B710 MkII*, the *B215* provides recordings of fine clarity on metal tape. There was again the sense of listening only to electronic circuits, but with a bit of hiss added, noticeable only at high volume. Stereo imaging was needle sharp and perfectly steady too. We noticed very slight wow on critical organ music, which was a pity.

BASF super-chrome tape (BASF *CR-II*) again

gave a perfectly even, steady sound, but with some slight softening and diffusion of treble on sustained high levels. It was only this feature that gave chrome away on difficult programme. Otherwise chrome had much the same lucid quality as metal tape on the *B215*.

Transients were best maintained without noise reduction and this was a perfectly valid option on the *B215*, because of its ability to accept BASF super-chrome, which has a very wide dynamic range. Ferric recordings were slightly vague in treble quality, possessing splashy transients, and some graininess, but this is usually the case. The *B215* still did a good job here.

Musicassettes had a sense of depth about them; we felt this deck had the ability to delve into a performance even on relatively poor tapes — a feature noticed only on few other top quality machines. Poor tapes became entertaining, instead of beyond use. The quality of good musicassettes was properly revealed in relatively stable imaging, clean treble delivery, and a sense of solidity that added realism.

## SUMMARY

A complex machine, the Revox *B215* had a fine measured performance, ignoring the slight blemishes of low level hum and capstan wow, which would rarely be heard. It gave impeccable sound quality both with recordings and with musicassettes, and is undoubtedly one of the best cassette machines available.

## TEST RESULTS

<b>Replay of pre-recorded musicassettes</b>		
Frequency response	22Hz-20.0kHz	very good
Speed accuracy	+0.5%	good
Noise	-58dB	good
<b>Record/replay using blank tape</b>		
Frequency response, ferric	26Hz-20.0kHz	very good
Frequency response, chrome	26Hz-20.0kHz	very good
Frequency response, metal	26Hz-20.0kHz	very good
Stereo separation	-53dB	good
Speed variation	-0.03%	very good
Modulation noise	-44dB	very good
Flutter energy (band level)	-39dB	very good
MOL, ferric, 315Hz/10kHz	+2.5dB/-1.8dB	average
MOL, chrome, 315Hz/10kHz	+0.5dB/-5.0dB	average
MOL, metal, 315Hz/10kHz	+4.0dB/-1.2dB	good
<b>Input/output performance</b>		
Line in (sensitivity/overload)	50mV/>3mV	
Mic input (sensitivity/overload)	None	
Output	750mV	
Typical price inc VAT	£1410	
First reviewed 1985. Rating: Recommended.		

# SONY WALKMAN PROFESSIONAL WM-D6C

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**A**imed at reporters, broadcasters and those who need to make very high quality live recordings 'on site' without a wagon load of back-up equipment, the *Walkman Pro* is relatively inexpensive as professional prices go. Though rather bulky for 'personal' headphone 'carry about' use, a car adaptor is optional, and those whose in-car systems can accept an extra signal source will find the *Pro* provides outstanding quality while being easily removable to avoid theft.

The *Pro* has Dolby B and C, and also records onto metal tape, as well as ferric and chrome. The capstan is quartz-locked for speed accuracy and stability, but the lock can be released by flicking a switch whereupon speed may be varied. A small mechanical tape counter proved awkward to zero, but this is probably deliberate, to prevent accidental operation.

Whilst the *Walkman Pro* will record conventionally from a hi-fi amplifier, or *via* the very insensitive mike input, its natural role is hooked up for replay of musicassettes. Trying to record is a bit of a fiddle, although no more difficult at home than in the field. Connection into a hi-fi system requires a phono-to-jack adaptor lead, since inputs and outputs are 3.5mm stereo mini-jacks of the sort found on all *Walkmans*.

Powered condenser mikes must be used to cope with the low mike input sensitivity of 200mV, and full gain was needed with the supplied optional Sony mike (*ECM-929LT*) to get 0VU with speech from just a few feet away. Line jack levels may be inappropriate for some hi-fi amplifiers, though connection may also be made *via* mike and headphone sockets, taking care not to turn headphone volume up too far to avoid output amplifier clipping. The headphones supplied (*MDR-40*) were very thin and tinny-sounding; we used Sennheiser *HD40s* instead, in order to hear bass. The *Walkman Pro* is big by 'personal' standards at 13cms long, 9cms wide, and 4cms deep. It is also comparatively heavy, and uses four AA batteries. We used Sony's mains power unit and also tried a specialist heavy duty 'audiophile' power supply from Exposure Electronics, intended for stationary domestic use, and this gave improved bass performance.

## LAB REPORT

The record level display used a single column of five red LEDs, 0VU being placed very high at IEC 0dB Reference level (250nWb/M). (This is approximately 2dB above Dolby flux, the normal point for 0VU.)

A laser amorphous head, gives respectable head overload figures (MOLs), even with metal tape. Bias had been set high partly to achieve this, so compromising treble overload (SATs). I was surprised that the *Pro* could handle metal so well, all the same.

For top quality live recordings — and live recordings can be most impressive — the *Walkman Pro* is good enough to justify use of top quality metal tapes. However, whilst Sony *ES* metal is very quiet, watch out for its treble peak, which can add a 'sting' to recordings. The *Pro* has been adjusted to give flat frequency response with recordings made onto standard hi-fi tapes, like TDK *MA-X*, Maxell *UD-II* and TDK *AD*, as the graphs of performance with IEC Primary Reference Standard tapes showed.

Replay-only frequency response was disappointingly inaccurate measuring — 2dB at 10kHz and with little upper treble above 12kHz. Pre-recorded musicassettes will therefore sound a bit 'soft' or dull.

Speed stability was astonishing. Drift was virtually unmeasurable, so there was virtually no wow. The spectrum analysis clearly showed how sharp the test tone 'spike' is at right. There was little flutter too. Recordings will therefore have 'solid' timing, and musicassettes will benefit too, with a well defined sense of tempo instead of the vague timing low rate wow introduces.

## SOUND QUALITY

This machine proved quite a surprise. It produced recordings of astonishing quality, especially onto TDK *AD* ferric tape. There was a relaxed naturalness and excellent transient handling (Dolby B) to the sound, but diffuse high level treble as usual. Strangely, really good recorders somehow manage to make ferric tapes sound almost as good as metal. Chrome (BASF *CR-EII*) was light and bright sounding, but very clear, and again impressively smooth. Metal tape

(Maxell *MX*) was a bit bright and aggressive, which was disappointing. However, the treble was clean, transients were very strong — as always with metal — and clarity superb.

Musicassette replay indicated a fine head, since although there was obviously less treble than there should have been, and this noticeably affected inherently dull recordings, there was also good insight, lack of muddle, and clean high levels. Excellent speed stability gave both musicassettes and recordings really tight tempo, banishing 'sloppiness' in the sound.

Live recordings on metal tape (Maxell *MX*) sounded bright, but this was probably due to the mike and tape. Natural sibilance in speech was emphasised, which was a pity, but at least there was no 'spitch.' Only slight, soft hiss could be heard when using Dolby C, probably from the mike's pre-amp. Quality was superb and, only a better mike was necessary to achieve the highest broadcast standards. Optional HF filtering in the mike might be useful.

## SUMMARY

Used carefully, with allied equipment of very high quality, the *Walkman Pro* provides astonishing recordings, and replays pre-recorded tapes well too. I would like to see variable bias to cure some tape-match problems, especially with metal, plus an accurate replay response. Then it would rival the best mains powered recorders.

## TEST RESULTS

Replay of pre-recorded musicassettes	
Frequency response	30Hz-8.0kHz average
Speed accuracy	+0.3% very good
Noise	-65dB very good
Record/replay using blank tape	
Frequency response, ferric	27Hz-12.0kHz good
Frequency response, chrome	27Hz-14.5kHz good
Frequency response, metal	27Hz-15.0kHz very good
Stereo separation	-60dB very good
Distortion	1.9% poor
Noise	-55dB very good
Speed variation	0.03% very good
Modulation noise	-40dB good
Flutter energy (band level)	-25dB good
MOL, ferric, 315Hz/10kHz	+4.0dB/-10.0dB average
MOL, chrome, 315Hz/10kHz	+0.5dB/-10.0dB average
MOL, metal, 315Hz/10kHz	+2.5dB/-2.0dB very poor
Input/output performance	
Line in (sensitivity/overload)	50mV/>3V
Mic input (sensitivity/overload)	200mV/00
Output	450mV
Typical price inc VAT	£229

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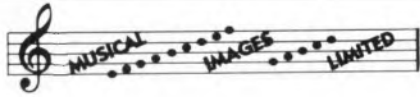
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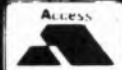


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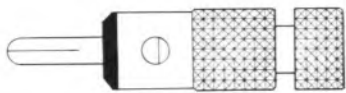
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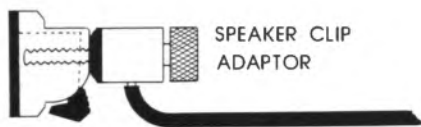
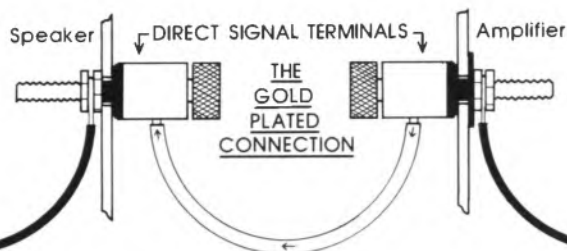
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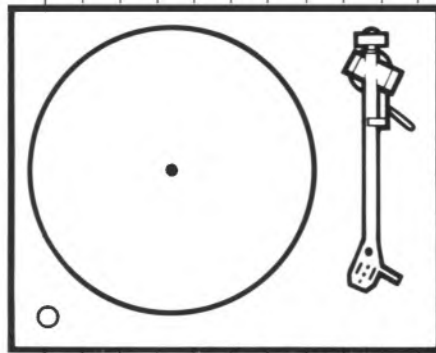
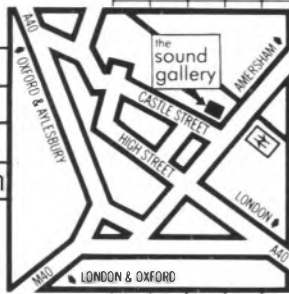
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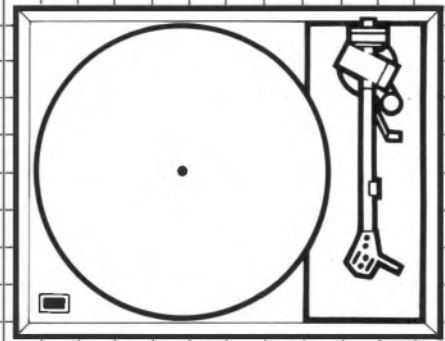
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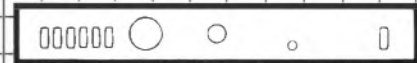
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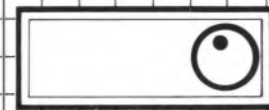
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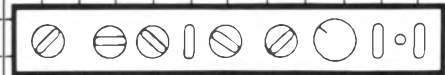
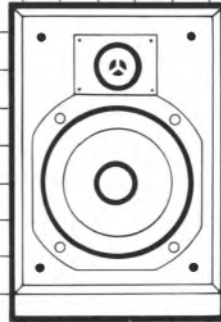
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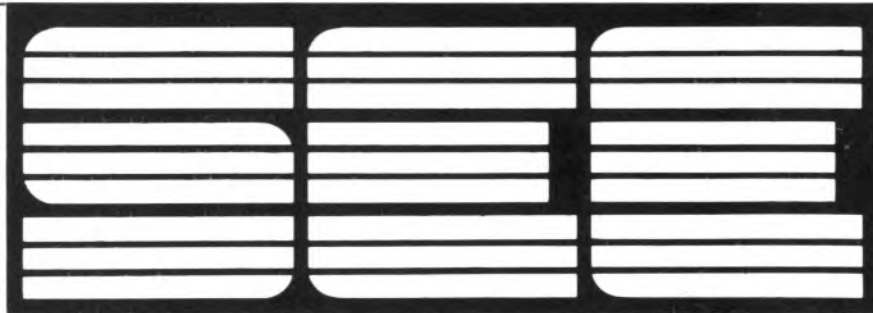
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One might legitimately question whether a product such as this is a suitable candidate for *The Collection*, especially since sample shortages prevented a proper hands-on assessment. But from certain perspectives it could be considered the audio product of the decade (so far), and it is certainly the most creative application yet of digital signal processing techniques (an area where we are continually assured we 'ain't seen nuthin' yet').

The following is more in the nature of a report than a review, which will set out to explain what this remarkable device can do. And because the DSP1 may (and should) be used entirely separately from the main signal path, using only the 'tape out' socketry of the pre-amplifier, the only way it seems able to degrade the main signal is by proving too much of a distraction.

## FUNCTION

In essence the DSP1 adds genuinely coherent 4D (space plus time) surround sound information to any stereo signal source. But it doesn't just add any old synthesised spatial information, it allows the choice of up to 32 precise acoustics, 16 of which imitate many of the greatest concert environments in the world. You take your nasty close-miked studio recordings, and decide tonight to hear them from the Carnegie Hall, NYNY, maybe switching to the Concertgebouw after cocoa.

This is a fairly outrageous suggestion, but one which the DSP1 can justify. Certainly its success in creating such illusions will vary from listener to listener, as will the importance of such illusions to various listeners. The most obvious beneficiary will be one who listens mainly to classical music which is invariably assisted by

a sense of acoustic reality, unlike some of the products of the modern rock recording studio. And it is particularly nice to be able to create environments that are appropriate to the music being played — large halls for symphonic works, and more intimate surroundings for jazz or chamber music.

In fact you need rather more than the £649 DSP1 to create the effects. You also need four channels of power amplifier, and four preferably matching loudspeakers. But since these are only being used to generate reverberation information, there is no need to use expensive equipment here, and £1,000 in all could suffice. Yamaha produce a convenient £170 4-channel power amplifier, though one could easily use two stereo models from the secondhand market, while something like the KEF C10s would be suitable loudspeakers — or again secondhand/no longer used pairs could be pressed into service. In fact it is possible to get away with just a stereo pair at the rear, but the full effect is obtained with a further pair located out of sight a yard behind the main system loudspeakers.

An immediate worry for some might be that the thing does so much it must be infernally complicated to use. But the spectre of constantly jumping up and down to tweak this control or that doesn't arise, as Yamaha have thoughtfully provided full remote control over no fewer than ten parameters — very necessary in fact to allow the optimum adjustment to be set from the listening seat. Ultimately it has to be admitted that this is a selfish device, only truly effective in one spot, and something of a distraction for others present.

So how does it create a concert hall? There's a lot of memory and processing speed in this box of tricks, and during the development programme Yamaha sent out a research team to

measure the 'acoustic signatures' of many of the world's greatest concert halls, using transient impulse techniques and a surround sound microphone array.

The main stereo signal fed to the DSP1 is digitised, and then the processors start work, using the main signal as a basis for synthesising the reverberation that would accompany such a signal in the desired environment. This reverberant field is then artificially generated around the main signal soundfield, fooling the individual into believing that he/she is in the desired acoustic.

In addition to selecting one of the supplied acoustics, the user has the opportunity to create his/her own, working from scratch or modifying one of those already supplied. From the listening seat it is possible to select the size of the hall, the seating position, and the equalisation of the surround loudspeakers. It is possible to use the DSP1 as a remote volume control for the whole system, with individual adjustment of main reverberant, but running the main signal through the unit to do this does prejudice sound quality. Better to leave the remote volume adjustment to the reverberation signals only. Semi-pro and musician users will be attracted by further capabilities to create SPX-type live performance effects and so on.

## CONCLUSIONS

When first introduced ten years ago, surround sound foundered on the rocks of software capability and compatibility. Neither is relevant with Yamaha's excellent DSP1, which supplies convincing surround soundfield information without prejudicing the main stereo signal. The £1,000 or so total pricerag and domestic/wiring considerations remain the only disincentives.

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
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
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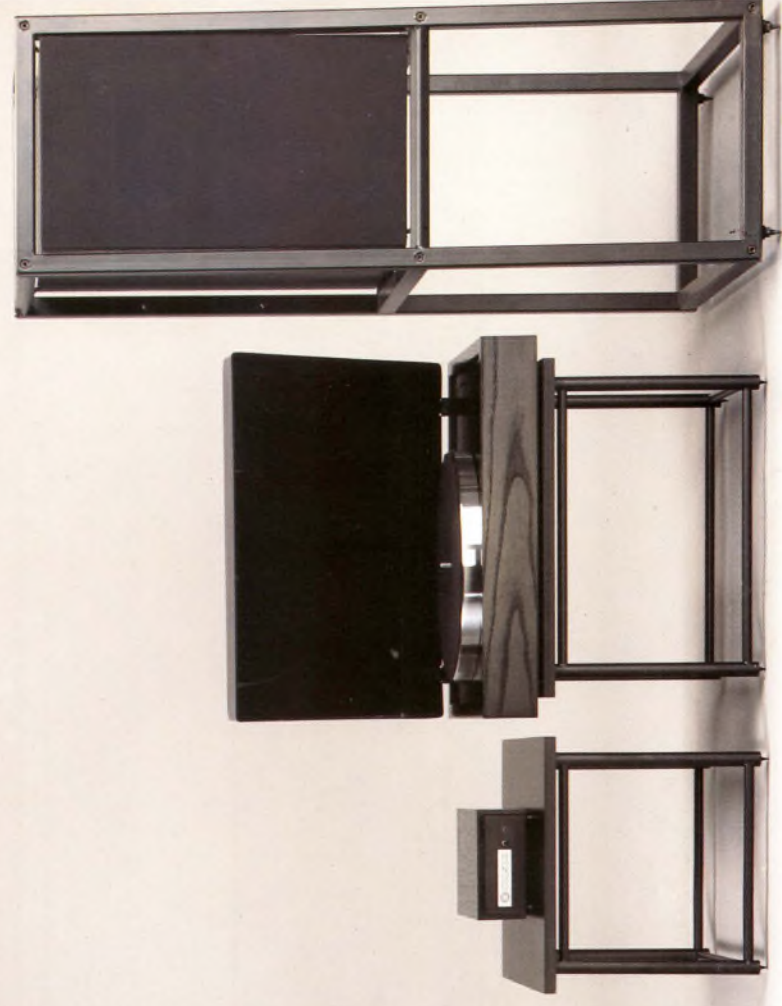
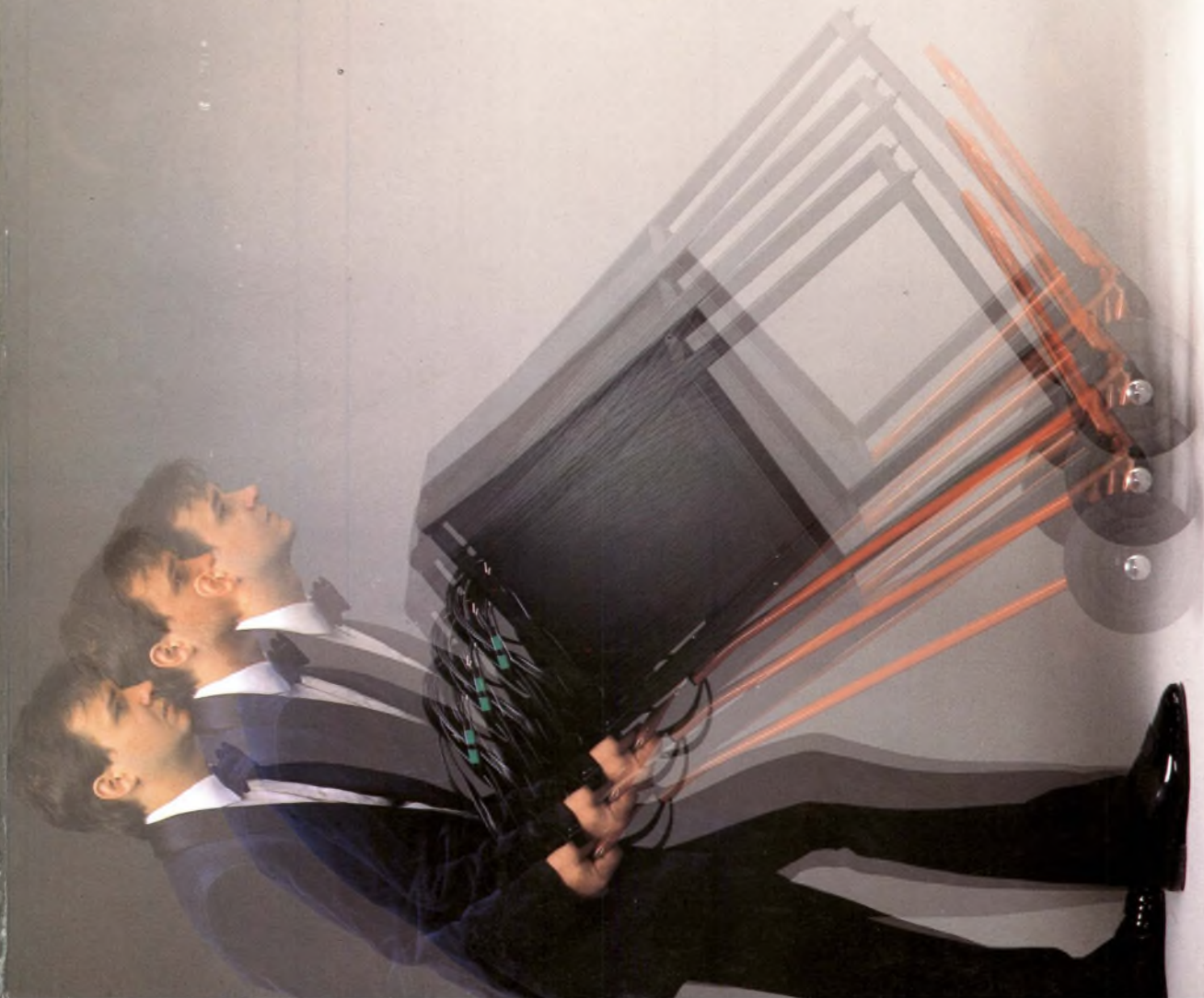
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