

HI-FI CHOICE

THE WORLD'S NUMBER ONE GUIDE TO BUYING HI-FI

FEBRUARY 1992 £2.95

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THE WORLD'S No.1 GUIDE TO BUYING HI-FI

HI-FI CHOICE

ISSUE NUMBER 103 FEBRUARY 1992

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PUBLICATION

PRODUCTS AND EDITORIAL SUBMISSIONS

Hi-Fi Choice welcomes all information on new and upgraded products and services, for possible coverage within the news and reviews pages. However, the publisher respectfully points out that the magazine is not obliged to either review or return unsolicited products. The editor is always pleased to receive ideas for articles, preferably sent first in outline form, with details of the author's background, and - where available - samples of previously published work. He cannot, however, accept responsibility for unsolicited copy and would like to point out that it may take time for a reply to be sent.

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Hi-Fi Choice welcomes any technical questions, although these can only be discussed within the pages of the magazine. Regrettably, Choice is not in any way able to offer telephone assistance.

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Menu

On a recent press trip I was chatting to Martin Colloms about the way the market has shifted from vinyl towards CD, and he reminded me that the first time *Hi-Fi Choice* covered CD (1984) it was as a single review of a very early Sony player tacked onto the back of a massive issue devoted entirely to vinyl. Even as recently as 1985, CD player reviews took up a mere five pages, again tacked onto the back of over 40 pages of turntable and cartridge reviews.

It is amazing to see how things have changed in just six years, nowadays we have to search high and low to assemble a mere 15 record players for our annual tests, while we do CD players twice every year and have no problem getting hold of 25 or so players for each group. We have even reviewed over 30 CD transports/DACs bringing the total number of digital product reviews close to the 100 mark.

The really sad news is that this might be the last time we devote an entire issue to vinyl, next year the much loved but fast declining format may have to be relegated to secondary review status, for the simple reason that there just aren't that many new decks around.

Still, there is at least some good news, and that is to be found in the quality of the products that are being turned out. Just look at the number of Best Buy and Recommended flags on the review pages and compare this to the number we were awarding back in 1985. And, perhaps more importantly, look at the prices you have to pay to get a decent quality deck.

Despite the fact that records are becoming harder and harder to find, the hardware side of things seems to be alive and well, with excellent value decks being the order of the day. Most of these decks are not new, indeed some have been around for more than a decade, but these designs have gradually evolved into excellent sounding, relatively cheap, final (or at least nearly final) statements on the art of turntable design.

On the face of the evidence in this issue, it appears that the famous line 'the report on my death was an exaggeration' applies equally well to vinyl as it did to Mark Twain. Although no one would claim that the vinyl market is exactly healthy, there are still a significant number of people out there, ourselves included, with extensive record collections who intended using them well into the 21st Century and beyond.

Andy Benham



Cover photograph by
Chris Richardson.

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Shopping for the ideal component or looking to build a system? Look no further. Our directory



summarises the huge inventory of *Hi-Fi Choice* reviews and offers at a glance information on all the current products tested in our pages. The ultimate reference featuring nearly a thousand entries: beware of cheap imitations!

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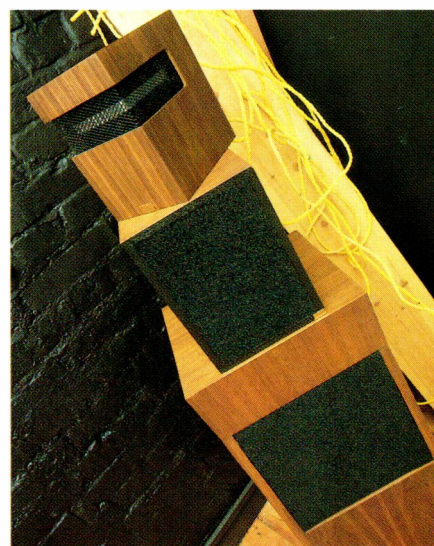
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Your chance to buy all manner of hi-fi enhancing goodies to optimise your system.

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Paul Messenger samples a new omnidirectional loudspeaker from the land of the brave.



Top: True colours; Audio-Technica headphones and system enhancers on offer in this month's competition.

Middle: DAC's entertainment; ten new digital to analogue convertors are put through their paces on page 95.

Bottom: Room at the top; the Sequerra stacked speaker system is assessed in Statements.



In the Scandinavian pipeline

Following on from the massive success of its highly acclaimed 2500 system, B&O has launched a pair of active loudspeakers, retailing at £1,800.

In many ways the design of the *Beolab 8000* is as radical as that employed in the 2500. The floor standing design is a tubular column enclosing the crossovers, power amplifiers and drivers, the latter consisting of a single tweeter and twin bass units. The drive units are enclosed in the upper part of the tube which is reflex loaded by means of a port at the top of the column. The polished aluminium tube is tapered to a spike at the base and this can be fitted into a heavy base plate for floor standing use.

Alternatively, the speakers can be hung from the ceiling by means of a special mounting bracket.



Objects of desire number 42: B&O active loudspeakers.

Electreticity

Audio-Technica has announced a new £246 electret headphone called the ATH-9000. Electret headphones use a thin flat diaphragm like electrostatics, but differ in as much as the diaphragm is thicker and permanently charged, so it doesn't need an active charger. Electrets are more common in microphone design, of which A-T is a major manufacturer.

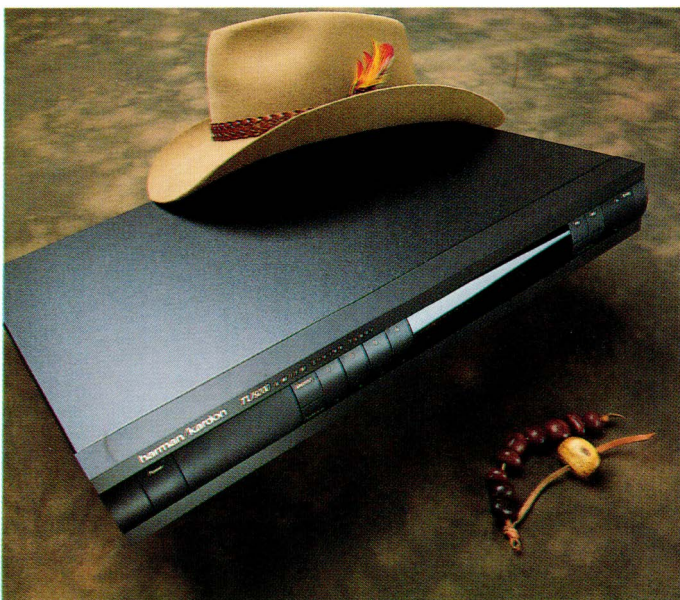
The ATH-9000 connects to the speaker outputs of an amplifier via an adaptor, which has the facility to pass the signal on to the loudspeakers when not in use. The earpads are large round circumaurals with open backs and the headband has an internal adjustable strap.

If you fancy a pair, why not enter our bumper Audio-Technica competition on page 36 of this issue. Who knows, this could be your lucky month.

Save, save, save

Top tip: avoid paying extortionate software costs by investing in a radio. Well that's one excuse for investigating Harman Kardon's new tuner, the *TU9200*, which will receive signals on both the FM and AM bands and remember 16 presets from each band with its inbuilt memory.

Other goodies include a signal strength meter and seek tuning, and all for a mere £169.



What a conker: Harman/Kardon's bulging TU9200.

The whole trough

Townshend Audio's famous damping trough, previously exclusive to the *Avalon*, *Rock* and *Rock Reference* turntables, is now available as an add-on kit for 'standard' record players.

The idea behind the design is to provide a more rigid support for the cartridge. This is accomplished by means of an outrigger which is attached to the headshell, a paddle at the end of the headshell sitting in a silicon fluid filled trough.

The kit comes complete with fitting instructions and an *Elite* alignment gauge and costs £79.95 inc VAT. Designed to upgrade most solid plinth turntables, such as Regas, Revolvers and even some Thorens models, the trough assembly will fit any turntable where the distance between the top of the headshell (when playing a thin record) to the top plate of the plinth is 45mm or greater. However, bear in mind that fitting one of these troughs may invalidate your original manufacturer's guarantee.

Received wisdom

The much touted revival of the receiver goes a further step forward this month with the launch of two new units from Sony, the imaginatively named *STRAV370X* and the *STRAV770X*.

The former is a 50watt unit priced at just a penny short of £200 and is billed as a full remote control A/V unit, the tuner unit coming complete with 30 random presets accessing either the FM or AM bands.

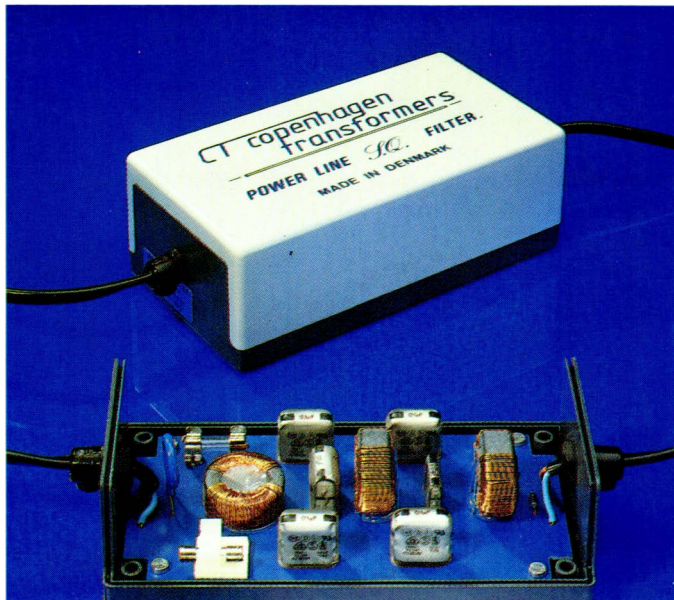
The unit's big brother, the *STRAV770X* will set you back a further £100. The extra outlay provides you with an 80watt output and an inbuilt 20watt rear channel amplifier to handle the output of an onboard Dolby Surround decoder. Alternatively the rear channel amp can be used to provide some basic DSP facilities such as Hall surround.

Full A/V switching is accomplished by means of a programmable remote control unit.

Cleaner current from Copenhagen

Copenhagen Transformers has introduced the CT Mainsfilters range of (you guessed it) mains purifiers. Designed by Freddy Maldonado Fisker the Copenhagen Mainsfilters come in two versions, the *CTF-5* (£175) puts out 1,100W and will take a five amp load and the *CTF-2* (£125) supports two amps and delivers 440W.

Unlike most conditioners the CTs can be used with whole systems as long as they don't include musclebound power amps. Copenhagen claims that they are the only filters that clean the mains without reducing a system's dynamics or openness – traditional criticisms of this type of device. The CTs contain audiophile grade Wima paper capacitors and custom made ferrite/ceramic cored transformers.

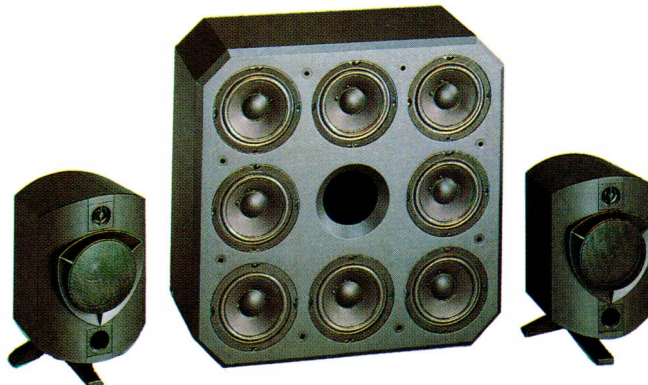


Keep your power pristine with a Copenhagen Mainsfilter.

Working the wall

Rock Solid Sounds Inc, a division of B&W, has launched the *Bass Station* subwoofer. Priced at £350 this is a compact multi-driver subwoofer designed to partner the colourful *Solid* satellites, but it will of course work with other speakers that offer a similar bandwidth.

The *Bass Station* incorporates no less than eight 95mm drive units and claims a bandwidth of 34 to 100Hz (-6dB) with a healthy 91.5dB sensitivity. Unlike most subwoofers it's not a black or white box that makes a good perch for cats, plants or feet but a 200mm deep, 470mm square box that sits upright against the wall.



More drive units than you can shake a stick at from RSS Inc.

Akai breaks down the receiver

Akai has been busy with new product lately, it has two new CD players in the form of the *CD27* at £160 and *CD57* at £180. Both have 1-bit DACs and both

electrical and optical digital outputs. The *CD57* justifies the extra expense by virtue of remote controllable variable output and a full keypad on the

machine as well as the handset.

Akai has also come up with a rather novel intro in the press release for its new tuner, 'While some manufacturers have compromised radio reception by combining tuners with amplifiers to create receivers, Akai has chosen to keep the two items separate.' And the barrier breaking product it announces is the *AT27L* tuner, featuring FM, medium and longwaves and 20 presets. It costs a mere £100.



New wares from out west

The West Country has a new distributor in the form of Studio Acoustics, which will be importing two new American brands: OCM and Superphon. The latter is an 'affordable' high-end amplifier brand whose prices start just short of £500 and include a line preamp and 60, 100 and 200W power amplifiers along with a standalone phono stage.

OCM produces a similar range of amplification but at a higher price, the *OCM55* line stage preamp costs £1,145 and the 200W *OCM500* stereo power amp will set you back close to £2,000. As well as incorporating something called 'OCM Architecture' these are solid state designs that are claimed to be devoid of normal transistor amp characteristics. For more info contact Studio Acoustics on (0626) 67060.

Enter stage left

QED has added another product to its ever expanding accessory range in the shape of the *Discsaver*, a budget phono stage aimed at midi and mini system users.

As many of these packaged systems don't have a phono input, QED has produced a budget unit so that users can hook up a record player to their racks. The *Discsaver* costs £29.95 and will run off either a PP3 type battery or an optional, external 12volt power supply which is available for an additional £15.

Castle on the rack

Not content with being the recipient of our most expensive loudspeaker Best Buy award to date, Yorkshire based Castle Acoustics has branched out into equipment support manufacture with the rather aptly named Tower.

Featuring solid wood front columns and real wood veneers on acoustically inert high-density fibreboard, the Tower comes in both castor and spike supported versions. Finished in either mahogany or black ash the unit retails for £259

INDIVIDUALS TAKE NOTE THIS SYSTEM TAKES SOME BEATING



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And all be Koss . . .

All you Walkman users looking to get one over on your fellow tube travellers could do a lot worse than a pair of Koss ESP/950s, a cool £2,000 worth of battery operated, portable, electrostatic headphone.

The complete system, which comes housed in an exquisite calf skin leather carrying case, consists of the headphones themselves, the E/90 energiser/amplifier, an AC adaptor, a battery box, no less than eight feet of extension chords and three interconnectable stereo cables which enable the cans to be connected to just about any socket known to man.

Koss' portable ESP/950s - electrostatics to go.



In Brief

A new branch of Bartlett's hi-fi offering two listening rooms has opened at 11 The Broadway, Woking, Surrey, tel: 0483 771175.

Audio-Technica will give you a 30 per cent discount off any of its cartridges if you trade in your old MC. This offer usually only applies to old A-Ts but it has been extended to any cartridge until March 31st.

ATC's Bill Woodman has won Australia's most prestigious audio accolade for the SCM 100A active loudspeaker. 'The Critic's Choice', is an award given out by a panel made up of representatives from the countries' leading professional and hi-fi magazines.

The B&W Matrix 805 loudspeaker has dropped its electronic bass equaliser box and slimmed down its original £915 price to an almost approachable £795.

The Doug Brady empire has expanded once again with a new shop in Otley. The address is Forge Cottage, 19 Crossgate, Otley, W. Yorkshire, LS21 1AA. Telephone: (0943) 467689.

Robbs of Gloucester has been acquired by Cleartone, making it the groups' ninth store. 13/15 Worcester street, Gloucester, tel: (0452) 419777.

Goldring has produced a new interconnect that utilises oxygen free copper conductors and gold plated phono plugs. A 1m terminated pair will cost £19.95, but they are available in 0.5, 1.5 and 2m lengths.

Beyer has launched an aluminium flight case'd version of its new top of the range DT911 headphones. Complete with the Sound Power (a sampler/demo disc) CD it costs £199.

Pioneer tests the DAC waters

Pioneer has taken the plunge into the uncertain waters of DAT with a £600 machine called the D-500. This uses 1-bit D to A and A to D conversion and incorporates what Pioneer calls a clean clock circuit which is designed to reduce jitter. Unusually both electrical and optical socketry is provided for the input and output of digital signals alongside the usual analogue loop.

In true DAT tradition, it will record at all three sampling frequencies when presented with a signal in the digital domain. However, analogue recordings can only be carried out at 48kHz. It will also record

in long play mode if so required. And in order to placate the record companies, it's fitted

with the almost completely foolproof SCMS anti-piracy system.



Pioneer's sexy new D-500, 1-bit DAT with all the trimmings.

Beefed up big brother

Copland, whose CTA401 integrated valve amp is reviewed in this month's *Statements*, has introduced a big brother in the form of the £1,498 CTA501. Unlike the integrated 401 this is ostensibly a tube power amp with two inputs, one has a volume control and is designed to take the output of a CD player or DAC and the other is intended for a preamp. This configuration minimises components in the signal path and thus offers a high fidelity option for the source you use the most.

The CTA501 is a 30W pentode amp that operates in ultralinear mode 'very close to class A',

which in reality means that it can drive far more inefficient loudspeakers that you would expect of a 30 watter. Golden

Dragon valves are used throughout and the output transformers have been designed by Copland's main man Ole Moller.

Marking a welcome return to silver finish, Copland's CTA501.





The Pioneer A400 amplifier.

As recommended
by these
speakers.

WHAT HI-FI?
MAGAZINE AWARDS 1990

Best Amplifier.

Best Buy Overall.

HI-FI CHOICE MAGAZINE

Best Buy Amplifier.



 **PIONEER**
The Art of Entertainment

WHAT HI-FI? OCT 1990. "THERE IS SOMETHING INEFFABLY RIGHT ABOUT THE A400." ALVIN GOLD.

HIGH-FIDELITY. SEPT 1990. "IT LOVES MUSIC, THE A400. IT LOVES IT WITH A VENGEANCE." MARK PAYTON.

AUDIOPHILE. SEPT 1990. "EVEN IF YOUR BUDGET EXTENDS TO £1,000, IT COULD BE EXACTLY WHAT YOU'RE AFTER." JIMMY HUGHES.

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Packed with in-depth reviews!



Amplifiers on test

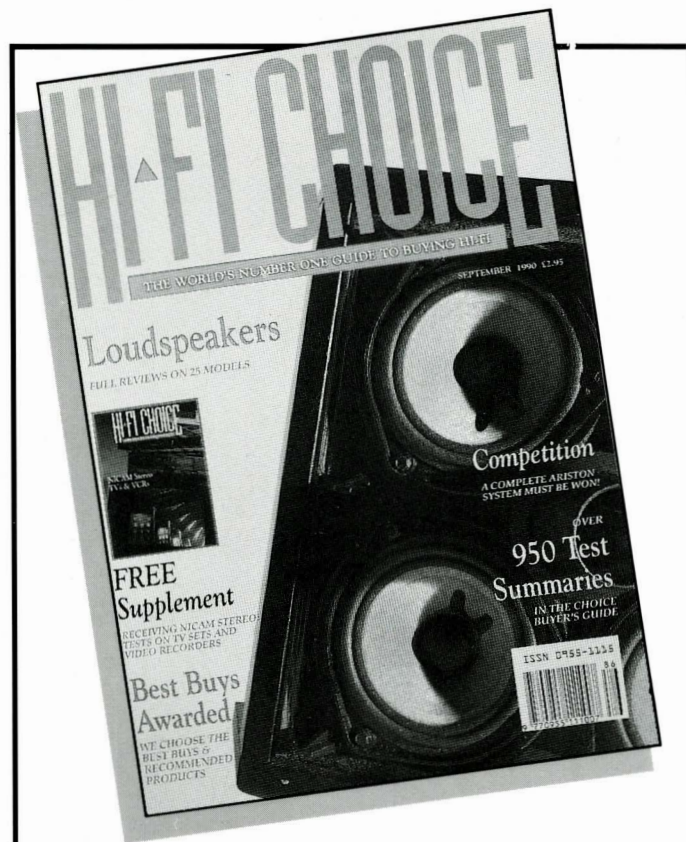
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RoySmith Electrical, Chesterfield	0246234953	Norman Audio, Preston	{ 077253057 0772 555769	Cosmic, Addlestone	{ 0932854522 0932851753	Robert Ritchie, Montrose	067473765
DEVON		Romers Hi-Fi, Blackburn	0254887799	Tru-Fi, Leatherhead	0372378780	WALES	
Bernard Smith, Barnstaple	027143503	Wigan Hi-Fi Centre, Wigan	094237977	Tru-Fi, Redhill	{ 0737766128 0737767404	CLWYD	
Radford Hi-Fi, Exeter	0392218895	LEICESTERSHIRE		SUSSEX EAST		Lloyds TV, Video & Hi-Fi, Wrexham	0978364168
Radford Hi-Fi, Plymouth	0752226011	Mays Hi-Fi, Leicester	0533 625625	Smythe & Barrie, Eastbourne	032329192	Owens, Colwyn Bay	0492530982
Upton Electronics, Paignton	0803551329	Parker High Fidelity, Loughborough	0509 269888	Sunderland Electronics, Brighton	0273774113	GLAMORGAN	
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A C L Radio Services, Grays	0375374666	Babber Electronics, W13	081-5796315	TYNE AND WEAR		Owens, Bangor	0248362951
AV Tech, Iford	081-5146688	Brians Hi-Fi, W1	071-6311109	Bill Hutchinson, Newcastle-upon-Tyne	091-230 3600	PIONEER	
Chew & Osborne, Epping	037874242	Covent Garden Records, WC2	071-3797427	WARWICKSHIRE		The Art of Entertainment	
Chew & Osborne, Saffron Walden	079923728	Hi Spek Electronics, N3	081-3491166	Carvells of Rugby, Rugby	0788 541341		
Peter Foulkes, Chelmsford	0245491479	Kamla Electronics, W1	071-3232743	The Hi-Fi Company, Leamington Spa	0926 888644		
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Peter Foulkes, Maldon	0621853148	Myers Audio, E17	081-520 7277	Bridge Hi-Fi, Walsall	0922640456		
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{ 0702 206835 0702 204965		Stereo Regent Street, W1	071-2872458	Naam Hi-Fi Vision, Birmingham	021-633 4944		
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{ 0402444765 0268285922		MERSEYSIDE		Superfi, Birmingham	021-6312675		
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Choice Sessions

Into the woods

The Celestion 100 is a bit of a departure for the Ipswich based loudspeaker manufacturer in that it sees a return to a wooden cabinet after the aerolam extravaganzas of the 600 and 700.

This review turned out to be something of a saga. When Celestion phoned up and asked if we wanted to review the 100 it was just after Paul Messenger had completed his listening tests for issue 102, so rather than wait four months I decided to take them home and have a listen.

The 100s duly arrived complete with dedicated stands filled with a hernia inducing quantity of lead shot and sand. They were hooked up to the Arcam Alpha 3 that I reviewed last month and I settled down to listen to some music.

The first thing my ears told me was that somewhere the phase was inverted, despite the fact that it had seemed right with my Snell Ks just a couple of hours before. Swapping red and black certainly proved this observation to be correct, Beverley Craven's vocals snapping into focus in front of a deep and convincing sound stage. Just why I had to phase invert remains a mystery, as a quick measurement on the Alpha 3 showed that it is not phase inverting, although the older Alpha 2 was. Oh well, a case of believing my ears rather than a volt meter methinks.

Leaving aside the phase mystery, there was also something quite seriously wrong with the bass, in that it was both slow and slightly detached. I suppose that expecting an inefficient pair of £500 pair of loudspeakers to perform well with a £200 amplifier was stretching things a bit far, but it certainly showed up the 100's demand for the very best in partnering electronics. The main problem with the speaker is that it uses a comparatively heavy 150mm Cobex bass cone and if the amp hasn't got the grunt to keep it under control then the whole thing tends to lack a sense of integration. Under the circumstances I was a bit loath to hook it up to my 15watt Audio Innovations pre/power combo, so I started to scout around for something capable of giving the Celestion the firm hand it so clearly needed.

We sample Celestion's newest speakers and a devilishly clever Radio Data System tuner. Andy Benham has been tuned in and turned on this month.

The solution came in the rather unexpected form of a Copland CTA501, a close relative of the CTA401 that Malcolm Steward writes about on page 17 of this issue, albeit with some 20 per cent extra muscle. Although this beast is only rated at 30watts a side, the combination of a high current power supply and pentodes operating in ultra-linear mode proved to be just what the 100s required. Finally, the speakers started to produce the sort of sound that I had expected. The 100s are a bit of a departure from the SL600 and SL700 in that the company has gone back to a real wood veneered cabinet, and a glorious looking one at that, with the 32mm aluminium tweeter and aforementioned bass unit being housed in their own zinc cast-

What no aerolam? The trees fight back in the shape of the new Celestion 100.



ings, which take up the top three quarters of the front baffle. Although the cabinet may be radically different, the drivers will be familiar to SL700/SL6Si owners, but there have been slight changes to the units, in particular the tweeter magnet, aimed at improving sensitivity, which is still only a relatively low 84dB.

In a nutshell this adds up to a speaker not totally dissimilar to the SL600 only a bit louder and a lot more dynamic. Before I go any further I should go on record as saying I actually quite liked the SL600, being a fan of its great horizontal imaging and depth of soundstage, although, like many others, I wasn't so impressed when it came down to the height of the soundstage and the sheer welly available.

The 100 is very definitely related to the SL600/700/SL6Si family in terms of its marvellous depth and width of image, but it also manages to give the proceedings the same sense of height and by so doing produces a speaker with one of the best soundstages you are likely to find at the price. Fine tuning this image takes a lot of tender loving care and at least three feet of space from the rear wall. It also demands a very good pair of stands and decent cable, in fact two sets of decent cable as bi-wiring is an absolute must.

Drum major

However, if you pander to its requirements then the 100 will repay all your efforts with interest. Listening to John Mellencamp's excellent new album brought home just how good the 100s can be. The superb depth of image produced by the 100s makes drum kits sound absolutely amazing. They lay the drum kit out in your front room, showing off the different placements of the various drums. It is also up to the task of revealing the fact that Mellencamp's drummer, Kenny Aronoff, often uses a very shallow five inch piccollo snare which produces a sound quite distinct from the deeper versions, even though the difference is easily lost with less responsive speakers.

However, everything is not completely right with the 100 and the price you pay for that astonishing soundstage is a slight loss of dynamics and a sense of timing that is slightly on the relaxed side. In fact in some ways the 100 is very hard to



describe, it certainly isn't the ultimate detail transducer but it does show up some things with consummate ease. Somehow it manages to convey information without thrusting the fact that it has all that detail down your throat.

Summing up, there is a great speaker inside the 100 which is trying very hard to get out. If you are prepared to take a bit of trouble when it comes to positioning the speakers, and can afford a really good amplifier of the calibre of the Copland then the 100s are capable of soundstages that very few speakers at this price will come close to, let alone better.

Their great strength is that they have a degree of musical involvement that will have you rummaging through your record collection looking out all your old favourites and showing you things that you'd missed completely the first time round.

Sweetheart of the radio

Although invented for use on the move RDS can have advantages when used in a standalone hi-fi tuner, as Andy Benham found out.

By now most of you will be familiar with the Radio Data System, or at least its RDS acronym. The system was originally designed for in-car use but over the last few months a number of RDS equipped domestic tuners have appeared on the market, including Sony's £199 ST-S570ES. Ever enthusiastic to play with a new gadget, a review sample was extracted from Sony and set up chez Benham.

The Radio Data System is intended to provide an FM tuner with information

Talk radio: Sony's ST-S570ES tuner has no identity problems.

about the signal it is receiving, from simple data such as the name of the service (PSN for you acronym fans), to more complicated stuff such as AF, which provides the tuner with a list of alternative frequencies on which a particular station can be found.

On the face of it, a stationary tuner needs the AF list about as much as a fish needs a bicycle, but my initial cynicism was brushed aside when it came to tuning in the beast to the plethora of stations available via a decent aerial.

Tuning is quite simple and once you've grabbed a station it can be assigned to any one of 30 presets, arranged in groups of ten. The programme identification feature really comes into its own during tuning, as no sooner has the unit grabbed a station than the display spells out in simple English which station it has found, providing, of course, that the station is broadcasting the RDS information. However, the one it finds first is not necessarily the best signal. Once you've grabbed the station all you have to do is press the AF button and the tuner reads the list of alternative frequencies, tunes into each one in turn, measures the signal strength and then returns to the best one.

Having access to all this information means that the tuner's display window looks a more like a Nintendo *Gameboy* than a piece of hi-fi, but various display options mean that most of the superfluous information, such as your previous high score, can be ignored, leaving just the station name, or time, and even this

can be dimmed if required.

Aside from its capabilities as a games machine, you may be wondering how the Sony performs more mundane activities, such as letting you listen to the radio.

Capital punishment

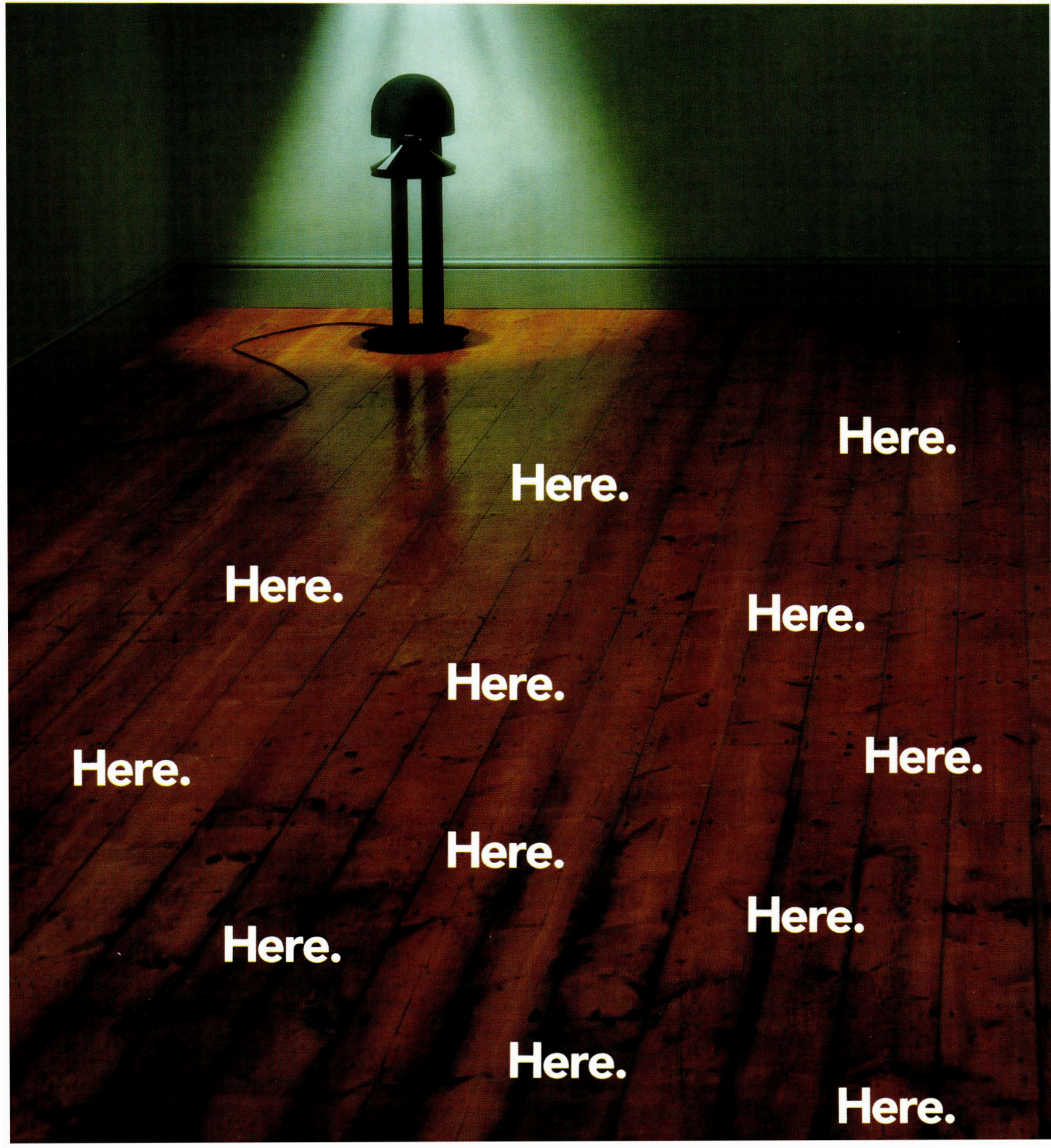
I started out with the tuner picking up Capital Radio's FM service which sounded compressed and rather lacking in detail. A good start for the tuner, as Capital has got to be one of the worst sounding FM stations around.

Swapping over to Radio 4 improved things immensely and I was particularly impressed with the tuner's ability to handle speech, the 570 turning in a performance that was well above that suggested by its budget pricetag. A quick switch to Radio 3 and I began to be seriously impressed. The dynamic range of the 570 was very impressive and even with complicated passages the tuner managed to sort things out in a most convincing manner. Moreover, it was capable of delivering quite convincing soundstages with a decent depth, although not quite the height provided by more expensive units.

The unit's ability to handle a decent dynamic range was just as apparent on pop selections, bass notes having a decent weight and vocals showing no trace of sibilance.

Whether the RDS features are just a gimmick or something that you will actually use turns out to be a bit irrelevant. For under £200, the ST-S570ES is an excellent tuner and well worth adding to anyone's audition list. The RDS features are simply a rather nice bonus.

Where can you hear from a pair of Can



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Can you hear true stereo sound on S50 speakers?



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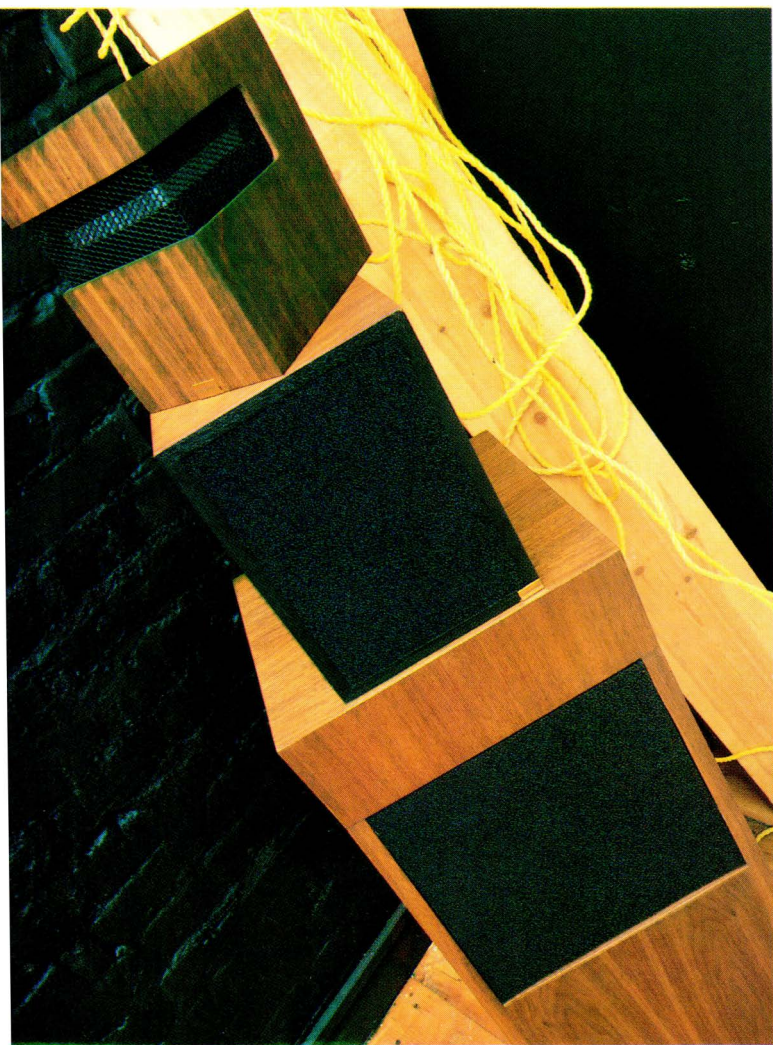
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Roy Gregory has been experimenting with a three box Sequerra loudspeaker, while Malcolm Steward has been making house room for a Copland tube amp.

other thing you'll be aware of is an increased sense of insight into the performance. It's that much easier to tell what's happening where and when. This is because the *MET 7s* take their virtues (speed, articulation, rhythmic integrity and resolution) and integrate them into a coherent whole. And the bass, despite its real limitations, remains convincing. In fact that's the best word to sum up the *MET 7s*. They are, without fail, musically convincing.

But, fine speaker that it is, the *MET 7* is only part of the story. Where Sequerra gets really clever is in providing the *MET 8/III* stereo subwoofer, and the *MET 9/III* ribbon tweeters.

Let's start at the bottom. The *MET 8/III*s are a pair of single driver subwoofer enclosures intended to sit beneath the *MET 7s*, and fill out the bottom octave. They cost £1,850 a pair. They use a 10inch polypropylene driver, time aligned by the slope of the front baffle, and claimed to reach down to a -6dB point at 23Hz, a figure which agrees pretty well with my measurements. The clever bit comes with their sensitivity, the same 90dB (1W at 1m) as the *MET 7s*, and the fact that you connect them in parallel with the smaller speakers. That's right, no feeding the signal through a nasty crossover. The *MET 7s* continue to operate full range; the *8s* simply roll off when they reach them.

Perhaps even more surprisingly, the *MET 9* ribbons work in exactly the same way, overlaying their output on that of the existing tweeter. Again, sensitivity is high, 91dB for their omnidirectional output, largely due to enormous magnets which go a long way towards explaining the £1,295 price tag for the *9s*. Unlike the subs, the tweeters are intended as a universal product, and as such you can match their sensitivity to other speakers using a trio of dip switches on the back.

Give it some stack

The Sequerra stack, *7*, *8* and *9*, represents a serious full range system at an all in price of £3,840. And the real beauty of it is that it doesn't need an enormous muscle amp; 25 Watts of Jadis drove the whole lot to ear shattering levels with ease.

So what do you get for all that extra outlay? The subs give you an increased sense of body and substance, a sense of volume to the soundstage. Whether you're playing Julian Bream or Bon Jovi, you'll hear the difference, along with a dramatic increase in dynamic range and a real sense of bass power, but only when it's called for. Subwoofers should be heard but not noticed and the *8s* do just that, adding scale and authority to the *7s*.

Statements

Imported by Path Premier, the Sequerra *MET 7/III* is an American speaker which comes with a heavyweight reputation, and a heavyweight name. Designer Dick Sequerra is the man behind such legendary products as the Marantz *10B* and the original Sequerra tuner. These stratospherically priced products are a far cry from the *MET 7/III*, which signals a new determination on the part of Mr Sequerra to bring quality music to a wider audience. Of course, the price of importing and distributing the *MET 7* goes some way toward undoing that good work, and by the time the speaker hits the streets this side of the pond, it will cost you £695 for the standard walnut veneered version.

Trashing pop wisdom

One thing that immediately endears the *MET 7/III* to this jaded hack is the way it trashes popular wisdom. What we have here is a carefully considered answer to the problem of getting a musically satisfying performance out of a tiny enclosure.

Firstly, it's time and phase coherent. The stepped baffle sees to the time alignment whilst the narrow dispersion of the cone tweeter minimises diffractive effects. The baffle and inner edges are also felt lined. Impedance is a fairly easy 8ohms and, unusually for such a design, efficiency is high at 90dB (1W at 1m). It's the crossover which is responsible for the phase coherence, but the blurb doesn't extend to the how as well as the why.

The frequency response, measured in room, is far from flat, but reveals some careful tailoring. Substantially flat from 130Hz to nearly 2K, the response falls gently above that. Below it, a severe dip leads to a bass peak at around 50Hz. The result is that you seem to hear far more bass than you really do, or to put it another way, you don't really miss what isn't there. Which brings us to the way the speakers actually sound.

Fire them up and you'll quickly discover that the Sequerras throw a huge soundstage, extending well outside the speakers and beyond the back wall. The

The tweeters are similarly subtle in their contribution. Play them on their own and you can barely hear them. Connect them along with the 7s and the air and sweetness, detail and focus they add to the top end is hard to miss. If the subs give the soundstage 'volume' then the tweeters give it 'height'. They also give the 7s one of the most delicately natural top ends I've ever heard.

Neither the 8s or 9s are exactly budget products. The icing on the MET 7 cake doesn't come cheap, but it is there. The proof of that cake is in the eating and the 7s alone are surprising satisfying. Add the 8s or 9s and they get even better. But the key moment comes when you remove the extra units. Suddenly you wonder how you put up with the sound before. Of course, come back to the 7s a day later, and they'll seduce you all over again.

This is one speaker system I'll be very sorry to part with, and one I might well end up living with. At US prices the Americans should be beating down Dick Sequerra's door. At UK prices, I'd recommend a very serious listen.

Roy Gregory

Valve amplifiers rarely find their way into the Steward household. Perhaps this indicates some reaction on the part of their manufacturers and distributors to my personal choice of amplification which originates from the Salisbury area?

Audio Innovations was the first company to risk approaching this particular flat-earther with what proved to be an extremely enjoyable and different amplifier combination. Now Absolute Sounds has decided to bite the bullet and become the second brave soul to supply me with a valve design to sample: the integrated £1,498 Copland CTA401.

Copland, the company, began life in Copenhagen in 1986 with designer, Ole Moller, who subsequently teamed up with Sweden's Target Electronics allowing him to concentrate solely on design work. And design features strongly in the CTA401. Whilst many valve amps have an unfortunate home-baked appearance, the 401 has an extraordinarily professional demeanor. Fully enclosed in a black painted steel case, to keep inquisitive fingers and paws at a safe distance from its hot glass, the amp's crowning glory is its elegant and substantial silver alloy fascia.

The Copland not only looks good, it feels good, the Alps volume and balance

potentiometers are satin-smooth in operation and the controls for power, input selection and tape monitoring have a reassuringly solid action. Care and attention have been lavished upon the internal construction—neatly dressed wiring runs, star earthing, and enough high quality parts to satisfy all you audiophile grade component spotters.

Ultralinear dragons

Shuguang Golden Dragon low noise valves are used throughout the ultralinear design: ECC83 double triodes are used in the RIAA stage and drive the ECC82 phase splitters which feed two pairs of EL34 pentodes working in push/pull. The output valves run very close to class A and can in fact be re-biased to run fully in this mode if so desired. Output is rated at a meagre 26 watts although the current capacity of the power supply and output transformers could easily handle 100. Two sets of binding posts accommodate either 4 or 8ohm loudspeakers, and inputs include four at line level, one tape loop, and a phono section which, with its 3mV sensitivity, will handle moving magnet or high output moving coil cartridges.

Not surprisingly the CTA401 preferred to work with reasonably sensitive speakers. It can be used with less efficient designs but gave its most composed and fluent performances with relatively sensitive models (> 87dB). With the more responsive species of loudspeaker it demonstrates a graceful and refined sound quality, although not one which is lacking in dynamics or vibrancy.

I spent a lot of time running a pair of Cyrus 780 miniatures with the Copland which might seem like an incongruous combination in price terms but this didn't prevent it from proving to be enormously satisfying. Indeed, late one night, as I beavered away at the keyboard with a CD playing quietly in the background, the sound stopped me in my tracks, such was presence of the singer's voice in front of me. If you want to hear this amp at its most magical I'd suggest that you play Robert Ward's *The Comfort Table*, through it. The song features Ward's voice accompanied solely by his Stratocaster through a delicious-sounding Magnatone ampli-

fier. Not only was I impressed by how the Copland imbued his voice with real solidity and human warmth, but you should have heard that guitar.

But this luscious tonality, abundance of timbral information and instrumental intricacy will come as no surprise to those who regularly read about tube amps. Neither will the Copland's delicately defined and sweet-sounding top end which let me pick out the breath passing through the flautist's lips amidst an orchestra playing Prokofiev's *Symphony In D*, Opus 25. What surprised me pleasantly was the amp's grip on low frequencies. Benny Rietveld's bass guitar excursions on John Lee Hooker's *Stripped Me Naked* weren't held as tightly as I'm used to with my Naim NAP250, sounding slightly fatter and softer, but were nonetheless firmly under control.

But enough of this hi-fi parlance: does the Copland boogie? If Honeychild's *Too Much Subject*, from their *Information Heaven* LP, a James Brown meets The Pixies kinda number is anything to go by, the answer's in the affirmative. It hadn't the sheer impact and verve of some amps I could mention but it certainly wasn't any slouch



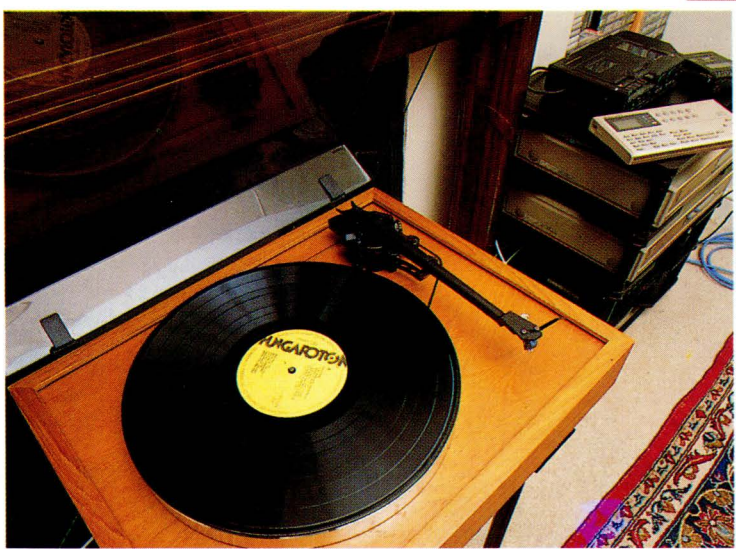
Swedish integrated tube amplification for the design conscious.

when conveying a hard-riffing rhythmic pulse. It gave a similarly enthusiastic appraisal of Blue Print's *M.L.K. . . . Check!* a track whose Chapman stick bass line virtually goes to DC at times. Not the sort of track you'd imagine a small valve integrated enjoying but, as one visitor commented, it showed it off in an extremely favourable light. Negative vibes? The CTA401 isn't a party amplifier: if you want to raise the roof choose something beefier. And it is expensive for a low-powered integrated, even one that's this exquisitely built. But if costs aren't a concern, there's little doubt that it's highly seductive.

Malcolm Steward

Toys for the boys

What happens when an audiophile combines hi-fi with a fascination for computers? Dan Houston is off to see the wizard, with photographs by Chris Richardson.



Tim McNally's Georgian house in East London is a hi-fi and audio-visual treasure trove.

Tim McNally is a 28 year old computer wizard whose Georgian house is situated close to the Bethnal Green Toy Museum in East London and is adjacent to one of the oldest buildings in the area, dating from Tudor times. The house has a Dickensian character, though the paintings, illustrations and prints covering the walls are all modern enough. Maybe it's the presence of the nearby toy museum, but in the four years McNally

has been living here, the spirit of childish fascination seems to have infused him with an unbounded fetish for... kit.

McNally's house is full of electronica; he has seven computers, and a comprehensive range of hi-fi and video equipment, some of which he uses via a computer to access information on his CD-I (or interactive CD) collection. That's in the basement workroom of the 215 year old house. Upstairs on the first floor his

listening room houses a hi-fi which includes the latest Roksan amplifiers, a Marantz CD12, Sony DATman, Pioneer Laser Disc player, Sony Betamax VCR and two Naim stereo VHS machines. Anywhere in between he can use his Sony Watchman ("because I like watching videos on the tube"), or the various CD personals he has collected since their inception three or four years ago. His collection of software is as comprehensively eclectic; he estimates that he has around 1,600 video tapes – two bookcases full. He also has a respectable LP collection – around 1,600, about 700 Compact Discs and as many compact cassettes. Everything is prerecorded – as a collector, the original sleeve and packaging of the product is important to McNally.

Children of a laser god

However, his favourite medium is now Laser Disc. "I bought one of the original Philips Laservision players in the early Eighties when it was first launched and then I bought a Marantz CDV55 when it was re-launched as CD-Video. Both of those systems flopped but I now have a Pioneer dual-standard Laser Disc player (the 1450) and I buy most of my films from the States. There are a couple of shops which are selling Laser Discs seriously in Britain, but in America I have been into places where they have most of the 10,000 titles available. In fact I'm going over there in January just to buy Laser Discs. They are much cheaper in America - about \$25 for a feature film. For an extra \$10 you can buy versions where on the right channel of standard sound you get the director's and actors' commentary which is a really useful way to learn about the film."

Tim reveals that the fascination with hi-fi, video, and audio began before he moved next to the toy museum. "I was the first person I knew who bought a CD player," he recalls. "It was the Philips CD100 and there was a time when there were only about five or six Compact Discs available – and I had them all. But that was quite a while ago and I haven't been able to keep up!

"I started off in 1978 with one of the first NAD 3020s (a classic benchmark budget amp) which I used with a B&O record deck that looked really good although it didn't sound brilliant. That was in Devon where I was brought up. When I came to London I bought a Rega turntable with small Naim amplifiers and then upgraded to a Linn LP12 with Naim pre and power amps and Linn Isobarik speakers. Then in 1986 I saw the light when



Roksan brought out the *Xerxes* record player. I bought one with the Roksan *Darius* loudspeakers which I am still using. I have a *SME V* arm and Roksan *Shiraz* cartridge, I don't think the Roksan arm is quite good enough yet. I was using the system with Bryston amplifiers – the *12B* and a pair of *4B* monoblocks, they're the big beefy, cook-your-dinner-on-them sort of amps which run really hot.

"They never had quite enough bass for my friends though. I have a friend who builds organs for a living, and he's always bringing around organ music and used to be critical of the bass handling in my system. That was before I installed the new Roksan amplifiers which . . . well, have a listen to this."

Organ donor

Tim fetches a Hyperion CD (*Organ Fireworks III*) which contains a Batiste Offertoire played by Christopher Herrick on the organ at St Eustache church in central Paris, at 4.00 am for quietude.

To say that the low notes began to threaten the normal pattern of molecular activity in his living room is an understatement. I am not sure what a low A equates to in terms of Hz, but the rumbling bass seemed to be shaking our individual vertebrae.

"I know people who were there and they say that is how it sounded," says McNally proudly. "I couldn't achieve that with my previous amplifiers."

He likes to work to music, specifically to Mozart, and his basement is wired for sound, albeit of a less esoteric nature than



the listening room. Here a NEC CD-ROM (read only memory) player is wired through his IBM computer and a Yamaha (A4330) amplifier into a pair of Roksan *Hotcake* loudspeakers.

"The CD-ROM machine allows me to play CD-Interactive discs which are a couple of pounds more expensive than normal discs. Apart from the music of the CD you can get an on-screen commentary, the libretto in German and English and a bar by bar commentary on the score as well as information on other issues and

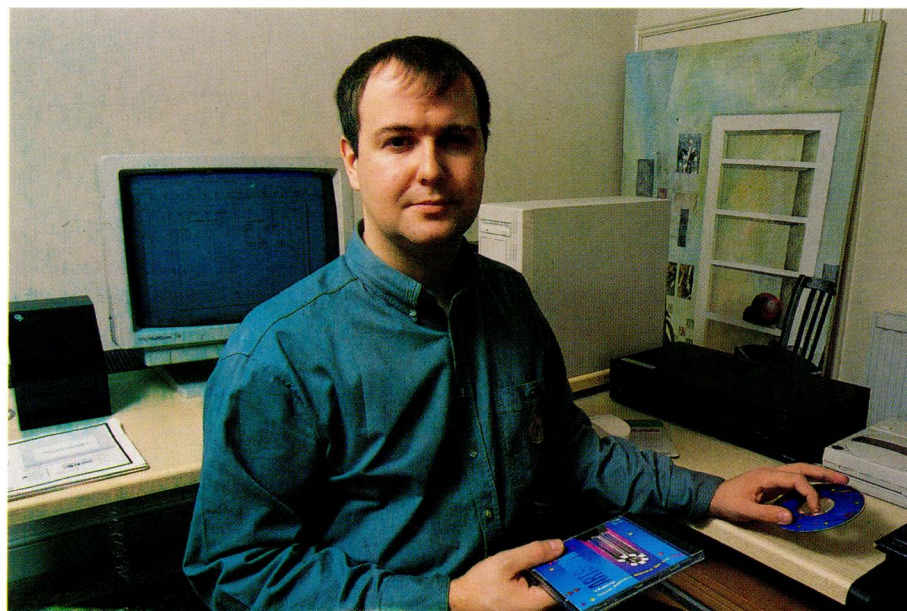
Stacks of Marantz: Tim McNally's CD player, DAC and Surround Sound Processor and (below) the man himself.

background to the music or composer. They're a brilliant way to learn."

Apart from being a lover of Baroque McNally is keen on the modern composers Philip Glass, Michael Nyman and John Adams. His collection is largely classical although his taste in videos spans the likes of the original *Star Trek* series and other cult TV productions.

McNally says he finds himself using CD more than LP and claims that his Marantz *CD12* and *DA12* is one of the best machines on CD now, and I am not going to buy any more records, though I have been forced to do so, especially on the classical side," he says. "When I saw Roksan's new CD player at the Penta hi-fi show I put in an order – I just had to have it, it looks out of this world and I think this new Crystal DAC they are using sounds really interesting. And when Roksan says that CD sounds better, well . . ." he shrugs, presenting a picture of the disciple who changes faith to follow his guru.

As a matter of fact our host says his favourite medium as far as sound quality is concerned is DAT. He has access to some DAT 'masters' which are recorded without any pre-emphasis or tinkering by recording engineers (who are trying to



improve software for cheap and largely incapable hi-fi systems). When he plays James Bowman singing one of Handel's *Heroic Arias* (Hyperion again) and switches between CD and DAT it's hard to disagree with him. The little Sony DATman, which is much cheaper than the Marantz, seems capable of filling the room with Bowman's extraordinary counter-tenor voice which is more lifelike and three-dimensional than the CD version.

DAT copies of masters are hard to come by, however, no matter how good your contacts with the music industry, and McNally admits that buying and using Compact Discs is easier.

"I think there will be a point where the technology is suitably advanced, that what is now considered esoteric in terms of sound quality will be available to the masses. I don't think things like DCC and Mini-disc are going to help that, but as with other technologies you expect the quality to go up and the price to come down. I think that there will soon be room for a CD Mark II offering the best possible sound quality, whether it be 128-bit or whatever. It will probably be like the Red Book (CD standard) and Philips and Sony will probably have to originate it for it to be a success because they have such a stranglehold, particularly on the music side of the business (with Polygram and CBS Sony)."

Thanks for the memory

McNally points out that in the computing world recording densities have risen dramatically, and that equipment has also become faster and has larger memory without great price increases. As a person who seems committed to buying the very latest hi-fi equipment, he is looking forward to a CD which can store vastly greater amounts of information than at present. "The Red Book standard dates from 1984, which is when it reached the retail market, but at the time of research it was the technology of the Seventies. We're amazed by what can be achieved at the moment but by the time it filters through to the marketplace nobody raises an eyebrow."

The next piece of technology McNally is looking forward to owning is a CD-R machine. "I have a large collection of compact cassettes and at Penta I was thinking about buying a Nakamichi cassette deck so that I could have something better than my Marantz (portable) CD430. But then I saw the Marantz CD-R machine and that



money will now go towards one of these when they arrive."

But McNally's 'kit' already provides an almost bewildering set of options over the range of recording media available to the consumer. His surround sound system is plugged into the Roksan amplification with a backup Marantz (SP50) amplifier to power another pair of Roksan *Hotcakes* on the wall behind the two 'listening' armchairs. The holographic nature of the *Darius* loudspeakers is especially suited to films in Dolby Stereo, while the Sony *Trinitron* is large enough to allow films in 'letterbox' format to be played via the Pioneer. The AV toyshelf is just as comprehensive as the purist hi-fi with the LD player in pride of place in

You don't have to turn on the red light — despite a lot of Roksan amps (above) and a TV leading a shuttered existence.

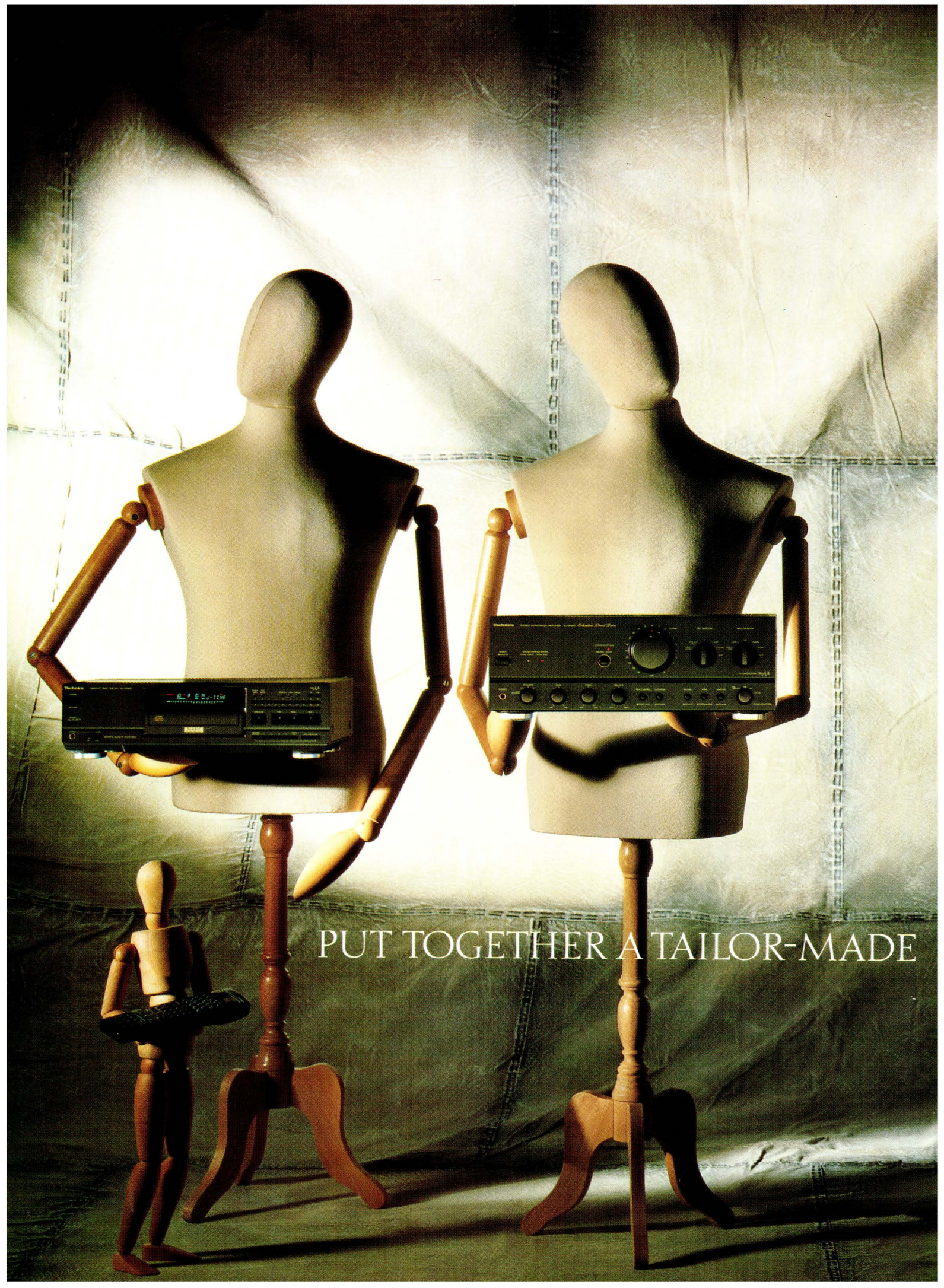
spite of the huge VHS tape collection. "If I record I still use a Sony Betamax, because that was the best format for tape," McNally said.

"I suppose LD-R (laser disc recordable) is the logical development, it's only a matter of recording density," he adds wistfully. It's pointless to ask whether there will be room among the Roksan hi-fi for such an extra box of tricks; I think our host is competing with the nearby museum. His late 20th century collection of audio wizardry and gadgetry reflects the multifarious directions of both the hardware and software industries at present.

The System

Roksan *Xerxes* turntable
 SME V Series tonearm
 Roksan *Shiraz* cartridge
 Marantz CD12 and DA12
 Marantz CD430 cassette deck
 Sony *DATman*
 Roksan amplification
 Roksan *Darius* loudspeakers
 Interconnects and speaker cable from Isoda
 Roksan *Hotcake* loudspeakers
 Pioneer CLD-1450 Laser Disc Player
 Marantz SP-50 Surround Sound Processor

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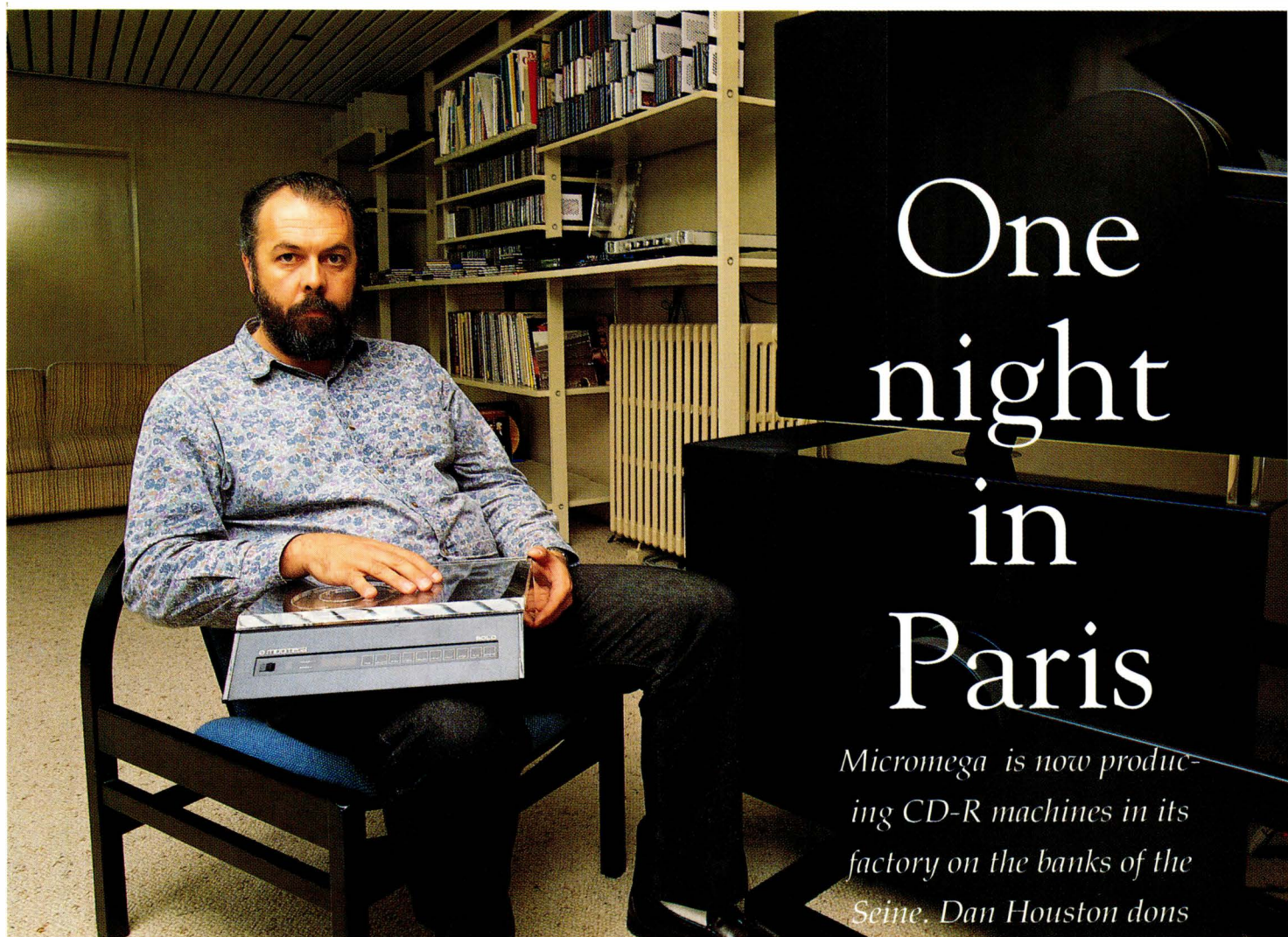
But however you put them together, all our remote controlled components can be operated by the SH-R500 remote. (In fact it's so versatile it'll control most makes of TV, video and satellite as well.)

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One night in Paris

Micromega is now producing CD-R machines in its factory on the banks of the Seine. Dan Houston dons

his striped jersey and beret and investigates, while

Chris Richardson carries the camera and onions.

The Micromega factory is situated on a peaceful stretch of the River Seine at Conflans St Honorine, on the North Western outskirts of Paris. It's a small factory but, as they say, almost perfectly formed. The workforce of 16 includes the founder – 41 year old Daniel Schar and his wife. There are several workshops, an assembly line, plush listening room boasting Goldmund amplification and speakers and a couple of offices, all housed in old stables and buildings around a courtyard. The Scharns and their two teenage children also live here, in a house which overlooks the courtyard and the river.

The perspex lids for the top loading CD players are all made here as are the perspex fascia panels and extruded aluminium casework. A workshop full of lathes, drills and bench saws is used for primary tooling while the more precise work of drilling the fascias for switches and LEDs is done with the aid of jigs in a machine room nearby. Four women work

As you read this the representatives and distributors of Micromega should be hot-footing it around Europe showing off the world's first consumer CD recordable machine. The *Solo R* is a Philips-made £3,500 unit incorporating SCMS (solo copy) technology which allows it to be sold on the open market.

It looks as if CD-R machines will be the talking point among the deeper walletted audiophiles over the next couple of years. In issue 101 of *Choice* we found that the (same design) Marantz machine copied discs in the digital domain which sounded better than the original mass-produced CD. Marantz is one of four or five companies producing CD-R machines at present. The problem with the Marantz is that the player is only being sold to studios or radio stations: the professional market. At the time of writing the other companies, Mission, Studer and Meridian had yet to announce their players and Micromega claims it will have a four month lead in this new marketplace.

CD-R itself isn't new, and *Choice* has covered its development over the last two or three years, but this is the first time anybody can buy the (admittedly expen-

sive) machine and copy their CDs, perhaps better than 'perfectly', at a cost of around £12 each for blank discs. Micromega is selling the discs through its own dealers to keep prices down. Eventually, depending on how accurate a five year forecast can be, it claims its CD-R machines will cost only 20 per cent more than normal CD players. Philips told us that its first CD-R player should be expected at the end of 1992, cost £1,500. By then Micromega expects to be producing second or third generation machines. When we visited the Micromega factory recently we were told about the 'all singing all dancing' CD-R machine which will incorporate a dedicated RIAA stage to cater for audiophiles who wish to convert their record library to CD.

A whale of a relationship

Micromega's relationship with Philips resembles that of a remora fish swimming beside its gigantic whale host. But then Philips makes OEM equipment for many CD player 'manufacturers'. Micromega uses Philips parts in all its transports and DACs, which start with the 'budget' (£500) *Logic* and end with the high-end-club-only £4,500 three box *Trio*.

in the board stuffing room where PCBs arrive from the wave solder machine; the Micromegas are put together by another team of four in the assembly room across the yard.

The first thing one notices is an almost tranquil sense of ease to the place – the lazy green river forms a backdrop to everything and it's difficult to imagine panic breaking out; a ringing telephone just doesn't sound urgent. But the tranquility belies a smooth operation. This is a company that boasts a £2M turnover, and, if the CD-R machine is as good as promised, it's a company which is right on the cutting edge of things.

Known by his company

Schar set up Micromega using an off-the-shelf registered name in 1984 with partner Gilles Milot. At first they made the LEEDH brand of loudspeakers, the lengthy acronym standing for the Laboratory for the Study and Development of Olophony (three dimensional sound). The pair parted in 1987 and Daniel kept the Micromega name to make CD players.

In the Seventies he had worked as a recording engineer after graduating in Mathematics from Grenoble University in the South East of France. He remembers using Mark Levinson amplification at home which led to a meeting with the celebrated American designer. "We got friendly and a couple of years later, in 1978, I went to work for him in Newhaven in Connecticut," Schar recalls. He describes his work for Levinson as "organising the engineering side of things, and making sure that projects were completed on time".

He blames Ronald Reagan for the failure to acquire the fabled 'green card' work permit which led to his return to France in 1981, after which he worked for the distribution company Harman until he teamed up with Milot. "He was the designer. My job was running the company," he says.

Schar employs two design engineers now, but is very much involved with the design process himself. When we met he had just completed the two day task of designing a new digital to analogue convertor - the £300 *Le Microdac*. Its cigar box dimensions and black lacquer finish complement the designs of the three top loading CD players in the Micromega range.

"I believe in the global approach to design," he states rather grandly. "And I never design for one specific function. There are two points to design: first – there is no such thing as a perfect product, and second – therefore everything is a compromise. So my goal is not to make an



uncompromised product, which is what many people tell you they have done; I just try to make something for a certain price point with the best possible compromises in every aspect."

He relates this philosophy to the original idea behind the top-loading CD player. "There are several reasons we do this. We can have the mass in the centre and so stabilise everything, and there is no clamping device to hold the CD; it's held by the mass of a weight. Clamping a CD by an arm or magnetically isn't the answer. For

"We can use the basic Philips chip sets to more advantage": Micromega staff assemble components in the Paris factory.

example an arm generates mechanical feedback through the suspension and a disc is very light and can vibrate easily. By putting mass in the centre we can damp it down, and remove feedback because the mass is moved by the motor itself.

Drawers of perception

"People seemed to go for the drawer mechanism and stick to it, but I think there is an aspect of music which is very important. With LPs music lovers had a sort of ceremony with the record deck - taking the LP carefully from its sleeve, putting it on the platter, clamping it or cleaning it and then carefully lowering the arm onto the lead groove. You never had that feeling of being ready for the music with a cassette. And CDs are like that. There is no mental preparation for the pleasure of music. I wanted to bring that kind of involvement back."

Schar wasn't always keen on CD players, but he says that the early machines were so badly designed in terms of basic physics that he felt he could do better. "A couple of things really shocked me when I first looked inside a CD player," he relates. "For a start the pure analogue part was almost nothing at all - just a couple of ICs (integrated circuits). But also everything that had been done in the last ten years by turntable manufacturers – the use of precision bearings, or damping materials – had been disregarded. It looked as though all the physics had changed with digital, and nobody seemed





to care about mechanical concerns like mass. We didn't even have to go deeply into digital technology to be able to improve on existing designs."

Apart from using the clamp, which allows the user to view his spinning disc through the perspex cover (but not to take a flash photograph if he doesn't want it to skip), Micromega is also involved in striving to make the electronics inside perform better. Schar explains that when Micromega designs a printed circuit board it is aiming for different criteria to Philips. "They have a position in the market where they have very specific goals to achieve. They can only use 50 per cent of their technology because of that.

"We can use the basic Philips chip sets to more advantage. For example the 7321 D/A chip was designed to have few components around it but we put many external components around it – our own secondary analogue stage, our choice of clocking system and so on. That makes our player expensive. Take a Philips player, most have one simple transformer for everything. From the *Leader* up our players have different power supplies for both digital and analogue sections. We use specific regulators for each function where Philips would use a common power supply with transistors and capacitors to split the functions."

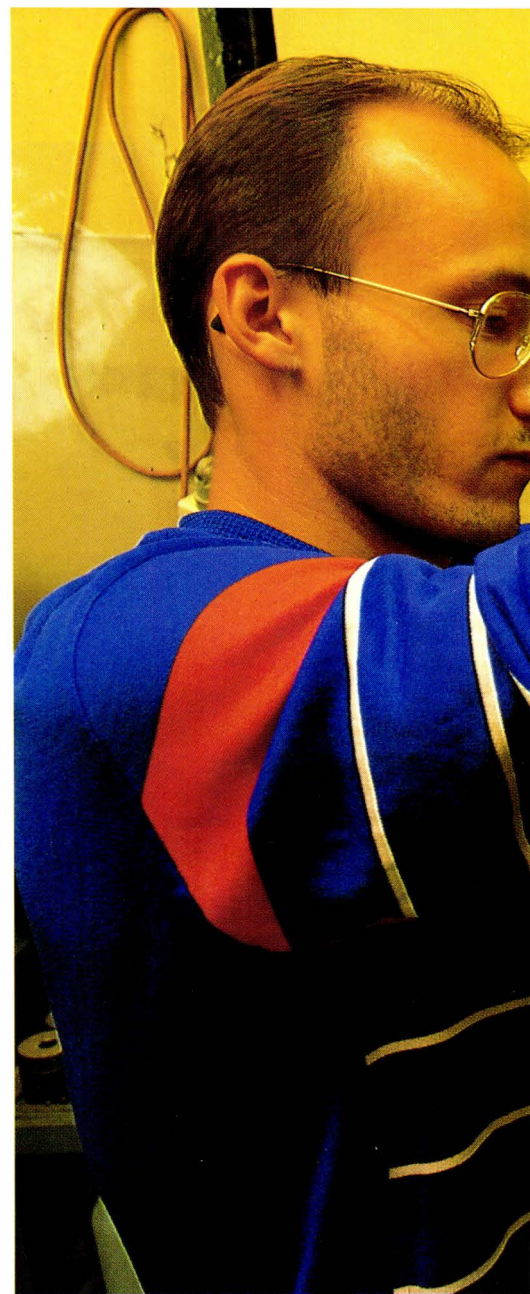
It's starting to look as though Monsieur Schar can make a CD player better than the inventor. Does Philips have anything to learn from Micromega I asked him. He repeated that Philips were tied by budgetary restraints and then told me to ask them.

I did so and a spokesman confirmed his answer; the remora enjoys a privileged but dependent lifestyle. "However our engineers are also in the business of supplying expertise, and we're always talking to people like Micromega so it is a two way thing," they told me.

Deciding to disturb the tranquility I then asked Schar if his work was mere tweaking. "No, no, no it's not that. It's a total re-design," he asserted rising to fetch me the innards of a *Leader*. With hand signals that do credit to any Gaul he explained the workings and reworkings of the design satisfying me that capacitors, ground planes, (two per cent) silver soldering and the likes of the Yamaha demodulator were from the Conflans St Honorine and not Eindhoven ideas bank.

French polish

His approach to design is audiophile in nature. He is in the business of separating and simplifying signals, keeping digital and analogue functions apart and running everything to good ground points, or star earthing. "Everything is common knowledge," he concedes, "but to put it together is not common. There is no black art here, we just try to make equipment that is revealing of the record (CD). And it's important to realise that. You can't say a piece of equipment sounds like music – that's nonsense, nobody is listening to music, they are just listening to the reproduction of recorded music. The purpose of audio equipment is to bring as much of the record as possible to the listener. We don't have to care what the record sounds like – that's the recording engineers', mu-



"It's a total re-design." Micromega employees customise digital hi-fi technology.

sicians' and conductors' business. We shouldn't touch that. We should make equipment which shows that when a record is terrible, it sounds terrible.

"The only way to improve equipment is to try to make it more transparent which means that you will hear larger differences between instruments, and tone values, an increase in the range of colours, which means you are getting closer to the source. Some manufacturers are making poisoned equipment which colours everything. It's like looking at the world through blue glasses."

This passion for the pursuit of excellence reminds me more of analogue audiophiles, from Professor Keith O Johnson in San Francisco (Reference Records) to Ken Shindo in Shindo Labs Tokyo, who rail about digital as an inferior and hyped-up medium. I suggested that the way to audio Nirvana was via the



analogue medium, which has inherently better dynamic and frequency extension characteristics than CD.

"I don't know about that," he admitted. "But the warm rounded analogue sound is part of our culture and that's a fact. When you listen to a master tape the first thing you notice is how bright it sounds—the rounded sound of the record wasn't there. I think some people's feeling for analogue must be from the culture rather than the present perception. It's like city people going to the mountains and complaining that the clean air is burning their lungs. It's also true that there is not one set of measurements that correlates with the listening experience."

Schar concludes our interview by talking about the future developments for CD sound, saying that almost every area, from transports to sophisticated clocking techniques for improving jitter, could be improved. Micromega will no doubt be leading the trends. But I suspect that the French remora fish will be swimming close to the Philips whale.

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Reference marks

What does 'audiophile recording' mean to you? Does it conjure up visions of records of sound effects and music chosen principally for its impressiveness? I hope not; and J Tamblin Henderson ('Tam'), president of Reference Recordings, would doubtless agree.

Reference has been around now for 15 years, making it one of the elder statesmen of audiophile recording, and in that time the company has built up a strong reputation, not only for its high technical quality, but also for the high artistic standards it sets.

I went along to a Reference recording session in Watford Town Hall in August, to observe the Reference Recordings team at work and hear the Royal Philharmonic Orchestra record works by Robert Farnon, under the composer's baton.

In a room behind the Town Hall stage, the recording team was already in action when I arrived. But where was that indispensable item of modern orchestral recording equipment, the colossal mixing console? Of course, silly me; Reference Recordings has these funny ideas about complex equalisation and fades not being necessary, so the mixer consisted of a mere handful of rotary controls and a few

Vinyl may be on the defensive but there are still companies devoted to high quality recording. Richard Black lends an ear.

switches on a small instrument case. And indeed, why should one wish for more? The balance of the symphony orchestra, and the tone of the individual instruments, have been arrived at empirically over tens and hundreds of years, and it is a perfectly reasonable premise that they need no 'help' from the recording engineer.

The proficient Professor

Most prominent among the equipment were a pair of Snell *Type B* loudspeakers and the famous Keith Johnson tape recorder. 'Professor' Keith Johnson is the engineer for Reference Recordings, and he has built or modified all the recording equipment he uses. He is also responsible for various designs in the fields of domestic and professional audio, and is in every way one of the senior figures in American

audio. He took a few minutes away from a well-earned tea break to show the equipment to me.

"This tape recorder I built in 1965, and I've been working on it ever since. It uses focussed gap head technology with a bias frequency of 3.5MHz and has a closed loop transport. It uses quarter inch tape running at 15 inches per second, and there's no erase head as we only ever use virgin tape. Not bad sound for a 25 year old machine, eh?" Not bad at all, although Johnson is certainly preaching to the converted there. I noticed that the tape in use was TDK *GX-50B*, which disappeared from this country so long ago I had almost forgotten what a reputation it had with audiophiles for its sound quality.

What about digital recording? "We run two parallel recording systems, analogue tape for the LP and digital tape for the CD, so as to retain the respective advantages of each medium right down the chain. The digital recorder is based on a Sony *PCM701*, but the original Sony is only doing some data formatting and providing the display. Analogue to digital conversion is done outboard." Johnson waves a hand at a small box full of very obviously one-off circuitry. "The data is re-

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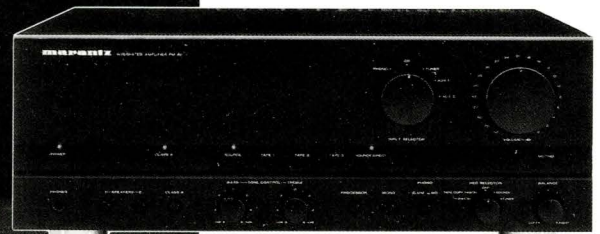
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corded on a Sony U-matic video recorder, as per the professional standards. Perhaps by the next recording session I will have replaced the rest of the *PCM701*.

"In order to keep the analogue and digital chains completely separate and prevent any interference, a buffer amplifier drives each system, from the stereo feed derived 'live' from the mixer. This mixer is passive and has no tone controls, although there is in fact some subtle equalising within the microphones. Because different frequencies are attenuated at different rates in air, the microphones are all calibrated for the distance at which they are working from the sound source. The signal from each microphone comes out at line level and is treated as flat amplitude from there on. These microphones are modified Sennheisers, an old model from the Sixties using frequency modulation to derive a signal from the capsule; that's intrinsically quieter than normal capacitor microphone amplifiers.

Decca the halls

"The microphone set-up we are using here is similar to that used by Decca in years gone by. We've basically got a pair of directional microphones mounted centrally, and two pairs of omnidirectional microphones flanking the orchestra. In addition, there are two ambience mikes right at the back of the hall, and for once we've used a single pair of accent mikes on the percussion. Ten in all. Most of what you hear comes from the main pair, though."

I was able to hear a little of the orchestra in the hall, followed by some of the reproduced sound in the control room. Given that the control room had the usual woeful acoustics that recording crews have to learn to put up with (they'd had two days to do so, at least), I was still able to tell that the recording had the familiar Reference Recordings virtues of wide bandwidth and dynamic range and an unusual degree of clarity. A few days later, in more relaxed surroundings, I met Tambllyn Henderson to talk about the history of Reference Recordings.

"At the time we started, the era of multi-miking and multi-track recording was at its height, and I felt sure we could do just a little bit better. Funnily enough, when digital recording first came along, standards generally rose as it was no longer possible to record in multi-track, and everybody had to get back into live mixdown. But of course Mercury were doing much what we were, many years earlier: recording with only three micro-

phones. Many of those old recordings have a presence which is very attractive. We do hope to reissue some old recordings from Mercury and other labels on LP only." LP only? In the current digital witch hunt against vinyl? "Well, yes, Keith Johnson and (half speed mastering expert) Stan Ricker are co-operating to assemble Reference Recordings' own cutting facility, so we will have total control over that aspect, and we've been involved in discussions with Philips, which now owns the rights to the Mercury label. Philips is reissuing a lot of back catalogue on CD, but we — and Wilma Cozart Fine, who was behind Mercury almost from the beginning — feel that at least some of the titles should be on LP too."

But is the issuing of LPs still viable? Can Reference Recordings still get lac-



A reel man: Keith Johnson and his legendary tape recorder.

quers and pressings? "There is one manufacturer of lacquers in the States, so at least we can get those. As for pressings, we used to use JVC in Japan, which made fabulous pressings — flat, on centre, incredibly quiet and with a great sound. They went out of the LP business a while ago, and after searching the world we now use Record Technology in southern California. We tried having some pressings made on Teldec vinyl, which was a little quieter than Record Tech's, but it had a soft sound which we didn't like. We even tried having some pressings made by Polygram in Korea, but they weren't brilliant. A few of our titles were cut using the DMM system when we couldn't get decent lacquers, but ideally we prefer lacquer cuts. DMM has limita-

tions on deep grooves, so you have to mono the bass somewhat.

"We know that once either the supply of lacquers or the source of pressings disappears we will have to stop making LPs, but we hope it isn't for a while yet. We've done a lot of work on digital recording, and we think our CDs are better than most, but digital has many problems. At the sessions we can listen to the microphone feed, the output of the analogue recorder and the output of the digital deck, and the digital simply isn't as good. I believe the digital standard was decided prematurely, and unfortunately, a new, higher specification standard is very unlikely for the next several years at least. As far as I can discover, the biggest single problem with digital is the sampling rate. It should be a lot higher in order to make the output indistinguishable from the input. I don't even like the ergonomics of CD. I want a nice big album with liner notes you can read!"

I wondered how many changes there have been over the years in the Reference Recordings session setup. "It's expanded a bit. In the old days we could get everything into the back of a car and drive to the session, whereas now we need eight packing crates — of course, we've added digital equipment to the original analogue. The mixing desk has been expanded to accommodate twelve pairs of microphones, although we've never used that many. We use as few microphones as possible, perhaps only a three-point setup with two spaced omnis and a pair of cardioids. In Watford we had the most mics we've ever used on an orchestra. It's a cross between absolute purism and pragmatism; purism is fine in ideal circumstances but you can't spend forever setting up with an orchestra waiting."

We'd spoken about what Reference has done and is doing; what does it hope to achieve in the future? "I get very tired of audiophile records that have nothing to say musically. I'm very excited about the recordings we've just made of Farnon and Arnold, recording, for the most part, music that hasn't been available before, and with the composers themselves directing.

"That's what I want to do, record music that needs to be made available, and do it to the highest standards so as to capture what I call a three-dimensional sonic event and put it on a pedestal, so that one can hear it under the best possible circumstances. Those are noble goals. We don't always meet them, but that's what we're striving for."

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21st Century Fox

Mrs Dale used to write in her diary that she was 'worried about Bill'. Well I'm getting worried about the DCC launch.

Polygram already looks all set to do the launch of DCC no favours. Commercial Director Dieter Radecki recently said that prerecorded DCCs will cost the same as a "premium priced compact disc".

He explains that he has in mind a shop price of around £11.99. Actually this is a pound or so less than a lot of the prices I see being asked for premium CDs, but let that pass. What matters is that pricing DCC software at the same level as premium CDs, and thus well above the price of musicassettes and mid and budget price CDs, looks like a pretty good way to kill the new format before it even begins to take wing.

"We are talking about the launch," stresses Radecki. "We hope they will get cheaper after that, as CDs did".

Did they really?

Radecki says he came over from Canada, where he was based at the time, for the CD launch back in 1983. He remembers that the price of CDs was then £15.99, and they have got cheaper since. Well that is not what I and a lot of other poor long suffering members of the record buying public remember. Exactly the opposite in fact.

A new digital format is being launched while consumers are still paying ridiculous prices for CDs. Barry Fox ponders what is in store for us with Digital Compact Cassette. . .

Just a few months before CD was launched, the target price for discs was around £8. This was because Jan Timmer, then boss of Polygram and now boss of Philips, wanted CDs to be as close in price to vinyl LPs as possible.

When CD went on sale, shop prices were £9.99 (and players £500). Although player prices soon fell, disc shortages and demand soon pushed the price up to £11.49 and £11.99 including VAT. Different record companies charged different trade prices ranging from £5.25 plus VAT (Polygram) to £7.29 plus VAT (CBS). By the end of 1985 trade prices ranged from £6.70 to £7.29 plus VAT. If Mr Radecki will check his own company's records he will find that the trade price for Polygram's classical CDs rose from £5.75 to £6.25 to £6.79 and popular CDs rose from £5.25 to £5.75 to £6.79.

It really is very worrying to discover that Polygram is basing its DCC launch price policy on head over heels history, especially as Philips is planning to charge £250 to £300 for the first DCC home hi-fi deck. Meanwhile Philips talks of a 'huge' launch party for DCC next April 30th, in France. This party will be tied in to the launch of the Euro-Disney theme park near Paris. Yes please. But Philips has been saying that this launch party is timed to coincide with the tenth anniversary of CD. If so, someone should check their diaries. A launch party in April 1992 would com-

memorate only the missed launch date for CD, which I doubt is what Philips intends.

Philips first announced the idea of CD (then a 14-bit system) in May 1978. The first demonstration of CD (still 14-bit) was given in Eindhoven, in March 1979. In October that year Philips did a deal with Sony to pool patents on optical disc technology. After a tie-up with Sony on CD in June 1980, Philips announced the final format (16-bit) in October 1980. In January 1981 Matsushita (Panasonic/Technics) backed CD, virtually sealing its long term success, because once giant Matsushita makes a move all the smaller Japanese companies feel safe to follow.

World music

In April 1981 Philips, Sony and Polygram hosted a party in Salzburg to announce plans for a world market launch for CD. The plan was to have CD players and discs in shops in Germany, Holland, France and Britain before Christmas 1982.

Both Philips and Sony repeatedly made this pledge. But Philips ran into trouble with chip production and Polygram had terrible problems pressing discs.

In March 1982 Philips held a press conference in Paris at the Festival du Son, again promising a CD launch before the end of the year. But by August 1982 Hitachi and Sony were saying that they had their chips and players ready for a Christmas sales launch, but Polygram's factory at Hannover in Germany could not produce enough discs to back a launch.

Relations between Philips and the Japanese soon hit an all-time low. The CBS-Sony pressing plant in Japan was producing discs, but not enough to support a European launch. Polygram claimed to be making 20,000 discs a day, but at the Dusseldorf hi-fi show in autumn 1982 the large number of sample discs on display turned out to be unchecked pressings which Polygram classed as unplayable dummies. Polygram was at the time charging manufacturers \$100 a time for playable discs.

In the UK Polygram was making an appalling mess of the situation. When the Hannover factory officially opened in August, no one from Polygram UK even bothered to attend. Two British journalists went, but only because they had received personal invitations from contacts on the continent, over the head of Polygram UK.

The Japanese launch went ahead in October 1982. But the European launch was held over until March 1983. Sony got in first, with players in shops from the first day of the month. Philips followed through with several full page advertisements, for example, in the *Times* on March 3rd. This, incidentally, was the classic advert which promised "Pure, perfect sound that will last for ever. (We mean eternity)". This daft slogan, which apparently came from some advertising whiz-kid in Eindhoven, promptly proved an acute embarrassment, and was soon dropped. Nothing is perfect and nothing lasts for ever, especially not the first players and discs to hit the market.

All of which still leaves the puzzle — what tenth anniversary would a DCC launch party on 30th April 1992 commemorate?

Does anyone, inside or outside Philips, know?

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Father Christmas may have returned to the North Pole for another year but the Hi-Fi Choice gnomes are still madly distributing presents. This month, a bag full of Audio-Technica goodies including three pairs of the company's new ATH9000 electret headphones, four pairs of ATH911 dynamic headphones and eight sets of high quality PC-OCC interconnects. Plus 12 other pairs of headphones and 18 sets of cleaning equipment. All you need to do is answer the questions on the opposite page . . .



How To Enter

Our simple hi-fi quiz requires six answers which must be written on the entry form provided. Fill in the form, remembering to include your name and address and send it to the address shown in bold type at the bottom of the form. Mark your envelope **Audio-Technica Competition**.

The Prizes

The first three correct entries drawn from our mailbag after the closing date will each win a set of *ATH9000* electret headphones (£245). The next four correct entries win the *ATH911 Sovereign* dynamic headphones (£119). The next four get the *ATH-U5* under-headphones (£39), the following eight a pair of *ATHL1a* headphones (£19.95), the next eight each receive a set of *AT620* PC-OCC interconnects (£25.95), the eight after that will win an *AT637* electronic stylus cleaner (£22.95). Finally, the last ten winners will receive free *AT6078* laser lens cleaners (£16.95).

The Questions

Please write your answers in the space provided on the entry form.

1. What turntable did Tim McNally upgrade to after his Rega?
2. Name the two DACs in this month's review which come from an American company called In-Concert.
3. Which legendary sound engineer is known as 'the Professor'?
4. Who designed the Sequerra *MET 7/II* speaker?
5. Barry Fox is writing about a new digital format this month. Which one is it?
6. What kind of stylus is fitted to the Denon DL103?

Entry Form

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Your answers:

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- 2.....
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- 6.....

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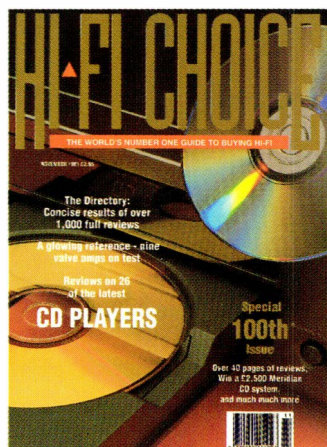
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Readers Write

CHOICE ANSWERS

Harbouring a grudge

My hi-fi system consists of a Philips CD960 transport and DAC, Cyrus 2 amp and KEF 104/2 loudspeakers, it's connected together with the more expensive Audioquest cables. The sound feels a little boring and not as good as my previous set-up.

There is so much top end equipment on sale here that it all becomes a little confusing. The question is, what in your opinion would be the best way of upgrading my existing equipment?

Frank Tokin, Hong Kong.

P.S I haven't ruled out the option of depositing the entire system in the 'fragrant harbour' and starting again!

The Philips CD960 DAC was not available in this country so it's difficult to say how good it is, but the chances are that more recent DACs would sound more interesting. Depending on your budget there are a variety of alternatives you could try. Start off by listening to the Meridian 203, Micromega Duo BSII and the Deltec PDM1, which all cost around £500 in the UK.

The next step is less obvious. Both your amp and speakers are



Save your system from the depths with Micromega's Duo BS.

good components and capable of giving impressive results in the right surroundings. The 104/2 however, is inclined to react to different environments unpredictably and it could be that you would be better off with another loudspeaker. Some models to consider are the B&W 805, Castle Chester, Yamaha NS1000M and

the Audio Note AN-J. Priced between £600 and £900 these are all potentially interesting loudspeakers that you should audition.

If all of this fails, chuck the CD player and your discs into the briny, purchase a half decent record player and spend the rest of your days sniffing out vinyl!

Digital audio gratification ahoy

My system, Aiwa XC-700, Audiolab 8000A, Cyrus 782 (re and bi-wired), has an appealing frequency response, and great speed and attack. But the thing I find irritating is that it sounds like a very good hi-fi instead of real music. I want it to image more effectively and create a better sense of presence, and I

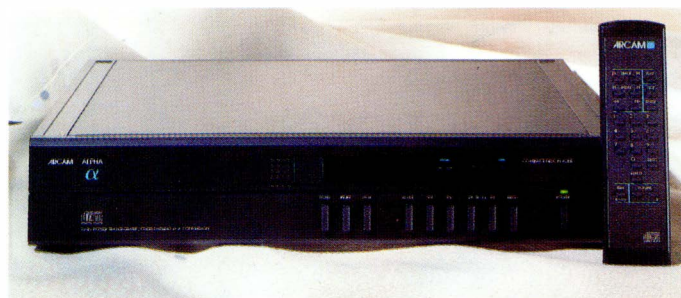
want some emotion. What should I do? Carl Whiten, Alverthorpe, Wakefield.

Er, get yourself a record player . . . no, no a better CD player will probably do the job. The burning question is, which one? You're just going to have to

listen to some of the better players on the market and decide for yourself whether they have what it takes. Affordable models that are well qualified for the job must include the Arcam Alpha (£420), Pioneer PD-8700 (£300) and of course this season's favourite, the Rotel RCD-965BX (£300).

There are, of course, plenty more highly rated players and transport/DAC combos around, but they do cost quite serious money.

However, if long term digital audio gratification is your goal then it might make sense to buy a separate DAC now and save up for a matching transport. A couple of DACs that spring to mind are the latest Meridian 203 (£560) and the Audio Alchemy DDE (£376).



If you're talking about communication, the Alpha's your man.

Smear tactics

For the last couple of years my "Buy British" system has been made up of a Cambridge CD2, a Musical Fidelity A1 amplifier and Linn Nexus speakers, bi-wired with Linn K20 wire and sited on dedicated, sand-filled stands.

In general, I like the tone and fluidity of the music that these black boxes produce, and the midrange detail is excellent, but with complex music it tends to break down, with obvious smearing and loss of detail in the bass and lower midrange.

I assume, perhaps wrongly, that this problem emanates from either the CD2 or the speakers and I wish to alter my system accordingly, without upsetting the fluidity of the amp. Given £600 to play with, how do you think I could most effectively solve the problem. Would a change of cables bring about worthwhile improvements? My listening room is of average size and I listen equally to classical and rock music at reasonably loud levels. Ian Bailey, Guildford, Surrey.

We would agree with your diagnosis of the problem, and suspect that the loudspeakers are the primary culprit. The cable is probably not helping either and could do with upgrading, but, starting at the expensive end, some speakers that you should audition include the Epos ES11 (£300), JRT AD1 (£500), Tannoy 609 (£250) and Linn Helix (£357).

Try as many of these as you can in the context of your amp and CD player, listening out for suitable cables at the same time.



Epos ES11s standing tall.

Sticking with the devil you know

Some years ago I assembled a hi-fi system comprising the following items: Technics SL1100 turntable, M63 cassette player, SU3200 integrated amplifier and SB-X5 speakers.

I now have two requirements on which I would appreciate your advice. I wish to add a CD player to the set up soon and have to decide what price level I should pay to suit the system and whether or not to stay with Technics for compatibility.

If I decide to start updating the whole system where should I start? Which are the weakest links and what sort of budget should I set for individual items or in total, to maintain at least the same standard but using more modern equipment? Michael Lagna, Bracknell, Berkshire.

It is not necessary to use a Technics CD player with your system. Almost any player will work reasonably well and we'd

suggest you go for a Best Buy model at around the £200 - £250 level. Models that fit this bill include the Marantz CD-52 and the NAD 5425.

As for upgrading your system, we would advise you to start with the loudspeakers and work backwards through the system using the same sort of procedure that we've outlined for CD player selection.

Then go and listen to some combinations at your friendly local dealers' shop.



Going under

It must be 20 years since I last dived into the hi-fi pool and nearly drowned. This time I was much more cautious and made my way very carefully to the shallow end and put one, just one, toe in the water. However, I still seem to be going under!

My budget changes with every review I read and my head's spinning at 78rpm (if you'll pardon me), but I've managed to arrive at a selection of apparently suitable components. What do you think of this lot? Aiwa ADF810 CD (er, this is a cassette deck - Ed), Technics RSD-X606 cassette, Sony STS-370 tuner and a Rotel RA 930AX amp. What would be the best speakers to get? Could I use my old KEF Cadenzas? If so, I could afford a turntable now rather than waiting until next spring. Which turntable should I get? Whose cartridge? How about replacing the Rotel with an Arcam Alpha 3? And would the Kenwood DP-5030 be more suitable than the Aiwa?

Eddie Vaughn, Aylesbury, Bucks.

Rubbish in, rubbish out!

I am an avid reader of your magazine and to use your own words a follower of the 'Theory of Precedence', namely that the source is of greater importance than the amplifier which in turn is more limiting to the final sound than the loudspeakers. But there is a great misinterpretation of this being put about in nearly every shop I visit and in many of the articles I read.

How often has the music lover been told that the greater part of his/her budget should be spent of

the source, less on the amplifier and less again on the speakers? It certainly sounds familiar to me and seems to agree with the philosophy of 'rubbish in, rubbish out'. However, there is a fundamental flaw here, for sound quality and money spent are only loosely related and having a 'very good' source paired with a 'good' amplifier does not automatically mean you should spend X on the source and half X on the amp. Listen out next time for the subtle change from the relative impor-

tance of the links in the chain to the money that should be spent on each as a proportion of the total budget and remind yourself that, especially in hi-fi, more does not always buy proportionately better. There are many 'good' sources that cost less than many merely 'average' amplifiers or speakers. Dr A. Dow, Leicester.



Whoah there Eddie, there's no need to whip yourself up into a frenzy, after all it's only audio equipment you're buying here. To be frank, you'd be better off going down to your local dealers dem room and listening to a few records. But that would be too easy so we'll add our threepence worth of advice to keep things on the right track.

It looks like you've got around £1,000 burning a hole in your pocket and a whole bunch of media to cover, which is firm Best Buy country. So, starting with the easy bits, we'd recommend a Denon TU-260L (£100) tuner, a Yamaha KX-250 (£150) cassette deck, the Marantz CD-52 (£200) disc player and a Marantz PM-40SE (£240) amp. Which leaves, what, £310 for some speakers or a turntable.

See how the above kit works with your KEFs and if it boogies, so to speak, then go for a turntable. Try a Systemdek IIX/900 (£200) fitted with a Moth (£95) arm and an Arcam C77Mg (£30) cartridge. You won't be disappointed.

But at the end of the day, if you hear a set up that turns you on down in the dem room, then that's the one to go for even if it isn't choc full of products that magazines recommend.



The beast that started the theory, Linn's revered LP12 Sondek.

You're absolutely right Doc, but what about the components that break the rules? Choice's ex editor, John Bamford, has a pair of gargantuan six or seven grand Townshend Sir Galahad loudspeakers that make totally awesome noises with ridiculously basic ancillaries of the £250 Pioneer variety. And there's the Audio Note Ongaku, which can make a sympathetic but otherwise only 'Very Good' system sound 'Excellent + + + + +'. There are always exceptions, I guess.

The one-bit to look for



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What price DCC?

In last month's issue we asked you to write in about the prices being touted for DCC, the price of CDs or any other software related topics. Each month we'll publish a selection of your replies and award a record token to the sender of the best letter. Send your views to *What Price DCC? Hi-Fi Choice, 14 Rathbone Place, London W1P 1DE.*

Nationalise the record companies!

The price quoted for DCCs is simply too high. How can we pay as much for DCCs as we do CDs when they offer inferior sound quality? How can a DCC be £12 when the same price is considered too high even for CDs? In this country you just don't get what you pay for. Distribution is so bad that it takes two weeks to find a Mary Black CD. In Japan

each and every record shop stocks a range of CDs that would give Tower Records a run for its money.

The prices of older titles in Japan are better as well. I thought that as albums get older and

become less popular they become cheaper; at least, that's what happens in Sainsburys and at the local chippie.

If Philips and the record companies don't get their act together DCC will never succeed and people might start going back to good old vinyl. (Nice thought,



Money For Nothing could well be one of the first DCCs

but I doubt it — Reviews Ed) After all, it's cheaper and offers better sound quality.

I've a few unrealistic, but ingenious solutions to the distribution and price problems in the UK.

- A) HMV sells artists whose names start with A-K and Our Price covers L-Z.
- B) WHSmith and Woolworths sell *Now that's what I call fab music* etc.

C) Sell discs without those silly jewel cases.

D) Nationalise record companies and call it BM (British Music)

E) Let the Japanese economy take over record companies for better management.

F) Lower VAT, charge more for esoteric hi-fi.

G) Sell only vinyl.

H) Give priority to *Hi-Fi Choice* readers.

Koji Kiyokawa, Allestree, Derby

Home taping — going for a song

I am writing this letter in response to the points raised in the editorial comment of issue 101. First, I would like to say that I agree totally with your assessment. I would like to add that a taping levy not only hits those using cassette for non music applications, but also those taping their own music — ie the thousands of amateur/semi-pro musicians (me included!) who regularly use tapes to record rehearsals, demos and in many cases as the only viable format for selling its work to the gig-going public. In addition to this the BPI (British Phonographic Industry) is currently trying to reduce the royalty paid to song writers for the sale of their work.

John Taylor, Norwich, Norfolk.

Stand up for your rights

In issue 101 of *Hi-Fi Choice* you refer to the home taping rights campaign. I believe they need all the support they can get and would like to do my bit. Can you please tell me where I can contact them?

Yours sincerely
PA Loe, Warwick

The Home Taping Rights Campaign is a coalition of groups representing teachers, students, consumers, visually handicapped people and manufacturing interests. It came together in 1986 to defend home taping and to oppose the principle of levies on blank tapes. They can be contacted at: The Home Taping Rights Campaign Office, Number One, Dean's Yard, Westminster, London, SW1P 3NR. Telephone 071 799 9811.

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No, indeed, I do not think that £12 (or more) is a fair price for a DCC, nor for a CD. I heartily agree with your campaign against the record companies on this subject although I have a nasty suspicion that it will end up in a file headed 'Quixote Benham's tilt against windmills' (Quick, where's my horse and armour? — Ed) unless of course you can get the government's Prices and Incomes Board on your side.

I fully endorse the Consumer Association's remark that the present price of CDs is a rip-off, especially as 'premium' CDs now cost over £13!

That said, through a certain

patriotically named mail order company one can buy four 'full price' CDs for just under £39 although the postal charges take some of the gilt off this gingerbread. Of course one can find lower price CDs in the shops, but I always feel nervous when I buy one in case it turns out to be sub standard, although this is sometimes the case with premium CDs as well.

My main gripe is that right now the vast majority of the music on CDs was originally recorded years ago. I do not know much about the recording industry but I would guess that the performance-cost element must be a fraction of

that involved in a completely new performance recording made for CD only.

Finally, as to paying £12 for a DCC, I am not busting a gut to spend an arm and a leg on a new tape system which seems somewhat superfluous and consequently highly unappealing to me. So the price has to be the straw that breaks this old camel's back which is already weighed down by the recording companies' greed. In fact, this old camel has really got the hump over all this and his only consolation is that listening to music makes him forget what he had to pay for it. Leslie Neville, Surrey.

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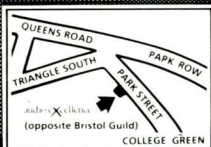
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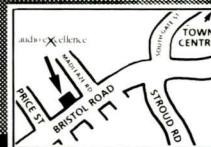
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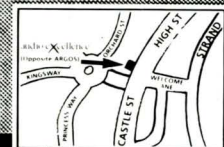
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Choosing and Using . . . Record Players

The question is easily stated. Why would anyone in her right mind want to buy a record player, when many vinyl pressing plants have shut up shop, and when digital audio has made such deep inroads into the business?

The likeliest answer is that you have little choice in the matter. Perhaps you have a clapped out record player that is due for replacement, or you have an arm that has seen better days. Whether these reasons apply or not, the common factor is that you will already have a substantial collection of music recorded on vinyl, and that you want to make the best use of this precious and perhaps irreplaceable material. Furthermore, judging by what hi-fi dealers tell us, the record player you buy now could be quite an expensive one, if only because it is likely to be seen as a final record related purchase that will see the user through the end of the vinyl era.

I write this with a certain wistfulness, even nostal-

If you're thinking of buying a turntable or arm, now is the time. Alvin Gold offers advice on some final sonic beauties as vinyl vanishes and the dark age of the digit closes in.

gia. Records have been the prime source of recorded music in the home for longer than I remember, and the medium has brought untold pleasure and enlightenment. It is also written with a little anger because the demise of vinyl has been hastened by the antics of some prominent (and many deservedly little known) hardware names and record labels who cut standards to the bone in an attempt to make a fast buck, and who gave vinyl a bad name from which it was never able to recover, despite the best efforts of the more respectable end of the hi-fi industry. Nobody in his right mind would deny that Compact Disc has freed us from this kind of cheapskating. By and large, discs and players have to meet a certain standard or they don't reach the shelves - and that's that.

Turning the tables

The essential truth that is concealed behind this story of casual or indifferent mastering and pressing standards and lousy hardware engineering is that records can and very often do sound marvellous. At their best, records are probably unmatched, and even now it's possible to set up a high resolution, wide bandwidth hi-fi system and give very serious music listeners, who have perhaps fallen out of the habit of listening to records, a surprise they will not forget in a hurry.

But how does one go about choosing a player? How can you tell if you're being offered a pup? With apologies to those grandmothers who are not into egg sucking, I offer the following simplified picture of what record playing hardware is all about, with the

emphasis on simplified.

Essentially the task is to get information off the record, and the key technical requirement is that the cartridge body stays in a fixed position relative to the average position of the record groove at each instant, whilst the stylus follows the rapid undulations of the groove, side to side and up and down. Whilst this is going on, the platter must rotate at an accurate rate, noise from the bearing and other sources must be suppressed and the whole system needs to be effectively rendered proof against impinging vibrations — air and structure borne. One manufacturer likens the task of the record player to that of a precision groove measuring tool, another describes record players as being efficient seismometers. Both descriptions are apt, though incomplete.

Solving the mechanical problems is no trivial task. All mechanical structures — arm tubes, headshells, platters, the wooden box it all fits in, the whole shooting match — resonate when excited, and resonances cause the same kind of output at the cartridge terminals as the music itself. Unfortunately, there's no easy way of distinguishing between music and unwanted resonant energy once they have been mixed, and the inevitable result is music flavoured by unwanted spurious signals.

Vinylising matters

A good dose of resonance control is of course absolutely vital in any turntable or arm, and rigid structures which are also free from obvious bearing slack and which don't ring like bells when energy is fed into them are just what we are looking for. But it is impossible to eliminate unwanted compliances or resonances altogether, no matter how good the arm or the turntable may be. Stiffen an arm and you move its resonance and alter its Q, which is often beneficial, but which in some cases may make problems more audible, or excite other parts of the player. You may also increase its weight which can have other interesting and not always desirable consequences. You can shift the problems around, but they'll never go away.

Another difficulty stems from the fact that the various types of energy that need to be locked out of the mechanical system — including feedback, impulsive shock noise, resonances in the arm tube or the platter — are very similar to the one that needs to be preserved, that is, the one caused by the deflection of the stylus in the groove. This brings us to our final point. Turntable design is a subtle and complex art, and good design is all about understanding how the different parts interact as a system. A well designed record player is all about optimisation and compromise, a lot of which can be determined by mathematical modelling but which in the final analysis requires a lot of well informed listening. Perfection is simply not a practical possibility. If the types of forces involved were different from those we actually encounter, the task of turntable design would be much less subtle and potentially, at least, the result would be much less compromised. But it isn't.

The KICK INSIDE

In a comparison test in Hi-Fi World's November issue, the Creek 4140 was regarded as the best of a group of amplifiers from six manufacturers. Some of them world heavy-weights.

Best? How can one define best in fidelity?

What made the 4140 outstanding in comparison to products by Pioneer, Marantz, Arcam, Musical Fidelity and Sonic Link, was, we quote, it's "pace and life", while being "detailed and coherent in presentation" it never sounded "out of control or nasty" on moving magnet or CD.

Probably the most telling comment was "It is one of those amplifiers that has an almost in-built sense of rightness to it that provides a strength the others lack."

What truly makes an amplifier better is its ability to convey the composition, the musicians and their performance. This test proves that this capability belongs to Creek.



Creek 4140 s2 Integrated Amplifier.



Creek Audio Systems
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Coatbridge, Strathclyde ML5 4TF
Scotland
Tel (0236) 20199 Fax (0236) 28230

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Ariston Pro Maxim

Ariston Acoustics Ltd, Freeport Prestwick, Ayrshire, Scotland KA0 2TA. Tel: (0292) 76933/4



The *Pro Maxim* turntable (not to be confused with the *Ariston Pro* turntable) is a development of the *Maxim* line mainly predicated on the idea (one that also occurred to Thorens when it dreamed up the *TD166VI/UK*) that it had a very nice turntable that was limited by the quality of the OEM arm. The arm fitted here is the Rega *RB250*, which, as in the case of the Thorens, has meant that the arm-linked motor switch has been deleted.

The *Pro Maxim* is based on a solid slab type MDF chassis with an internal visco elastic layer which sits on resilient feet, and to which the arm and one piece heavy diecast platter/main bearing assembly are bolted. The unit is belt-driven by a low voltage DC servo motor, with a switched speed change on the plinth.

Lab report

One notable artefact that showed up in the lab tests was the wide spread of the 3kHz peak in the spectrum analysis, which is a bad sign as far as pitch accuracy is concerned. However, the problem was that I was unable to repeat this in later tests. It seems that the process of moving the deck from one lab to another has some effect, because subsequent wow and flutter measurements showed no more than 0.22 per cent unweighted wow – high enough admittedly, but not devastatingly so. As a double check I checked out the running speed with a 3kHz tone and a frequency using two second sampling intervals over a substantial (over 10 minute) period. This test gave a worst case deviation of 0.3 per cent, and a worst case sample to sample variation of 0.15 per cent, the frequency counter test having its own error estimated at about 0.05 per cent. Flutter was low.

The one piece platter is inherently less well damped than one based on separate inner and outer sections, and this shows in the plot, despite heavy damping from the

thick rubber mat. The various breakthrough plots are adequate in relation to price, with some excitement below 200Hz, reflecting perhaps the lack of a suspension system other than the compliant feet. Rumble is higher than expected, and was almost audible on test, clogging up the gaps between notes at highish replay levels.

Sound quality

Naturally, a careful check was made for signs of programme wow, and some was detected, though at a relatively low level. With some orchestral and piano material there was a general lack of security in the sound, but hard evidence of pitch variation was harder to come by.

In other respects, it performs unobtrusively well. It is not without character, in part related to the smooth and well focused but definitely slightly distant sounding Rega *RB250*. The first time I heard this turntable in isolation I was impressed by its overall capabilities, and I suspect many others will be too, but assessed in the company of similarly priced and specified models like the Thorens *TD166 VI/UK/Rega*, the deck began to sound a little slow and opaque, though structural qualities like bass power and depth were far from short changed.

Fitted with a Roksan *Corus Black* cartridge it made a very impressive stab at Saint-Saëns' *Organ Concerto* (Fremaux/CBSO) but without ever once really getting inside the almost infinitely complex multi-layered sound.

Conclusion

The criticisms reflect a certain disappointment in the way subtleties were handled. Against this must be set against the unit's low price, excellent arm and the other positive qualities noted, including the accurate, man-size bass. It is best used with a clean, lightly balanced cartridge, most of the Audio Technicas would suit.

TEST RESULTS

Motor section

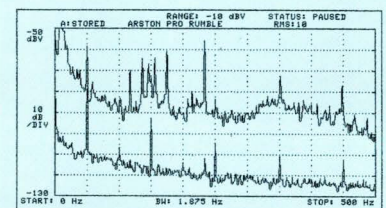
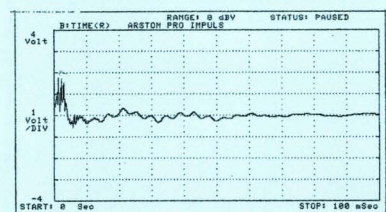
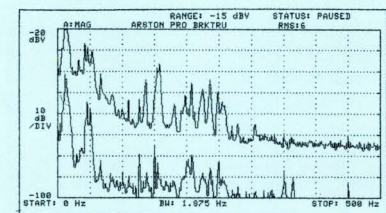
Type	integrated 2-speed belt-drive and cartridge
Platter mass/damping	1.3kg/poor
Finish and engineering	average/good
Speed options	detachable transformer in lead
Wow and flutter (DIN peak wtd)	0.13%
Wow and flutter (Lin peak wtd 0.2Hz - 6Hz/6Hz - 300Hz)	0.22%/0.093%
Absolute speed error	+0.3%
Start up time to audible stabilisation	3 sec
Rumble DIN B Wtd L/R Average	
/L+R (see spectrum)	58dB/68dB

Arm

Approximate effective mass inc screws, exc cartridge	12gm
Type of headshell	fixed
Geometric accuracy	good
Adjustments provided	overhang
Finish and engineering	poor/excellent
Ease of assembly/setup/use	good/poor/average
Friction (typical) lateral/vertical	50mg/10mg
Bias compensation method	spring
Bias force, rim/centre (set to 1.5gm elliptical)	90mg/150mg
Cue drift	negligible
Cue rate ascent/descent	fast/fast
Arm resonances	very good
Arm damping method	none

System as a whole

Size (hwxwd)/clearance for lid rear	38x42x34/6
Ease of use	average
Typical acoustic breakthrough and resonances	average-
Subjective sound quality of complete system	average
Hum level/acoustic feedback	average
Vibration sensitivity/shock resistance	average
Estimated typical purchase price	£210



Dual CS505-4

Ram Projects, Unit 27, Stretford Motorway Estate, Barton Dock Road, Stretford, Manchester M23 0ZH. Tel: (061) 866 8101



One question frequently asked about turntables is what's the least you can get away with paying? The answer, if you want a degree of automation, but don't intend that all vestige of sound quality be flushed down the toilet, is £170 all in for the Dual CS505-4.

The CS505-4 isn't new; in fact it was reviewed in issue 91, and is covered here largely to compare it to some important potential rivals such as the Goldring *Excelda 1* and the Thorens *TD280* using common criteria, and to present a set of lab test measurements consistent with the others tested in this issue.

The design has been refined over the years though there have been no very recent changes. The deck is built into an MDF chassis with a textured covering, and the pressed steel top plate floats on coil springs. The main bearing and arm are bolted onto the chassis and the motor is decoupled mounted with rubber bushes. The platter is a lightweight pressing (this is where some money is saved) with three access holes and is topped by a rubber mat with a label recess. The arm is a narrow tube design with correctly offset bearings and a detachable headshell fitted with a Dual (née Ortofon) cartridge.

Ease of use figures highly: the motor is started as the arm approaches the platter, and the arm lifts and the cueing level resets itself to 'up' at the end of each side. Cueing is excellent, making handling good, and damaging records difficult. 33/45 rpm switching is provided, and the running speed can be adjusted using a control which opens and closes a segmented motor pulley to adjust the gearing.

Lab report

The Dual passed the lab tests with a reasonable set of results. Low rate speed variations are well suppressed. Flutter is higher due to the low rotating mass, but still ac-

ceptable. Apart from an odd lump near 450Hz, the acoustic breakthrough spectrum is smooth though not especially low in level, but sensitivity to vibration is well suppressed. Electrical noise is very low, though the flutter analysis shows low level breakthrough at 100Hz, which probably isn't coincidental. Rumble levels are a little disappointing: there is significant bearing noise below 100Hz.

The arm is a mass of rather poorly suppressed resonances, the first modes starting below 300Hz, but friction levels are satisfactory, and basic factors like geometric accuracy meet a high standard.

Sound quality

The cartridge supplied with the deck was described as 'crude' back in issue 67, and the passage of time has done it very few favours. But its limitations are secondary to the fluid, musical nature of the deck itself. Stereo presentation was remarkably firm and stable, though a little recessed and distant, and with relatively little depth differentiation.

There was a subtle loss of dynamics, especially in the lower frequency range, and detail was a little muddled, with some background instruments and voices tending to become homogenised in the larger picture. But the inadequacies were largely benign and may not be noticed in many installations. Better is available for not much more money - the Thorens *TD280* for example - but when push comes to shove, the 505 hasn't lost its touch.

Conclusion

The passing of the years (no one I spoke to seemed quite sure of the exact age of the 505) has not left the Dual untouched.

What has worked in Dual's favour is that the tooling must have been amortised more than a zillion times over, and the package still offers genuine value for money. Recommended.

TEST RESULTS

Motor section

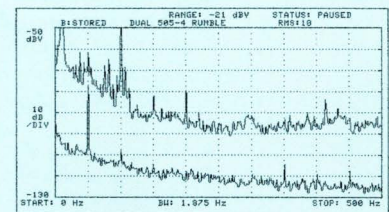
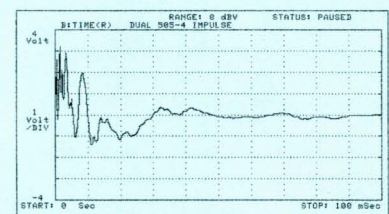
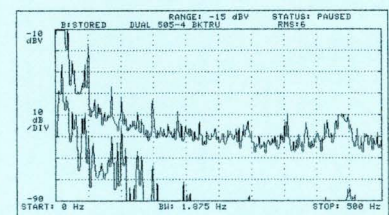
Type	Belt drive, auto-armlift, integrated record player with cartridge
Platter mass/damping	<1kg/good
Finish and engineering	good/average
Type of mains connection leads	2 core, captive
Speed options	33/45, fine speed adjust
Wow and flutter (DIN peak wtd)	0.13%
Wow and flutter (Lin peak wtd 0.2Hz - 6Hz/6Hz - 300Hz)	0.25%/0.10%
Absolute speed error	variable
Start up time to audible stabilisation	3 sec
Rumble DIN B Wtd L/R Average	
L+R (see spectrum)	71dB/74dB

Arm

Approximate effective mass inc screws, exc cartridge	8gm
Type of headshell	off set detachable
Geometric accuracy	v good
Adjustments provided	overhang
Finish and engineering	good/average
Ease of assembly/setup/use	very good
Friction (typical) lateral/vertical	10/15mg
Bias compensation method	spring
Bias force, rim/centre (set to 1.5gm elliptical)	260/260mg
Cue drift:	small
Cue rate ascent/descent	2 sec/3 sec
Arm resonances	good
Arm damping method	none

System as a whole

Size (hxwxd)/clearance for lid rear	14x43.5x574cm
Ease of use	good
Typical acoustic breakthrough and resonances	fair
Subjective sound quality of complete system	average
Hum level/acoustic feedback	good
Vibration sensitivity/shock resistance	average
Estimated typical purchase price	£170



Dual CS750-1

Ram Projects, Unit 27, Stretford Motorway Estate, Barton Dock Road, Stretford, Manchester M23 0ZH. Tel: (061) 866 8101



Dual used to be a very good source of semi-audiophile turntables at attractive prices, and the CS750-1 marks a return to that territory – with mixed success.

This is a fully integrated deck (like the 505) with an interlinked arm which lifts at the end of side, or (temporarily) during play if the platter slows or stops. Three speeds are available, including 78rpm. The 750 has a spring decoupled subchassis and an elaborate (though not necessarily better - see later) version of Dual's dynamically balanced arm, equipped with a Dual badged version of an Ortofon OM series cartridge. A two part but relatively lightweight platter is driven by a quartz crystal referenced DC motor/belt drive system. The chassis is an attractive and heavy inverted wood veneered box with an enclosed decoupled base.

The Dual has a rather craftily designed suspension which provides good perceived immunity from acoustic feedback and foot-fall noise, and which doesn't bounce unduly, making handling unusually foolproof.

Lab report

Some of the measurements could not be run due to the way the automatic systems operate, and an excessively long spindle meant the rumble coupler could not be attached.

The arm structural resonance plot is disappointing, breakup starting around 300Hz (the equivalent figure for a Rega RB250 is over 1kHz). The arm fitted to the cheapie Dual 430 is a great deal stiffer and less resonant. The acres of plastic moulding between the arm tube and main bearing gimbal probably doesn't do a lot of good, and ditto with the design of the headshell and the detachable locking collar assembly.

The player runs at close to its nominal 33rpm speed, and wow levels are very low. Flutter sidebands, however, were high, the relatively lightweight platter clearly doing

little to damp a rather rough drive system, though the spectrum analysis shows no dominating sidebands. The platter offered rather poor damping, with at least two resonances identifiable in the impulse Fourier analysis plot.

Sound quality

Musically warm and attractive, there is nevertheless a lack of real grip and power from this deck which is not addressed by a change of cartridge - though such a change remains well worthwhile. The lack of openness and light in the midband was particularly frustrating as again it appeared to be independent of the cartridge.

One of the test records employed is the Haitink/Concertgebouw recording of Bizet's *Symphony*, a lovely recording which congealed into a messy lump with little resolution, no coherent imaging but an effusive and certainly attractive bass quality which made the sound very presentable at first.

Pitch integrity was remarkably secure with almost all material, and I found little evidence that the Dual was fussy about the surface it stood on. Reasonable structural integrity is a prerequisite of course, but the emphasis in the design appears to have been to make the deck appealing to those who are used to the magic carpet ride of digital audio, and sound quality to a extent has taken a back seat.

Conclusion

Some of the 750's features and design points are clearly well conceived, but in the final analysis the deck proved a let down, perhaps because the idealist philosophy has not been backed up by properly informed listening during development. Maybe it will shake down over the next year or so; for now this semi-upmarket deck can only be seen as too little, too late. For those with 78rpm record collections however, the Dual suddenly begins to look more attractive.

TEST RESULTS

Motor section

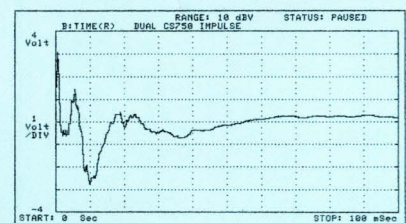
Type	integrated 2-speed auto-armlift
Platter mass/damping	good
Finish & engineering	good/fair
Type of mains connection leads	detachable 2 core
Speed options	33/45/78
Wow & flutter (DIN peak Wtd)	0.17%
Wow & flutter (Lin peak Wtd 0.2Hz - 6Hz/6Hz - 300Hz)	0.30%/0.12%
Absolute speed error	-0.1%
Start up time to audible stabilisation	3 sec
Rumble DIN B Wtd L/R Average/L+R (see spectrum)	

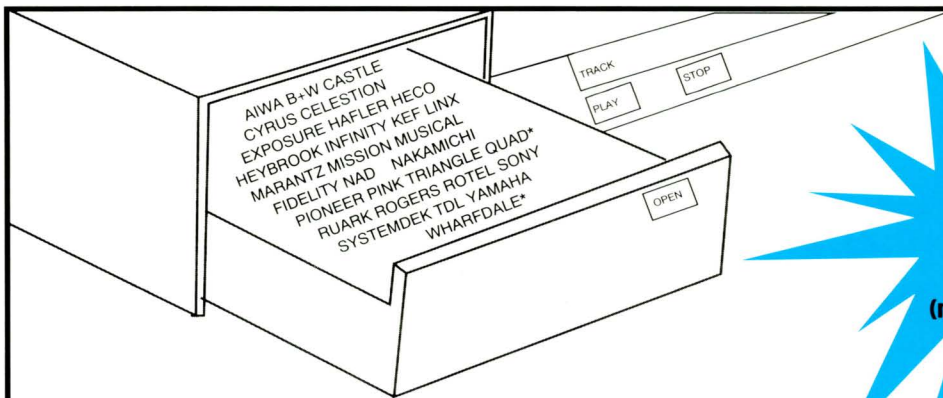
Arm

Approximate effective mass inc screws, exc cartridge	7 gms
Type of headshell	detachable, off set rigid composite
Geometric accuracy	average
Adjustments provided	overhang
Finish & engineering	good/poor
Ease of assembly/setup/use	very good
Friction (typical) lateral/vertical	10mg/10mg
Bias compensation method	spring
Bias force, rim/centre (set to 1.5gm elliptical)	220mg/250mg
Cue drift	negligible
Cue rate ascent/descent	fast
Arm resonances	poor
Arm damping method	none

System as a whole

Size (h x w x d) / clearance for lid rear	42x45x38/5
Ease of use	very good
Typical acoustic breakthrough and resonances	*
Subjective sound quality of complete system	below average
Hum level / acoustic feedback	low*
Vibrationsensitivity/shock resistance	*poor
Estimated typical purchase price	£299
* measurement not made because deck would not interface with test equipment	





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(Extracts: "Best Buy" HI-FI CHOICE)

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(Extracts: HI-FI CHOICE)



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Goldring Excelda 1

Goldring Products Ltd, 8 Greyfriars Road, Bury St Edmunds, Suffolk, IP32 7DX. Tel: (0284) 701101



Optimistically described to me in a phone conversation as a Rega clone, the sample supplied for review was received with both Goldring and Thorens labelling, neither of which tells the whole story.

It is hard to be sure of telling the story properly since the different sources involved put rather different glosses on it. What is undisputed is that the *Excelda* was designed by one-time director of Thorens, Reme Thorens, in conjunction with a Czechoslovakian company. The turntable is made in Czechoslovakia and its right to the Thorens name is, at best, questionable. Later batches will not, I'm told, bear his name on the product or supporting documentation. Goldring is the importer and distributor, and personalises the *Excelda* by fitting an *Elan* budget cartridge.

The deck itself is a compact, solid chassis design based on a substantial plinth, a captive plastic inner platter/main bearing, and a flat topped cast platter. The geometry of these items is in fact Rega-ish, but the felt topped platter has two quite unnecessary belt access holes. The arm has a fixed headshell prefitted with the aforementioned *Elan* cartridge and is mechanically coupled to a motor switch that initiates platter drive as the arm nears the platter. Speed change and arm lift/lower are manual.

Lab report

The solid plinth and damped feet are soundly based, and the platter is no lightweight. Care has been taken to balance the platter properly by drilling out the rim, but there is some play in the main bearing, and the arm has the same structural integrity and freedom from bending modes as a wind sock in a hurricane! The main vertical gimbal bearing was aligned incorrectly, so that the cartridge rotates laterally as it rises and drops, and no height adjustment is available.

Vibration breakthrough was high, not least

because of the constant background motor drone, and there was a lot of energy in the acoustic breakthrough plot. The poorly damped platter had a tendency to ring, the main excitation frequency being around 120Hz. Although the weighted rumble figure was satisfactory, the rumble spectrum showed a fairly active and unevenly spread distribution of energy indicative of complex bearing noise effects. The arm was also excitable, especially at high frequencies.

Wow and flutter results were somewhat contradictory, the spectrum in this case showed no major discrete artefacts to worry about, and a fairly sharp peak indicating good short term stability. This was supported by a satisfactory flutter figure. On the other hand, low rate speed variations ('wow') measured high numerically, and the pitch of middle frequency notes was extremely unstable, making a mockery of sustained musical notes in many types of material.

Sound quality

Definitely a no-no, the mere fact that the Goldring doesn't cost a lot is insufficient to excuse the gross excitability of this deck, the poor perceived dynamic range, the overactive surface noise and that fatal lack of speed stability.

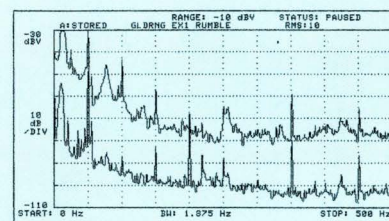
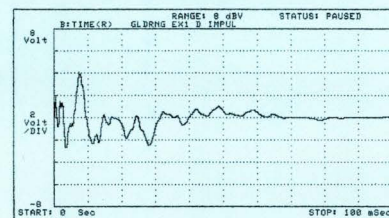
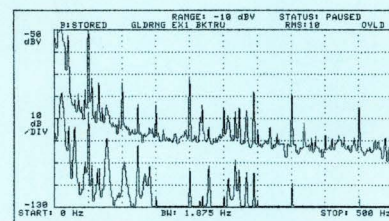
Stereo imagery was most obvious by its absence. The heavy burden of non-music related energy fed into the partnering system is also likely to give low power amplifiers a hard time, typically resulting in a reduction in maximum volume capabilities.

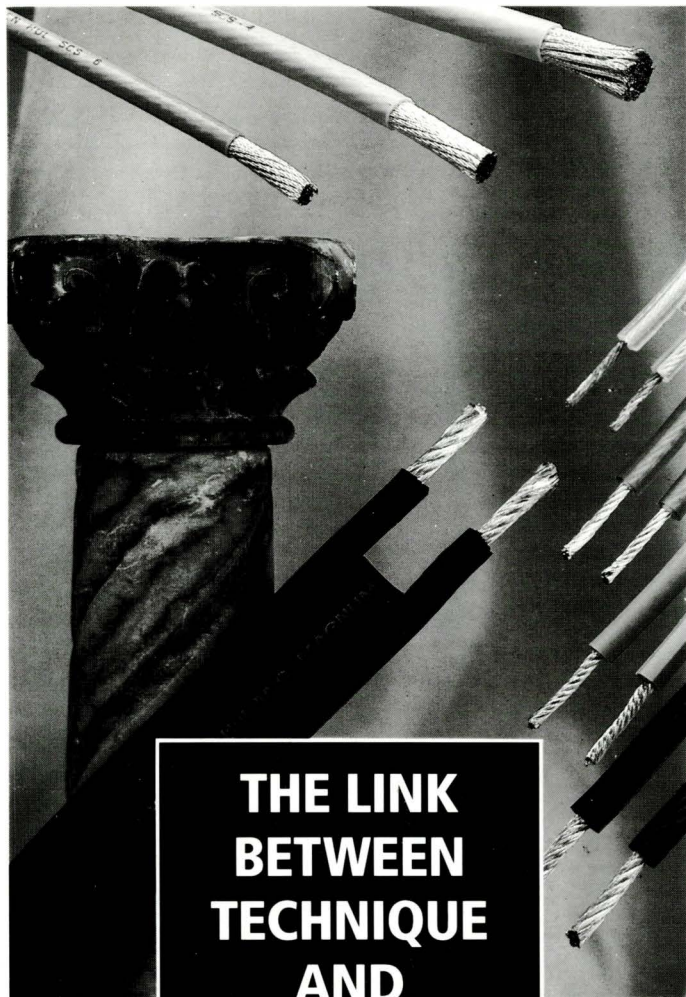
Conclusion

Even at this price level, ultra-competitive and well engineered designs like the *Ariston Pro* and the *Dual CS505.4* show that it is possible to do a lot better, and specifically that arms don't need to be as flexible as springs. They also show that a heavyweight platter is no guarantee of good speed integrity or *vice versa*.

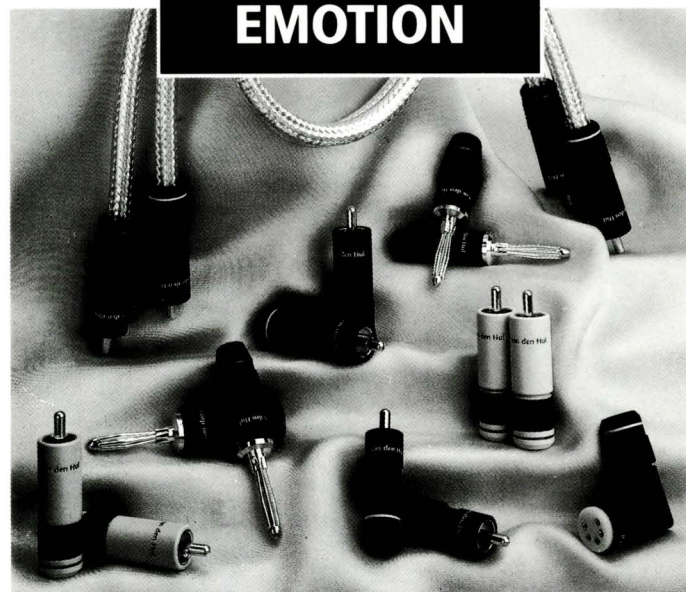
TEST RESULTS

Motor Section	
Type	Integrated manual turntable with arm and cartridge
Platter mass/damping	2kg/poor
Finish and engineering	average/average
Type of mains connection leads	captive 2-core
Speed options	33/45
Wow and flutter (DIN peak wtd)	0.20%
Wow and flutter (Lin peak wtd 0.2Hz-6Hz/6Hz-300Hz)	0.40%/0.10%
Absolute speed error	+0.1%
Start up time to audible stabilisation	3 sec
Rumble DIN B Wtd L/R Average/L+R (seespectrum)	74dB
Arm	
Approximate effective mass inc screws, exc cartridge	8gm
Type of headshell	synthetic offset/fixed
Geometric accuracy	average
Adjustments provided	none
Finish and engineering	average/poor
Ease of assembly/setup/use	good/good/average
Friction (typical) lateral/vertical	10mg/10mg
Bias compensation method	thread and weight
Bias force, rim/centre (setto 1.5gm elliptical)	200mg/250mg
Cuedrift	high
Cue rate ascent/descent	erratic
Arm resonances	high
Arm damping method	none
System as a whole	
Size (hxwxd)/clearance for lid rear	37x41.5x33/7cm
Ease of use	fair
Typical acoustic breakthrough and resonances	poor
Subjective sound quality of complete system	poor
Hum level/acoustic feedback	low/high
Vibration sensitivity/shock resistance	high
Estimated typical purchase price	£160





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Linn Basik

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The *Basik* – the turntable that Linn was once rash enough to say it would never make as it represented a compromise on the performance of its senior turntable – is quite different to the *LP12* in design terms, yet retains sufficient styling features in common to make the parentage clear.

The *Basik* comes complete with an *Akito* arm, but without a cartridge, an omission that was put to rights with a Linn *K9*, the model that most owners end up with, but which adds a not inconsiderable £89 to the price.

The platter is a relatively lightweight, mutually damping two part affair with a plastic inner drive hub and a bearing straight from the *Akito*. All the moving bits are attached to a flat sheet of grey vinyl finished wood, which is folded down around the edges for stiffening purposes. Speed change from the mains driven synchronous motor is manual and involves lifting the felt topped outer platter. The on/off switch is hidden below the front edge, which gives the deck very clean lines, but which could cause some confusion. The *Basik* requires practically no setting up: there is no coil spring suspension – just three springy feet.

Lab report

Wow and flutter levels are improbably close to the *LP12*, which, remember, is near state of the art in this respect. The spectrum analysis is very nearly as impressive, again, however, showing a trace of what appears to be mains harmonic derived breakthrough. Acoustic breakthrough measures quite well, though there is some excitability here which is just about visible at the bottom end of the plot, and the other turntable measurements failed to show up anything exciting.

Not so with the arm however. Another sample of the *Akito* supplied with the *Basik LP12* had exemplary bearing adjustment, where the *Basik's Akito* turns out to be a

little sticky. Nothing excessive mind, but enough to draw attention, and enough perhaps to have resulted in a significant deterioration in the arm structural resonance plot, since the way an arm is terminated has an important influence here. Less significantly, the bias feature was also a little out of adjustment. Could there be such a thing as A and B grade *Akitos*, perhaps selected for different applications? Or is this just production spread?

Sound quality

Although not as effective as the *LP12's* the *Basik's* suspension does an effective enough isolation job, albeit at the cost of deep bass purity and accuracy. Linn might say that a turntable like this should not be used in a wide bandwidth system; this is what the *LP12* is for, but a back to back comparison with an only slightly more expensive Dunlop Systemdek *IIXE* shows that even with smallish loudspeakers (the Arcam *Delta 2* for test purposes) the bass you can't hear has a knock-on effect in the higher bass regions that you can hear. In this company the *Basik* sounded unexpectedly wooden.

Musically it would not be fair to say that the *Basik* is as much a chip off the old block as the aesthetics suggest. It is, however, a clean, and competent player with an excellent midband that lacks nothing in areas such as separation, stereo imagery in both planes (given suitable material!) or clarity.

Conclusion

A strong contender in the affordable turntable stakes, the *Basik* is a hassle free package offering fine if not outstanding sound quality. The *K9* can sound a little thin and pinched, though it is also fast and rampantly detailed, but the package lacks the impressive dynamic range and authority of other Linn turntables, – or only slightly dearer models like the Systemdek *IIX/Rega RB250*. Recommended.

TEST RESULTS

Motor section

Type	Integrated turntable & arm
Platter mass/damping	1.35kg/poor
Finish & engineering	good/average -
Type of mains connection leads	2 core captive
Speed options	33/45
Wow & flutter (DIN peak Wtd)	0.07%
Wow & flutter (Lin peak Wtd 0.2Hz -6Hz/6Hz - 300Hz)	0.08%/0.07%
Absolute speed error	-0.1%
Start up time to audible stabilisation	3 sec
Rumble DIN B Wtd L/R Average/L+R (see spectrum)	-70dB/-72dB

Arm

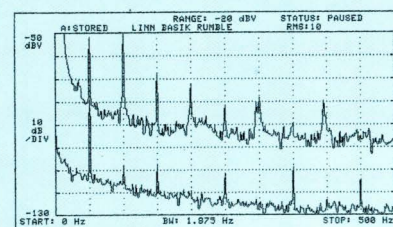
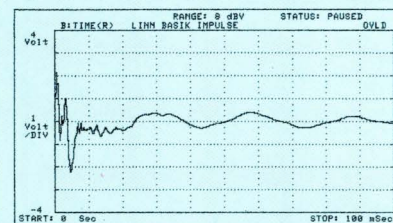
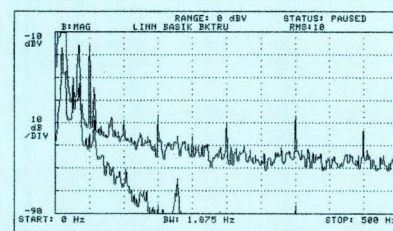
Approximate effective mass inc screws, exccartridge	10gm
Type of headshell	fixed, offset
Geometric accuracy	excellent
Adjustments provided	height, overhang
Finish & engineering	good
Ease of assembly/setup/use	good
Friction (typical) lateral/vertical	30mg/30mg
Bias compensation method	spring
Bias force, rim/centre (set to 1.5gm elliptical)	200/120
Cue drift	negligible
Cue rate ascent/descent	medium/slow
Arm resonances	good
Arm damping method	none

System as a whole

Size (hxwxd)/clearance for lid rear	43x44.5x35/7cm
Ease of use	good

Ease of use

Typical acoustic breakthrough and resonances	average/good
Subjective sound quality of complete system	average
Hum level/acoustic feedback	good
Vibration sensitivity/shock resistance	good
Estimated typical purchase price	£250



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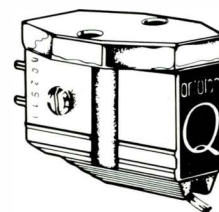
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Linn Basik LP12

Linn Products Ltd, Floors Road, Waterfoot, Eagleshan, Glasgow, G76 0EP. Tel: (041) 644 4262



The *Basik LP12* is a back to the roots *LP12*, clearly designed to mop up sales that would otherwise be lost as the latter inexorably becomes more expensive. The *Basik LP12* has another *raison d'être* too. As owners of the *LP12* with the standard *Valhalla* crystal lock power supply change to the more sophisticated *Lingo*, dealers are being left with stocks of *Valhalla* boards. Linn Products has suggested that *Basik LP12* owners might be able to upgrade to standard *LP12* specifications for a nominal price, though obviously they are not in a position to say so publicly. The move is perhaps a measure of how thin market conditions have become of late for high-end record players.

Those who have seen or know the *LP12* (and who doesn't?) will notice that the on/off/speed change microswitch has been replaced by a mechanical on/off switch. Linn supplies a spare belt and a motor pulley sleeve to provide a belt and braces 45rpm facility.

All *LP12*s are also fitted with Linn's new hard base, and this includes the *Basik*. Nothing else has changed, and the *Basik* can be readily upgraded at any time, not just to the *LP12* standard spec, but also to the full *LP12/Lingo* standard if you can cough up the readies and can afford the inevitable new arm.

Lab report

The *Basik LP12* delivered a textbook set of lab test results, including state of the art wow and flutter figures (the small blip on the spectrum analysis at -55dB is most likely breakthrough from the first harmonic of the 50Hz mains frequency).

Two findings are particularly relevant: the arm has astonishingly low levels of self-resonance, the trend above 1kHz being low in absolute level and entirely free of frequency related effects, ie identifiable resonances rather than noise. Similarly, the

platter excitation is damped down very rapidly. The platter and the arm of course are the two items physically closest to the source of the action, and these things can be expected to have an immediate effect on sound quality.

Sound quality

The *Basik LP12* is exactly what it purports to be, an *LP12* simulacrum, lacking only the last few per cent that makes the senior models stand out. As such it could almost be thought of as a bargain, if anything that costs so much can ever be considered a bargain.

The first and most impressive feature is the utter stability and authority with which music is reproduced. There is an utter seamlessness at all frequencies and across a wide dynamic range, resolution of fine detail is exquisite. Linn claims that the new base effectively eliminates the slight bass 'hump' that existed before, and this claim appears to be justified. In many ways the *LP12* is better than the equivalent Roksan *Xerxes 33*, but the latter's superior layering of depth and separation of complex imagery is still a factor to bear in mind.

Naturally, all this is contingent on setting the deck up appropriately, which means using a stiff support (wall or floor mounted) that doesn't move, since footfall noise will wreak havoc with your listening – or the stylus. It will also require periodic setting up, typically every couple of years.

Conclusion

The *Basik LP12* looks as good as the standard *LP12*, and is every bit as well engineered. It is an ideal platform from which to upgrade to the full *LP12* or *LP12/Lingo* provided you have first determined that this is the turntable you wish to aim for. In its own right to it stakes a strong claim, and although it has peers, at the price it probably has no betters. Finally, no turntable range is better supported in the field.

TEST RESULTS

Motor section

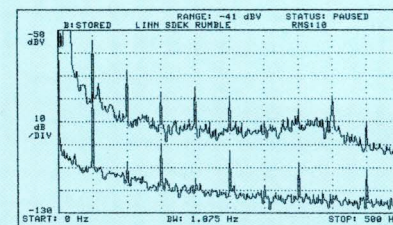
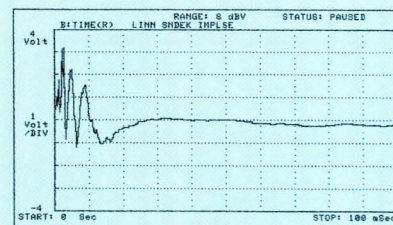
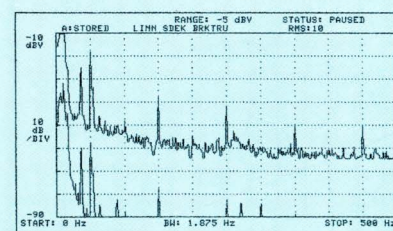
Type	single speed turntable & interchangeable arm
Platter mass/damping	3.7kg
Finish & engineering	excellent
Type of mains connection leads	captive, 3-core
Speed options	33/45 (with adapters supplied)
Wow & flutter (DIN peak Wtd)	0.04%
Wow & flutter (Linn peak Wtd 0.2Hz -6Hz/6Hz -300Hz)	0.08%/0.07%
Absolute speed error	+0.10%
Start up time to audible stabilisation	4 sec
Rumble DIN B Wtd L/RAverage/ L+R (seespectrum)	74dB/78dB

Arm

Approximate effective mass inc screws, exc cartridge	10gm
Type of headshell	fixed, offset
Geometric accuracy	excellent
Adjustments provided	height, overhang
Finish & engineering	good
Ease of assembly/setup/use	good
Friction (typical) lateral/vertical	10mg/10mg
Bias compensation method	spring
Bias force, rim/centre (setto 1.5gm elliptical)	150mg/150mg
Cue drift	negligible
Cue rate ascent/descent	fast/slow
Arm resonances	v good
Arm damping method	none

System as a whole

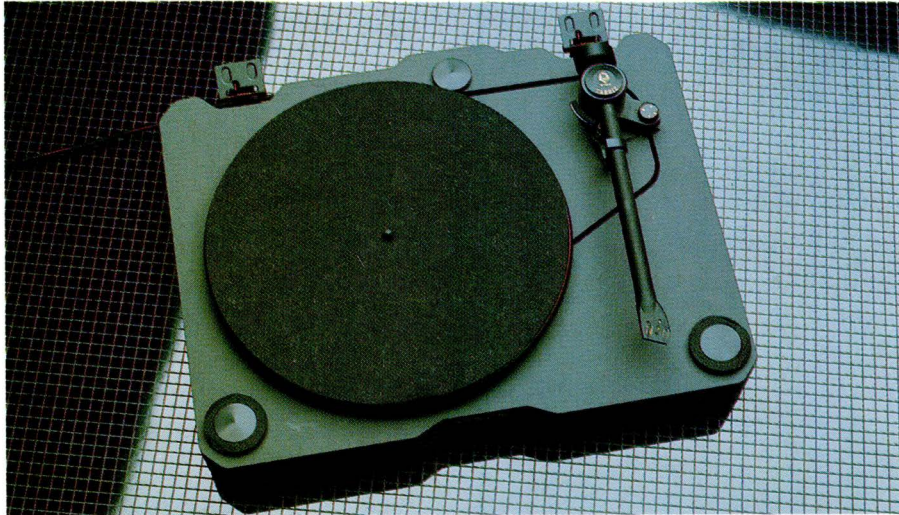
Size (hwxwd)/clearance for lid rear	43x44.5x377cm
Ease of use	good
Typical acoustic breakthrough and resonances	v good
Subjective sound quality of complete system	good
Hum level/Acoustic feedback	good/v good
Vibration sensitivity/shock resistance	excellent
Estimated typical purchase price	£736
	£609 (black), £599 (walnut), £579 (afromosia)
	Basik power supply £20
	Valhalla powersupply £180





Roksan Radius Tabriz zi

Roksan Engineering Plc, Ddole Industrial Estate, Llandrindod Wells, Powys LD1 6DF. Tel: (0597) 824911



Roksan's 'budget' (ha ha) model was a long time coming, but the result has turned out to be a compact and unusually stylish object that is excellent testimony to Roksan's new found sense of style - not to mention the benefits of CNC woodrouting. The mechanical design of the *Radius* brings the *Revolver* range to mind with its double plinth structure, the main bearing and arm being bolted to the top, which is rubber decoupled from the base.

In fact the line of decent from the *Xerxes* is easy to see if you look. The top plate has been cut to distribute resonant effects in a manner reminiscent of the *Xerxes*, and from a structural point of view the deck resembles a *Xerxes* with its outer frame removed - which is entirely functional by the way. Only the clipped, angular styling is completely novel. The long, thin bearing is very *Xerxes* like, but the glass loaded plastic subplatter and alloy disc platter (fitted with a felt mat) is not. On/off and speed change switching are available on the front of the deck, and operating status indicated with a tricolour LED.

Lab report

Tested with a Roksan *Tabriz zi* arm, the top specified combination to be deemed kosher by the manufacturer, the *Radius* proved generally excellent. The arm, for example, was notably clean and free from obvious breakup problems, and indeed bettered all the other arms on test in this respect, apart from one sample of the Linn *Akito* - a second sample was in fact inferior, apparently due to poorer bearing setup. The *Tabriz* bearing measured well, with low friction and appropriate bias settings being the key features.

The turntable itself was characterised by very low levels of wow and flutter. The slightly broad peak in the spectrum analysis was measured early in the proceedings, and the deck was seen to improve significantly

over the next few tens of hours running in. The essentially featureless nature of the spectrum plot shows that there were no overriding problems - rocking or precessing motions of the platter/main bearing shaft for example. The various breakthrough plots were mostly very clean with some increased susceptibility at very low frequencies (compared to the best of the rest) entirely in line with the lack of a fully floating subchassis. Nevertheless the deck's isolation from most forms of interference was impressive; and the careful isolation of the lid, even when closed, made a further contribution.

Sound quality

The *Radius* is a thoroughbred. Although it lacks the senior models' image scale and dynamic authority, its seamless excellence pays its own powerful dividends. This is a deck that is capable of explicit stereo imagery, even giving a good impression of image height with some recordings, and although it is contained within a narrower dynamic envelope than the *Xerxes*, say, there is no homogenising of detail or of the central band of dynamics.

Most impressive of all is the *Radius*'s solidity and stability - its consistency if you prefer - which allows individual instruments to weave their own course through changing musical landscapes without becoming inaudible or changing in character in the process.

Conclusion

There hasn't been room to examine the detail here; suffice it to say that the *Radius* is elegant and ingenious in its accommodation with its price, and that in the end it transcends its apparent status as a cost constrained *Xerxes*. This is an utterly mature turntable of all-but high-end performance, and with an almost complete freedom from the usual turntable setting up and fine tuning hassles. Recommended.

TEST RESULTS

Motor section

Type	Component 2-speed turntable, sold with or without Tabriz or Tabriz zi
Platter mass/damping	1.4kg/average +
Finish & engineering	good
Type of mains connection	
leads	captive, transformer in plug
Speedoptions	33/45
Wow & flutter (DIN peak Wtd)	0.07%
Wow & flutter (Lin peak Wtd 0.2Hz - 6Hz/6Hz - 300Hz)	0.13%/0.04%
Absolute speederror	-0.1%
Start up time to audible stabilisation	4 sec
Rumble DIN B Wtd L/R Average/ L+R (seespectrum)	71dB/78dB

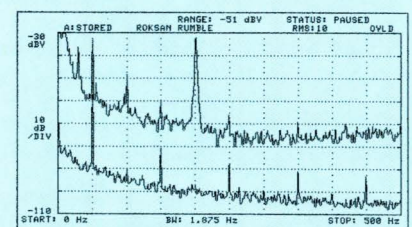
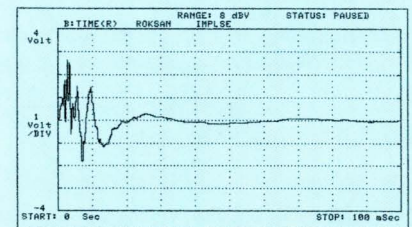
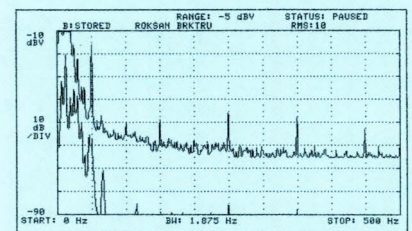
Arm

Approximate effective mass inc screws, exc cartridge	11g
Type of headshell	integral, offset
Geometric accuracy	good
Adjustments provided	height, overhang
Finish & engineering	good
Ease of assembly/setup/use	average
Friction (typical) lateral/vertical	15mg/15mg
Bias compensation method	spring
Bias force, rim/centre (set to 1.5gm elliptical)	280mg/260mg
Cue drift	low
Cue rate ascent/descent	fast/medium
Arm resonances	very good
Arm damping method	none

System as a whole

Size (hxwxd)/clearance for lid rear	37x44.5x35/5cm
Ease of use	good
Typical acoustic breakthrough and resonances	good
Subjective sound quality of complete system	good
Hum level/acoustic feedback	low
Vibration sensitivity/shock resistance	good/med
Estimated typical purchase price	

£640 with Tabriz zi
(£550 with Tabriz, £399 w/o arm)



Roksan Xerxes 33/Tabriz zi

Roksan Engineering Plc, Ddole Industrial Estate, Llandrindod Wells, Powys LD1 6DF. Tel: (0597) 824911



For this project, the Roksan *Xerxes* was tested in two distinct forms, the first of which is this newly introduced entry level version designed to catch aspiring *Xerxes* owners who can't afford the complete shooting match. It is also meant as a platform from which to upgrade when funds permit. The only physical difference between the *Xerxes* and the *Xerxes 33* is the outboard power supply which is child's play to change, but which costs £295.

As always the turntable revels in its iconoclasm. It's a big and rather awkward looking product, undeniably made of quality materials (though the woodwork is veneered rather than solid, Linn style). Typical of the subtle thinking is the two part platter. It looks similar to others yet in reality each of the two parts is made from two interference fitted components to reduce weight and damp resonances. Then there is the narrow main bearing shaft which reduces bearing velocities and hence noise, and which is fitted with the *Xerxes* most recognisable feature: the removable spindle cover which reduces noise breakthrough from the main bearing onto the record.

The *Xerxes 33* is a single speed design, powered from a simple transformer housed in an outsize mains plug.

Lab report

On the whole the *Xerxes 33* measured as expected, but there were some interesting points of departure from the all singing *Xerxes* (also tested) which have nothing to do with sample variations since the tests were run on the same equipment, simply swapping the power supplies. Even the arm was kept the same for the bench tests – it was the *Artimez*.

The differences are seen in the rumble spectrum, the overall rumble figures and even in the wow and flutter figures, which displayed a little extra wow, though not enough to be of more than academic inter-

est. The noise results, however, were highly significant, the figures being in the 4dB plus region and the spectra being quite different in shape, especially below about 30Hz.

Sound quality

The measurements were run after most of the listening had been completed, and no set of measurements were more keenly anticipated than for this deck. Why? It had become apparent that the *Xerxes 33* sounded worse than the standard *Xerxes*. Some difference had been expected, but the size and musical significance of the change was hard to credit at first, and the thought of trying to explain it without some backup from the numbers was daunting.

The long and the short of it is that with the get-you-started supply, which incidentally gives more torque and quicker starting than the *XPSII*, the sound was a little sluggish and bloated, the fine crispness and 3D stereo perspectives somewhat deflated, an effect akin to riding a fine bicycle with under-inflated tyres.

The difference wasn't exactly gross, but through the *Xerxes 33*'s gently distorting mirror a number of fine records used repeatedly in these tests sounded just that bit less focused and less vital. The difference was most marked in the bass, and tended to most seriously affect recordings like the CBSO Saint-Saëns *Organ Symphony* (on EMI), which became a little messy and diffuse.

Conclusion

The *Xerxes 33* is still a fine turntable by conventional standards, but it is not a cheap one by any standards, and some less costly models run it close, not least Roksan's own *Radius*. The deck is mainly recommendable as a stepping stone to the full blown *Xerxes*. *Editor's note: the author's own turntable and arm, recently set up by the manufacturer, were used for this test report.*

TEST RESULTS

Motor Unit

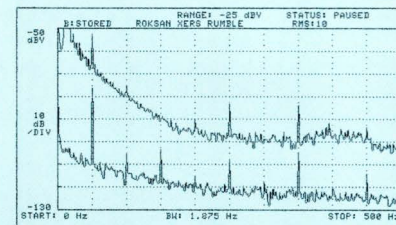
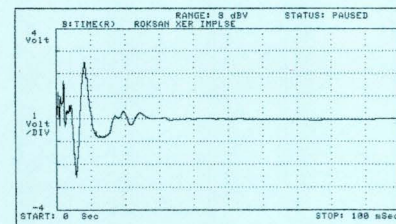
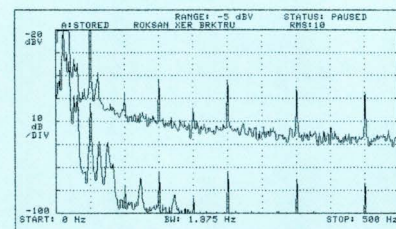
Type	Component belt drive 33rpm turntable
Platter damping	good
Finish & engineering	good/excellent
Type of mains connection leads	detachable lead with integral mains plug/transformer
Speed options	33
Wow & flutter (DIN peak Wtd)	0.09%
Wow & flutter (Lin peak Wtd 0.2Hz - 6Hz/6Hz - 300Hz)	0.18%/0.06%
Absolute speed error	+0.2%
Start up time to audible stabilisation	3 sec
Rumble DIN B Wtd L/R Average/L+R (see spectrum)	68dB/73dB

Arm

Approximate effective mass inc screws, exc cartridge	11g
Type of headshell	integral, offset
Geometric accuracy	good
Adjustments provided	height, overhang
Finish & engineering	good
Ease of assembly/setup/use	average
Friction (typical) lateral/vertical	15mg/15mg
Bias compensation method	spring
Bias force, rim/centre (set to 1.5gm elliptical)	280mg/260mg
Cue drift	low
Cue rate ascent/descent	fast/medium
Arm resonances	very good
Arm damping method	none

System as a whole

Size (hwxwd)/clearance for lid rear	43x49x39/7cm
Ease of use	average
Typical acoustic breakthrough and resonances	good
Subjective sound quality of complete system	excellent
Hum level/acoustic feedback	below average/good
Vibration sensitivity/shock resistance	very good/good
Estimated typical purchase price	£550 (black), £640 (Teak), £710 (Rosewood), plus £255 for Tabriz zi



Roksan Xerxes/Artemiz/ Artaxerxes

Roksan Engineering Plc, Ddole Industrial Estate, Llandrindod Wells, Powys LD1 6DF. Tel: (0597) 824911



The Xerxes is not exactly a 'straight from the box' turntable, and it requires regular dealer checks – say every 12 months. It is eminently workable on though. Various upgrades have been produced and all are retro-fittable.

The turntable tested here was complete with the XPSII quartz locked power supply – a replacement for an earlier type, identifiable by its lever switches – which also includes 33/45 rpm speed switching. The test deck also included the Artemiz arm which features a wide diameter one piece machined armtube/headshell, superior bearings to those used on the Tabriz, and the pivoted hanging 'intelligent' counterweight. The Artemiz has lately acquired an internal damping ring as a result of finite area analysis; which has been fitted externally to the test arm. Also employed for part of the tests was the Artaxerxes MC step-up which fits the turntable plinth near the arm base and which feeds any line amplifier direct. The test cartridge however was not a Shiraz but a Koetsu Urushi, which works rather well with the Artaxerxes.

Lab report

Measurements were on the whole much as expected for a state of the art contender, though friction levels in the arm could not be measured reliably using conventional methods since the bearings only operate as designed when the arm is pulled forward by frictional drag from the record groove wall.

The remaining measurements were similar to those for the Xerxes 33, but important improvements were seen in the rumble figures, which are clearly affected by the quality of the drive signal. It is equally true of course that the rumble test, performed with

a Thorens rumble coupler, measures more than just bearing noise, but displacement at the centre spindle from all sources. Microphony and other resonant problems noted in the previous test were not noted in this deck, which had been recently set up by the manufacturer.

Sound quality

In a nutshell, the Xerxes and Artemiz are about as good as they get – with or without the Artaxerxes. The system is very finely voiced, with an unusually articulate, expressive and flowing midband and a well integrated bass that has tremendous dynamics and pace, yet which is as sharply focused and lacking in bloom as the mid.

It has been both praised and dammed elsewhere for sounding close to CD standards, and is beaten in this respect only by the Townshend Rock Reference. Treble is almost equally well integrated and exquisitely detailed, if a tad more obvious or less refined than the very best. Pace and timing were beyond reproach, and so was stability in all its myriad meanings, which means the deck never failed to rise to the occasion (or system) if the record had the wherewithal in the first place.

Conclusion

The Xerxes proved to be a state of the art turntable which provides arguably the best overall blend of qualities available rather than excellence in any individual area. If it is to be singled out however, it would be for its low level resolution and 3-dimensional stereo imagery, and its taut, tidy almost CD-ish bass. Highly Recommended.

Editor's note: the author's own turntable and arm, recently set up by the manufacturer, were used for this test report.

TEST RESULTS

Motor section

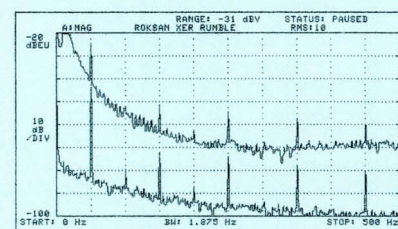
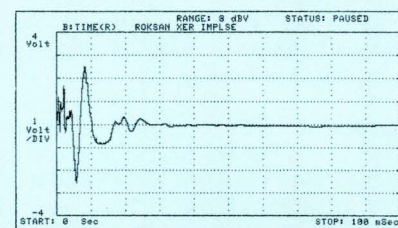
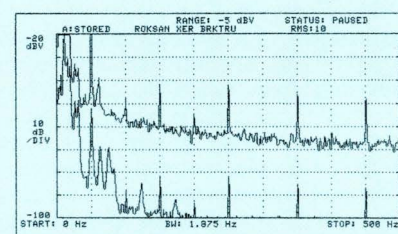
Type	Component belt drive turntable, arm & MC stepup
Platter dampin	good
Finish & engineering	good/excellent
Speed options	33/45
Wow & flutter (DIN peak Wtd)	0.08%
Absolute speed error	+0.1%
Start up time to audible stabilisation	4 sec
Rumble DIN B Wtd L/R Average/L+R (see spectrum)	72dB/>78dB

Arm

Approximate effective mass inc screws, exc cartridge	8gms
Geometric accuracy	good
Adjustments provided	height, overhang
Finish & engineering	very good
Ease of assembly/setup/use	average
Friction (typical) lateral/vertical	
Bias compensation method	weight & string
Bias force, rim/centre (set to 1.5gm elliptical)	150mg/240mg
Cue drift	low
Cue rate ascent/descent	fast/medium
Arm resonances	excellent
Arm damping method	none
(*) not reliably measurable due to way that bearings work - see text.	

System as a whole

Size (hwxwd)/clearance for lid rear	43x49x39/7cm
Ease of use	average
Typical acoustic breakthrough and resonances	good
Subjective sound quality of complete system	good
Hum level/acoustic feedback	good
Vibration sensitivity/shock resistance	very good/good
Estimated typical purchase price	£1,440 (black), £1,540 (teak), £1,600 (rosewood)
for turntable & arm. Artaxerxes costs £559.	



Systemdek I/900

Systemdek Ltd, Unit 34, Kyle Road, Irvine Industrial Estate, Irvine, Scotland. Tel: (0294) 71251



The Systemdek I is similar to the more costly models, but with the box plinth and suspended subchassis replaced by a solid plinth to which everything is bolted, including four springy feet. Only the motor is decoupled to reduce motor cogging effects appearing on the platter or plinth. The synchronous motor is placed very close to the main bearing, and drives a small plastic inner hub via a round section belt. The hub is surmounted by a glass platter, topped by a felt mat. Speed change is manual, accomplished by lifting the platter and moving the belt. Any of this sound familiar, you Rega lovers?

The arm is of Systemdek's own design. The bearings are well adjusted, and the arm and diecast headshell resist bending and torsion loads quite well.

For the houseproud, there is good news. The Systemdek I is available in three finger lickin' flavours - black, walnut and the finish supplied for this test, an aptly named blond ash (or should that be ash blond?). All three are real wood veneers, and - unusually - all three are priced identically.

Lab report

The original test Systemdek 1/900 supplied had a severe problem with low rate speed variations, indicated on the flutter analysis plot by the blunted central peak, and audible at a thousand paces on audition - there was no mistaking the slowly meandering pitch, indiscriminately undermining the music. A second sample was better, but could not be regarded as completely cured. Acoustic breakthrough and vibration resistance both ranked poorly. Bearing noise was well suppressed, but the two core arm wiring (used also by Rega, with audible hum resulting in some installations) may have been responsible for the high level of breakthrough of 50Hz harmonics up to the 500Hz measurement ceiling, and presumably beyond.

The glass platter does what you'd expect

when excited: it breaks up into complex high frequency modes, but it doesn't carry on for long: the glass is too rigid, and is quickly damped by the felt mat.

By way of contrast, the arm at least measures well. The structure appears to be well damped and terminated, giving a low level of resonant behaviour and no dominating effects to attract the ear. Bearing slack was not detectable, but friction levels in both planes were a little high.

Sound quality

There is a certain raw excitement about this player. It has a naturally explicit character, and the sense of energy, even urgency, is pervading. But it is all bought to an unsatisfactory head by the deck's unsatisfactory pitch integrity, and by a loss of focus and control at times that amounted almost to brashness.

There was little wrong with the Systemdek's reproduction of music. The problem on reflection is that it is overlaid on a fairly strong coloration associated with the chassis. It is possible to hear the signature of the player with the stylus in a stationary groove by simply tapping the chassis lightly. The output from the speakers has quite a strong middle as well as low frequency context. It was also clear that both the deck and also the arm are more than a little microphonic, and that lowering the lid serves to make matters worse.

Conclusion

You might say that this model is Systemdek's Rega Planar 2 (though neither company will thank me for saying so), and as such invites inevitably unfavourable comparison with its more illustrious southern cousin. The Rega is a much more refined and physically better controlled design. Lurking under the surface of the I/900 there's a tiger waiting to get out; maybe the Mark II (if and when) will untie the leash.

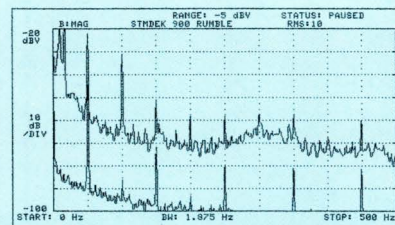
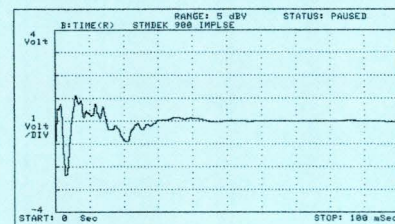
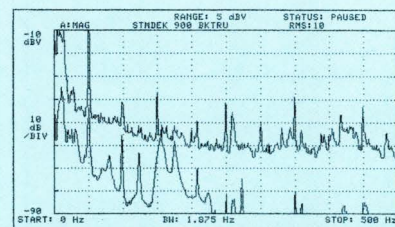
TEST RESULTS

Motor section	
Type	Integrated turntable & arm
Plattermass/damping	average
Finish & engineering	excellent/good
Type of mains connection leads	captive 2-core
Speedoptions	33/45rpm
Wow & flutter (DIN peak Wtd)	0.15%(0.10%*)
Wow & flutter (Lin peak Wtd 0.2Hz - 6Hz/6Hz - 300Hz)	0.35%/0.08%(0.22%/0.08%*)
Absolute speed error	+0.13%
Start up time to audible stabilisation	3sec
Rumble DIN B Wtd L/R Average/ L+R (seespectrum)	68dB/72dB

(* second sample - see text.

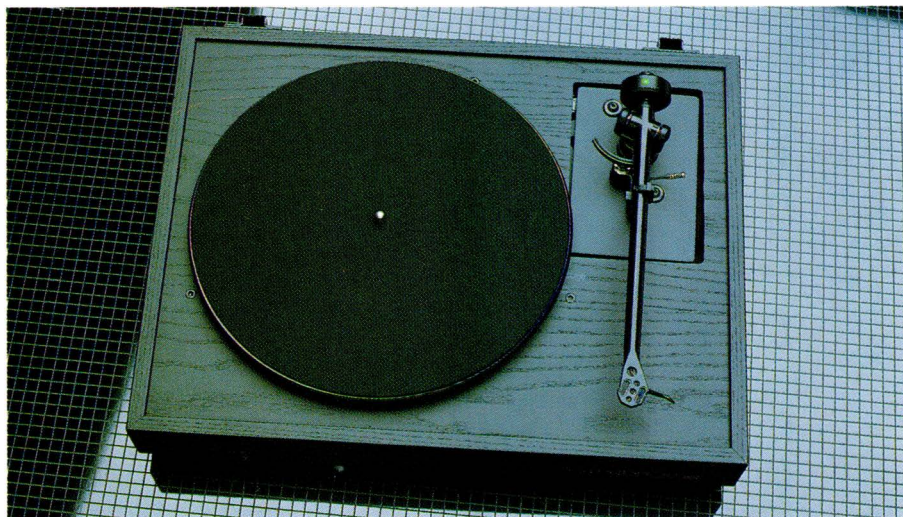
Arm	
Approximate effective mass inc screws, exc cartridge	14gms
Type of headshell	offset diecast, clamps on tube
Geometric accuracy	good
Adjustments provided	overhang
Finish & engineering	good/average
Ease of assembly/setup/use	good
Friction (typical) lateral/vertical	20mg/20mg
Bias compensation method	spring
Bias force, rim/centre (setto 1.5gm elliptical)	110mg/110mg
Cue drift	see text
Cue rate ascent/descent	see text
Arm resonances	medium
Arm damping method	none

System as a whole	
Size (hxwx d)/clearance for lid rear	42x47x37/5cm
Ease of use	average
Typical acoustic breakthrough and resonances	average/average
Subjective sound quality of complete system	below average
Hum level/acoustic feedback	below average
Vibration sensitivity/shock resistance	below average
Estimated typical purchase price	£188



Systemdek IIX/900

Systemdek Ltd, Unit 34, Kyle Road, Irvine Industrial Estate, Irvine, Scotland. Tel: (0294) 71251



Systemdek specialises in straightforward, non-tweaky engineering, styling that is both unobtrusive and vaguely furniture-like, and pricing that is closely related to the materials content of the products concerned.

No small part of Systemdek's success must be laid at the door of this model, the Systemdek IIX, which is the base model of its main series. This is a classic belt drive, suspended subchassis design with three very compliant undamped coil springs, interchangeable armboards (using a very easy two bolt arrangement that allows arms to be swapped quickly and efficiently), and a felt topped glass platter sitting on a driven inner hub.

Changes introduced in the models with the 900 suffix include a reshaped metal armboard (changed for acoustic reasons from the original medite), and a new split phase network, now housed inside the motor, which gives improved torque and reduced slowing under load.

The carcass consists of a standard up-ended wood veneered box, black in the case of the test sample, but available at no extra cost in walnut or a rather dramatic looking blond ash.

Lab report

The IIX provided an excellent set of test results, which given its longevity, its reputation, and the thorough nature of the engineering involved, is nothing less than had been expected.

There was some question about pitch integrity, but this might have been a measurement artefact, or a sign that the deck hadn't been properly run in. Certainly the wow and flutter figures, which were run a good deal later, yielded an impressive set of numbers, though the flutter analysis showed one prominent artefact at 100Hz.

The deck is rather jittery when running up to speed, but was otherwise untem-

peramental. Signal/noise was acceptable rather than good, but it is worth noting that the IIXE, which uses the same bearing (albeit with a lighter platter) gave much lower rumble figures. Sample variation may have played a part.

The Rega arm measured as expected in all respects — see the Thorens TD166/Rega test for further details.

Sound quality

In a nutshell, sound quality is excellent. It would be putting it too strongly to suggest that the Systemdek has an overt character, but it does, nevertheless, manage to convey a consistent impression of self-assurance and of being able to extract a wealth of fine detail off disc.

The sense of fineness, of subtlety retained and of good low-level resolution was apparent with a wide range of music, even when the music became dense and difficult. There was an occasional suggestion of glassiness with some material — piano and violins for example — and this is certainly an area where the more expensive IIXE does better. The bass isn't quite as strong or as obvious as with some, but it's also less dissipated than others too, and when meaningful bass is there on the recording, the IIX has a Compact Disc-like ability to make it count.

The other remarkable feature of the IIX is its fine, stable stereo soundstaging. The sense of layering and of depth wasn't fully realised in this design, but stability and the ability to illuminate spatial separation, especially in the lateral plane, is excellent.

Conclusion

Unobtrusive excellence in glass and wood, the Best Buy commendation is well deserved. Budget arms like the Rega, and equivalents from Linn and Roksan point the way to a high performance, low cost record player.

TEST RESULTS

Motor section

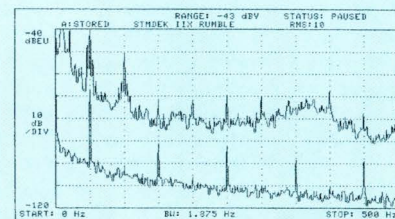
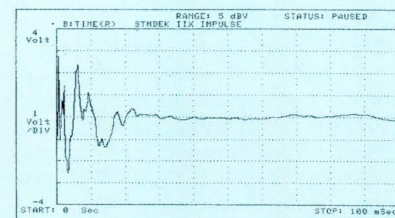
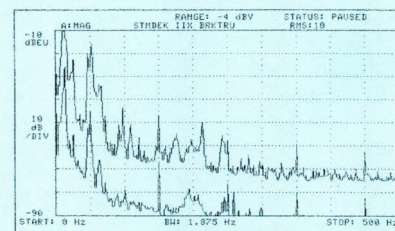
Type	Component motor unit with interchangeable armboards. Tested with Rega RB250
Platter mass/damping	1.8kg/good
Finish and engineering	good
Type of mains connection leads	2-core, captive
Speed options	33/45
Wow and flutter (DIN peak wtd)	0.10%
Wow and flutter (Lin peak wtd)	0.12%/0.07%
0.2Hz - 6Hz/6Hz - 300Hz	
Absolute speed error	+0.1%
Start up time to audible stabilisation	4 sec
Rumble DIN B Wtd L/R Average/	
L+R (see spectrum)	65dB/70dB

Arm

Approximate effective mass	12gm
inc screws, exc cartridge	fixed
Type of headshell	good
Geometric accuracy	good
Adjustments provided	overhang
Finish/engineering	poor/excellent
Ease of assembly/setup/use	good/poor/average
Friction (typical) lateral/vertical	10mg/10mg
Bias compensation method	spring
Bias force, rim/centre	
(set to 1.5gm elliptical)	330mg/320mg
Cue drift:	negligible
Cue rate ascent/descent	average/fast
Arm resonances	good
Arm damping method	none

System as a whole

Size (hwxwd)/clearance for lid rear	46x47x37/5cm
Ease of use	average
Typical acoustic breakthrough	
and resonances	good/good
Subjective sound quality	
of complete system	good
Hum level/acoustic feedback	fair/good
Vibration sensitivity/shock resistance	good
Estimated typical purchase price	£200



Systemdek IIXE/900AP

Systemdek Ltd, Unit 34, Kyle Road, Irvine Industrial Estate, Irvine, Scotland. Tel: (0294) 71251



Tested here with the Rega *RB250* arm, the *IIXE/900* has been changed only in relatively minor details over the last few years, the *900* suffix referring to revised motor mounts and other similar subterranean details explained more fully in the accompanying Systemdek *IIX* review.

The *IIXE/900AP* is the upmarket spin-off of the *IIX*. It has the same inverted box chassis, lightweight freely suspended girder-form subchassis and interchangeable metal armboards which are bolted through to the subchassis. The main bearing is attached to the finely finished wooden subchassis, and the platter sits squarely on top. The *IIX*'s glass platter is replaced by an acrylic platter (indicated by the AP suffix), which can also be purchased for other models in the range at a cost of £65 inclusive.

The other main difference with the *IIX* is the outboard synthesised power supply, which is housed in a small and rather awkwardly dimensioned box sporting a mains on/off switch and a speed change switch. The supply is quartz referenced, with separate crystals for 33 and 45rpm, and a switch to change between them.

Another common feature of all *Series II* models is that they can be obtained in black, walnut and blond ash wood veneer finishes, all priced identically.

Lab report

Rumble is extremely low, and despite a rather lively looking vibration plot, the deck is essentially proof against anything other than footfall noise or other low frequency signals fed into the main chassis, which set the largely undamped subchassis into convulsions. It is impossible to overrate the importance of using a stiff, preferably lightweight support, since any resonances in such a structure will lie above the frequencies that cause the suspension to dance.

The first test sample of this deck produced very poor spectrum analysis and wow

and flutter figures, which from experience were not thought typical. A second sample was obtained, unfortunately too late to rerun the spectrum plots, but the wow and flutter figures are better, and in fact almost as good as they get in this area of the market. Lets not be mealy mouthed about this: they're absolutely fantastic, that's what they are.

Sound quality

The *IIXE/900AP* (what a mouthful!) is identifiably of the same school as the *IIX/90*, but significantly refined and improved in a number of areas. Replacing the glass platter and felt mat with the acrylic platter provided important gains, notably in the quality of the extreme bass and the treble, both which opened out a great deal. There was greater separation between instruments in the bass, and vocal quality tended to be more 'open mouthed' and expressive. The whole soundstage seemed more alive, and elements such as rhythm and timing were more propulsive and sure footed.

One minor problem that I could not completely solve on test was a hum pickup, which persists even after breaking the turntable's earth link which, it transpired, was responsible for a hum loop. The finger of suspicion here is partly directed at the Rega arm, which persists with its anarchic combined signal and earth wiring, the only blemish on an outstanding product. At a slightly higher overall cost, the Roksan *Tabriz* works really well with this deck, and is hum free into the bargain!

Conclusion

This is a music lover's record player, but you also need to be a record player lover. No one else would be able to put up with the wobbly way the deck handles or its incredible sensitivity to handling if used other than on first rate support. It's a wide open window to the music though – Recommended.

TEST RESULTS

Motor section

Type	Component turntable with interchangeable armboards.
	Tested with Rega <i>RB250</i>
Platter mass/damping	1.5kg/good
Finish & engineering	good
Type of mains connection leads	3 core, PSU in lead (detachable)
Speed options	33/45
Wow & flutter (DIN peak Wtd)	0.15%/(0.09%*)
Wow & flutter (Linn peak Wtd 0.2Hz - 6Hz/6Hz - 300Hz)	0.28%/0.09% (0.11%/0.06%*)
Absolute speed error	+0.1%
Start up time to audible stabilisation	3 sec
Rumble DIN B Wtd L/R Average/ L+R (see spectrum)	73dB/>78dB

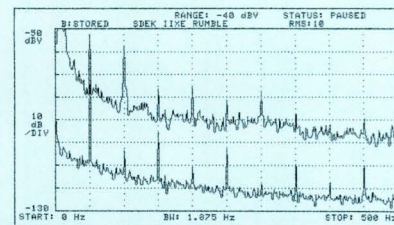
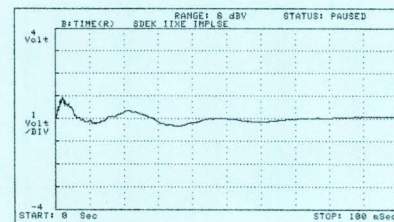
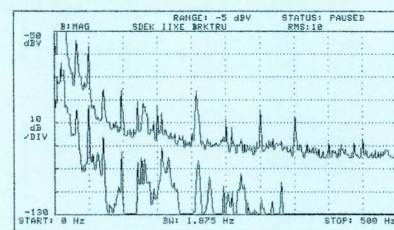
(*) - second sample see text

Arm

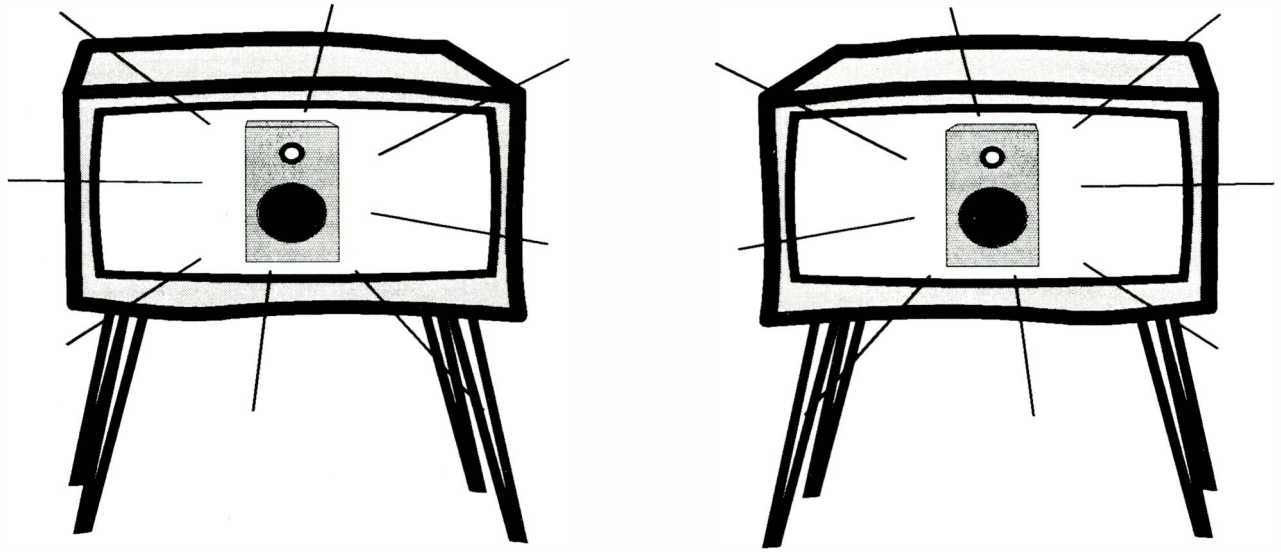
Approximate effective mass inc screws, exc cartridge	12gm
Type of headshell	fixed
Geometric accuracy	good
Adjustments provided	overhang
Finish & engineering	poor/excellent
Ease of assembly/setup/use	good/poor
Friction (typical) lateral/vertical	10mg/10mg
Bias compensation method	spring
Bias force, rim/centre (set to 1.5gm elliptical)	330mg/320mg
Cue drift	negligible
Cue rate ascent/descent	average/fast
Arm resonances	good
Arm damping method	none

System as a whole

Size (hxxwd)/clearance for lid rear	46x47x37/5cm
Ease of use	good
Typical acoustic breakthrough and resonances	good/excellent
Subjective sound quality of complete system	good
Hum level/acoustic feedback	fair/good
Vibration sensitivity/shock resistance	good
Estimated typical purchase price	£358



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Thorens TD280 II/UK

Portfolio Marketing Ltd, 67 New Road, Little Kingshill, Great Missenden, Bucks HP16 0EU. Tel: (0494) 890277



The *TD280* has been improved by popular demand (as they say) with a new cartridge and mat. The cartridge, which replaces the rather rough and ready Ortofon *OM10B*, is the rather more fashionably rough and ready Audio Technica *AT-95E*. The mat was rubber, and is now felt. But these changes amount to little more than the further egging of an already rich pudding . . .

The *TD280* is built to an improbably high standard given the price. The chassis is well though not extravagantly built, but the platter is a two-part design with an impressive diecast outer ring which sits on a plastic inner hub and main bearing assembly. A transformer housed in the mains lead drives a power supply with separate amplifiers for each phase of the motor, instead of the standard issue, and electrically dirtier, capacitor coupled circuit. The importer's PR agency describes this design as similar to the Linn *Valhalla* (the Linn *Sondek LP12*'s original upgraded supply), and further that some manufacturers charge more than the cost of the *TD280* for a similar stand alone power supply.

The arm is less idiosyncratic than some of Thorens' more costly models, and is generally well engineered, with less bearing slack than I have encountered in previous samples. But this is achieved at the cost of excessive bearing friction, apparently because of over-tightening.

The *TD280* is peach to use. Front panel switches take care of the excellent arm cueing feature and speed change. The motor switch is triggered by arm movement, and at the end of side, a no-contact optical acceleration sensor shuts the motor off and lifts the arm.

Lab report

The arm structural resonance plot is extremely active above 1kHz due to a series of largely unsuppressed resonances. The player

itself has good pitch integrity, with generally low flutter levels, though there is a prominent artefact at $\pm 60\text{Hz}$, which is the frequency that the power supply synthesises to drive the motor. Platter damping is quite good and the other plots are generally satisfactory. The only exception is the rather lively looking breakthrough plot. It was hard to match this to the listening tests except to say that the deck sounded better with the lid open.

Sound quality

Early samples of the *TD280* had occasional pitch problems, and a rather thick aural quality, but both appear to have been tackled. The review sample ran true, and no suggestion of programme wow was audible at any time on test. Equally the new cartridge, although certainly little more refined than the working surface of a Swan Vestas box, is palpably cleaner in the midband and more detailed than the agricultural Ortofon it replaces. The key change however is the mat, which opens out the sound, making dense orchestral textures lighter and more open, and revealing more information about ambience, intonation and the other subtleties that tend to pass budget turntable-dom by. I hesitate to say I told them so, but I certainly wasn't alone.

There are limits, of course. the *TD280* doesn't have the authority or stereo depth and focus of a real heavyweight, and there is more than a suggestion of crudeness in the midband, and on occasion a roughness of tone from violins and the like, even when using a more costly and better quality cartridge (the Roksan *Corus Black* in this case).

Conclusion

The Thorens is a first rate turntable at the price, solid and outgoing with an abundance of detail if not refinement. It is clearly superior to the (cheaper) Dual *CS505*, and comparably easy to use. Best Buy.

TEST RESULTS

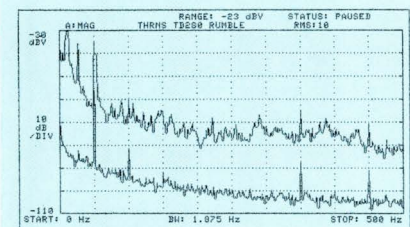
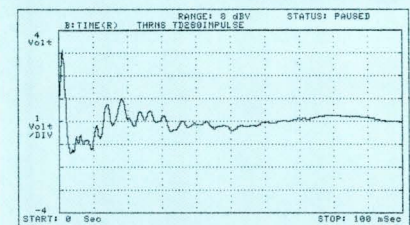
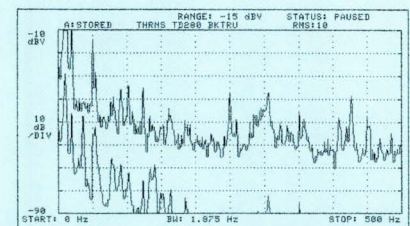
Motor section	
Type	integrated auto liftoff belt-drive player & cartridge
Platter mass/damping	1.3kg/plastic subplatter & diecast outer
Finish & engineering	good
Type of mains connection	
leads	detachable, transformer in lead
Speed options	33/45
Wow & flutter (DIN peak Wtd)	0.10%
Wow & flutter (Lin peak Wtd 0.2Hz - 6Hz/6Hz - 300Hz)	0.20%/0.10%
Absolute speed error	-0.3%
Start up time to audible stabilisation	3 sec
Rumble DIN B Wtd L/R Average/L+R (see spectrum)	70dB/71dB

Arm

Approximate effective mass inc screws, exc cartridge	12gm
Type of headshell	fixed, offset diecasting
Geometric accuracy	good
Adjustments provided	overhang/height
Finish & engineering	good/average
Ease of assembly/setup/use	good
Friction (typical) lateral/vertical	20mg/25mg
Bias compensation method	spring
Bias force, rim/centre (set to 1.5gm elliptical)	300mg/240mg
Cue drift	low
Cue rate ascent/descent	slow/med
Arm resonances	medium/high
Arm damping method	none

System as a whole

Size (hxwxd)/clearance for lid rear	160x44x35/9cm
Ease of use	good
Typical acoustic breakthrough and resonances	below average/poor
Subjective sound quality of complete system	average
Hum level/acoustic feedback	good
Vibration sensitivity/shock resistance	average/good
Estimated typical purchase price	£190



Thorens TD 166 VI/UK

Portfolio Marketing Ltd, 67 New Road, Little Kingshill, Great Missenden, Bucks HP16 OE1. Tel: (0494) 890277



Astonishingly in its sixth iteration, the Thorens *TD166* motor unit itself has been barely changed in recent times, though like other models in the range it now sports a felt mat in place of the sound deadening rubber type that Thorens has stood by so rigidly in the past. Although the *VI* is still available with a Thorens arm, this latest *UK* variant comes complete with a Rega *RB250*. The matching speed change switch is retained and the Rega arm handles well, though some may feel that the rather stiff cueing lever causes the suspension to wobble unduly.

The *TD166* is very soundly engineered. Its parentage can be traced back to the original *TD150*, the first European three point suspended subchassis design, and it abides by the original concepts with its low bounce frequency, relatively undamped suspension and massive two part platter. The plastic inner subplatter incorporates a substantial bearing and the outer is an alloy item with the weight concentrated around the rim to increase rotational inertia without affecting bearing loads. Drive is courtesy of a mains locked 16 pole synchronous motor via a transformer housed in the mains lead.

Lab report

The arm has just acceptable levels of pivot friction, its structural resonances are astonishingly well suppressed given the price level. The first breakup mode is delayed to over 1kHz, and there is little energy above that as the spectrum analysis shows.

The design of the player makes the other figures unsurprising. Wow is moderately low, but flutter is essentially negligible, being ironed out by the platter's flywheel effect. Some sidebands in the analysis of wow and flutter indicate the presence of discrete wow artefacts perhaps associated with the motor, but the overall level is moderate.

Shocks applied to the platter are rapidly

damped, and the breakthrough plots are universally good to excellent, which shows the fundamental rightness of the design, on paper at least.

Sound quality

The high platter mass and well optimised motor/belt design predictably led to a stable performance, largely free of flutter artefacts, and low rate wow variations were mainly below the threshold of hearing, though the Thorens did betray itself on a couple of rare occasions at the beginning of the tests, which might have been before the deck had been properly run in.

This said, it is essential to support the main chassis firmly since any movement here will result in severe programme wow. The suspension does, however, endow the deck with substantial freedom from acoustic feedback, and the sound remains notably lean and clean even at high replay levels.

Musically the *TD166 Mk VI* is usefully better than the *TD280*, especially in the areas of refinement and stereo imagery. There is a certain core softness, but clarity is of a high order, and simple chamber test recordings reproduced with a spacious yet well focused quality, with quiet surfaces and a seamless bass and midband. The effect was very believable, only the cosmetics of record reproduction (as always) marking it down in comparison to good (ie costly) Compact Disc reproduction.

Conclusion

The Thorens *TD166 VI/UK/Rega* combines the strengths of a classic, well sorted suspended subchassis turntable, with a tonearm that is one of the finest at its price, to produce an end result that is unbeatable in its class.

This, at any rate, is what Thorens' information with this clumsily named model says, and for once the claims can be fully endorsed. Another Best Buy for Thorens.

TEST RESULTS

Motor section

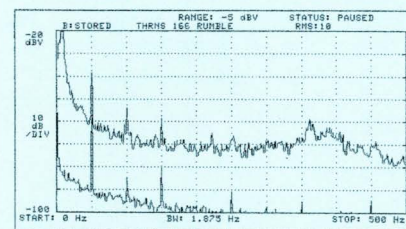
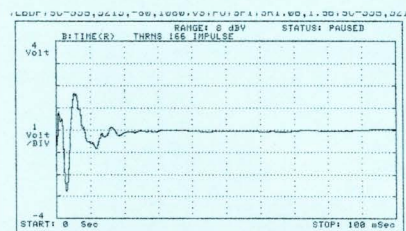
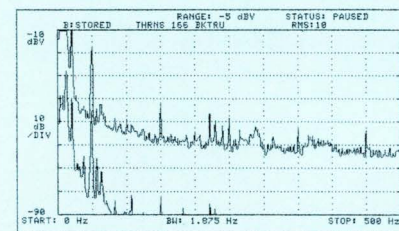
Type	integrated belt drive manual 2-speed player and arm
Platter mass/damping	2.7kg zinc-alloy casting outer, plastic inner hub
Finish and engineering	average/good
Type of mains connection leads	detachable, transformer in lead
Speed options	33/45
Wow and flutter (DIN peak wtd)	0.13%
Wow and flutter (Lin peak wtd)	
0.2Hz - 6Hz/6Hz - 300Hz)	0.18%/0.15%
Absolute speed error	-0.2%
Start up time to audible stabilisation	4 sec
Rumble DIN B Wtd L/R Average/ L+R (see spectrum)	68dB/74dB

Arm

Approximate effective mass inc screws, exc cartridge	12 gms (est)
Type of headshell	fixed
Geometric accuracy	good
Adjustments provided	overhang
Finish and engineering	poor/excellent
Ease of assembly/setup/use	good/poor/average
Friction (typical) lateral/vertical	15mg/15mg
Bias compensation method	spring
Bias force, rim/centre (set to 1.5gm elliptical)	330mg/310mg
Cue drift	negligible
Cue rate ascent/descent	average/fast
Arm resonances	very good
Arm damping method	none

System as a whole

Size (hwxwd)/clearance for lid rear	16x44x34/9cm
Ease of use	average
Typical acoustic breakthrough and resonances	good
Subjective sound quality of complete system	above average
Hum level/acoustic feedback	very good
Vibration sensitivity/shock resistance	very good/average
Estimated typical purchase price	£270





Thorens TD-3001/TP90SF

Portfolio Marketing Ltd, 67 New Road, Little Kingshill, Great Missenden, Bucks HP16 0EU. Tel: (0494) 890277



A part from an enormous heap of iron . . . (surely state of the art turntable - Ed) called the *Prestige* that Thorens brandishes at hi-fi shows, presumably in an attempt at intimidate the punters, the *TD3001*, with its new *TP90/SF* arm, is the top of the range model and Thorens' entry into the high-end, no less.

The basics are a mixture of familiar Thorens elements. This is a three point suspended subchassis design, using leaf rather than coil springs (adjustable from above) to give different resonant frequencies in the horizontal and vertical planes. The deck employs a computer controlled Berger-Lahr stepper motor. The transformer is housed in the power lead, and drives a motor using a split phase circuit driving a pair of op-amps per phase. The belt is aged for six months before being used, and the motor, belt and servo control are fine tuned to each other's specific characteristics, giving a 'spectacularly smooth' drive. From the evidence I have seen, the ground shaft/thrust pad type main bearing is even more exactly engineered than the better known English and Scottish competition, beating the established references for concentricity and smoothness.

The *TP90SF* arm, a development of the familiar *TP90*, employs a bonded headshell (the *TP90* equivalent is detachable), an internally damped armtube and other small changes. Engineering of this item appears sound but unexciting.

The deck has a fine veneered Medite carcass, but the metalwork is only moderately well finished. There were some petty annoyances - an excessively stiff weight setting dial on the arm counterweight for example - but nothing that will cause serious upset.

Lab report

The story here can be summed up in three words - good, good and good. Rumble wasn't

quite as low as the engineering might have suggested, but the special tool steel used is unusually hard, and the running in process is probably measured in months rather than weeks. The deck is essentially proof against all the usual breakthrough and resonance type problems, the platter being especially good here, provided it is mounted rigidly. The wow and flutter figures are good, and the shape of the spectrum analysis is a textbook example of its kind.

The arm is not engineered to the same standard. The resonance curve is OK, but a bit spiky and readily bettered by budget arms from Rega, Linn and others, whilst the important lateral bearings were a little sticky, though this is likely to be a sample fault.

Sound quality

It is hard to get worked up about this deck, which in the final analysis appears to be a little let down by the arm, though it is hard to be certain which part of the sound is attributable to the arm and which part to the turntable. Even with the arm however, this is a clean and detailed sounding turntable, which reproduces stereo soundstage information as though its going out of fashion. Detail is provided in abundance, the bass - often a weakness even with high-end turntables - is light and agile with no obvious overhang. Having said this, the Thorens had what can only be described as a slightly cardboardy feel, a lack of real grip, power and - ultimately - authority.

Conclusion

Recommended, but if I was doing the buying, I think I'd go for the BC (armless) version and buy an arm from elsewhere - perhaps a Roksan *Tabriz zi*, a Rega *RD300* or perhaps an SME *309*. In other respects the deck is unobtrusively excellent, with generalised adjectives like transparent and seamless taking precedence over the usual more glamorous superlatives.

TEST RESULTS

Motor section

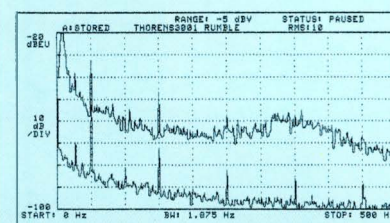
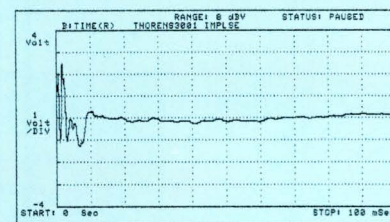
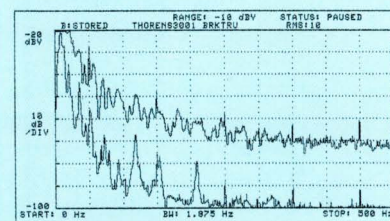
Type	Integrated turntable & detachable arm
Platter mass/damping	3.3kg/excellent
Finish & engineering	average/excellent
Type of mains connection leads	transformer in lead
Speed options	33/45
Wow & flutter (DIN peak Wtd)	0.5%
Wow & flutter (Lin peak Wtd 0.2Hz - 6Hz/6Hz - 300Hz)	0.15%/0.06%
Absolute speed error	+0.1%
Start up time to audible stabilisation	3 sec
Rumble DIN B Wtd L/R Average/L+R (see spectrum)	68dB/74dB

Arm

Approximate effective mass inc screws, exc cartridge	14gms
Type of headshell	fixed, offset
Geometric accuracy	good
Adjustments provided	height, overhang
Finish & engineering	average/good
Ease of assembly/setup/use	good
Friction (typical) lateral/vertical	50/10
Bias compensation method	magnetic
Bias force, rim/centre (set to 1.5gm elliptical)	60mg/80mg
Cue drift:	n/a *
Cue rate ascent/descent	n/a *
Arm resonances	average +
Arm damping method	none
* cueing platform maladjusted and unusable	

System as a whole

Size (hxxwxd)/clearance for lid rear	43x44x36/7cm
Ease of use	good
Typical acoustic breakthrough and resonances	v good
Subjective sound quality of complete system	good
Hum level/acoustic feedback	excellent/good
Vibration sensitivity/shock resistance	good/v good
Estimated typical purchase price	£850



Tech Talk

The turntable motor units and arms in this month's group were subjected to a full battery of tests designed to seek out weaknesses and highlight strengths in a number of areas. The principal tests involved looking at pitch stability, rumble, electrical and acoustic breakthrough, and included Fourier analysis to produce instantaneous frequency spectra.

In many cases the entries in the test report section of the turntable reviews are self explanatory and/or general in nature. Take care with the way you read the numbers. Platter weight, for example, means just what it says, and is not directly related to rotational inertia (which is one factor in the wow and flutter equation). A flat disc of glass of a given weight (say) will have lower inertia than a two part diecast platter with a deep rim where the weight is concentrated around the periphery.

Turntables and tonearms are complex beasts but Alvin Gold has them rumbled. Here he explains the tests used in the reviews.

Of those tests that are not self explanatory, wow and flutter was measured using a wow and flutter meter, and the results tabulated, with separate figures for wow, flutter and a peak DIN weighted overall figure, measured at 3.15kHz. Rumble is shown in two forms, as a Din B figure and in the form of a spectrum from the FFT. The rumble test used a recently refurbished Thorens rumble coupler attached to the turntable spindle. In both cases, of course, any measured artefact is undesirable, though some is inevitable. Geometric accuracy comments refer to checks made to show distortion due to tracking errors at various points across the record, using the Elite (Townshend) gauge.

It is important to understand the limitations of the measurements presented. The various structural plots (impulse, rumble, vibration breakthrough etc) are undoubtedly the most interesting of the tests, and give a graphic indication of the character of the products under scrutiny, but they're difficult to interpret, and are only distantly related to the component's fidelity.

There are even problems in relating the simpler measurements to the performance of the turntables tested, but there are a few rules of thumb, of which these two are the most important. First, the better sounding decks tend to be those largely free from frequency or time selective phenomena. Low levels of widely distributed noise artefacts, for example, are more desirable than a concentration in one ear catching frequency band due perhaps to a sharp high-Q resonance. Second, good measurements are necessary but not in themselves a sufficient precondition for good sound. The opposite, by the way, is not true, and a bad overall set of lab test results is a pretty good indication that things won't work out well on audition.

All spectrum plots share in common the fact that absolute levels are not important. What counts are the trends, for example, if a plot looks spiky, you can

expect the player to sound that way too, though a superficial listen may simply suggest it sounds detailed.

The plots include acoustic breakthrough (top line in plot) which results from feeding a high level pink noise signal (simulating wideband music) into the structure. The vibration plot (bottom line) shows a similar effect, this time when the outer structure of the deck is excited by a transient blow directed at the (isolated) surface on which the deck stands, in this case simulating footfall noise and mechanical feedback. In both cases the measurement is made from a cartridge whose stylus was sitting on the run in groove of a stationary record. A rotating record would have increased noise levels.

The top and bottom plots in the rumble graph show mechanical and electrical rumble respectively.

Listen very carefully

Listening followed a pattern I have established in the past, which in the case of the better players is a twin track approach designed to show how good a record player can sound under 'ideal' circumstances, and how good it is likely to sound under 'typical' circumstances. Two systems were involved, in two different rooms. The first 'ideal' system was built around Martin Logan *Quest* loudspeakers driven by various amps, including Musical Fidelity 570s and — until one of the transformers went into meltdown — Michaelson Audio *Chronos* monoblocs. PS Audio and DNM preamplifiers were used for equalising the cartridges. The main test cartridge was a structurally modified Audio Technica *AT-F5*, but the better decks were used with other cartridges including, memorably, a Koetsu *Urushi*.

Naturally the low end turntables were not used in this system. They were used exclusively with moving magnet cartridges (the one supplied by the manufacturer and a Roksan *Corus Black*) in a second system which included Linn Products *Pretek* and *Powertek* amplifiers and various middle price/size speakers including a prototype loudspeaker designed by Dave Berriman.

The usual eclectic range of recordings was used, with material from classical to rock, jazz and folk dating from the Sixties to the present day. Almost all were conventional commercial releases.



A desirable end to a tonearm: Koetsu's Urushi.

Conclusions, Best Buys & Recommendations

Records, and turntables, have been at the epicentre of all things hi-fi for so long that it comes as a shock to realise that their day is finally drawing to a close. For some time now my own personal listening has been more CD than vinyl based; reviewing commitments make this fact inevitable, though my vinyl record collection remains much better stocked than my CD collection. So tackling this group of record players involved an element of rediscovery, of returning with fresh eyes to a once familiar landscape, and inevitably there were surprises.

The first, (unpleasant) surprise was to discover how expensive the top stratum of players has become. The other surprise, however, was much more pleasant. I discovered, again, that when it comes down to grinding out the music, records are still the best.

Best Buys

Thorens TD280II/UK £189. Pricing and the traditional virtues of Thorens budget turntables are the secret of this deck, which features a low voltage split phase power supply in an outboard transformer. The arm is simple but adequately designed, and is prefitted with a crisp if slightly ragged sounding budget Audio-Technica cartridge. Sound quality is firm, stable and reasonably refined, at the price the deck is a steal.

Want to know which record players came out best in this month's batch of turntable and tonearm reviews? Alvin Gold presents the answers on a platter.

Systemdek IIX/900 £200. The current 900 series version of the IIX includes armboard and motor drive improvements, but is otherwise unchanged, the main design points being a compliant suspended subchassis and a felt topped glass platter. Used with the ubiquitous Rega RB250, the Systemdek IIX is an excellent and extremely assured sounding all-rounder, with no overriding strengths and no particular areas of weakness. A consistent, reliable choice.

Thorens TD166 VI/RB250 £270. This model is directly descended from the father of all European 3-point suspended subchassis turntables, the TD150, which was the inspiration for the Linn Sondek LP12. The deck is solid, quite heavy and well isolated, and is coupled here with the Rega RB250, which is as tidy and transparent as usual. The deck offers switched speed change, sound engineering, and a solid, three-dimensional performance. Some long standing gripes have finally been attended to with a felt mat replacing the awful rubber items previously supplied.

Recommendations

Dual CS505-4 £170. The CS505-4 has been progressively refined over the years to the point where it matches most of the best turntables in its price range.

In addition however it offers auto-armlift at the end of side and foolproof operation that mitigates most of the effects of mishandling. The Dual also offers variable speed courtesy of a segmented motor pulley - probably the first and last time you'll ever see such an oddball mechanism.

Linn Basik £250. Not quite a chip off the old block despite the visual references, its early weaknesses have been resolved, and the design now works well, though the development of the bass end does not quite match the rest of the design. The Basik is well partnered by the articulate sounding Akito arm.

Systemdek IIXE/900AP £358. Similar to the IIX, but with an acrylic platter and an outboard split phase, quartz referenced PSU. The deck is sprung and neatly if unobtrusively fitted out in a wood chassis. There was a suggestion of hum with the test Rega arm, and those interested might want to bear this in mind, though other budget/middle price arms including the Linn Akito and Roksan Tabriz work well. Sound quality is very articulate and assured.

Roksan Radius/Tabriz zi £635. Whilst it lacks the range and scale of Roksan's senior turntable, this very attractive newcomer has many of the same trademarks, including excellent low level resolution and stereo imagery, and an unusually coherent sound overall. Tested with the Tabriz zi, which is an excellent match. A thoroughbred.

Linn Basik LP12 £736. Designed as a stepping stone to a full LP12, the Basik version reverts to its pre-Valhalla mains locked motor drive, but is otherwise a full spec LP12, including the new Trampolinn-like wood base. All the familiar qualities are apparent (tested with Akito arm) but with inferior imagery and low level resolution than the full LP12. The mid bass is tauter now thanks to the bloom robbing new base, and the deck offers excellent value.

Thorens TD3001/TP90SF £850. It is ironic that Thorens, which in a sense gave birth to the high end turntable (albeit at second hand through designs like the Linn Sondek LP12) should have had so little success with its own turntables in this area. The TD3001 is a return to form, and categorised by conservative and unusually high grade engineering, the main bearing being a high point. The arm however is something of a let down, taking the edge off a performance standard which is otherwise hard to fault. Readers are pointed to the BC (armless) version, which costs £700 but was not tested.

Roksan Xerxes/Artemiz/Artaxerxes £1,999. The original Xerxes offered unusually fine resolving power, explicit stereo, and seamlessly extended (if lean sounding) bass. The deck has been refined in many ways, but its core characteristics have only been enhanced by the changes that have been made. The arm and Artaxerxes MC step-up are true high end designs which suit the deck well. It is still at the mercy of its setting up however, and a poorly cared for Xerxes will not get up and dance. All upgrades (for example the newish XPSII power supply) are retrofittable for those with earlier versions.

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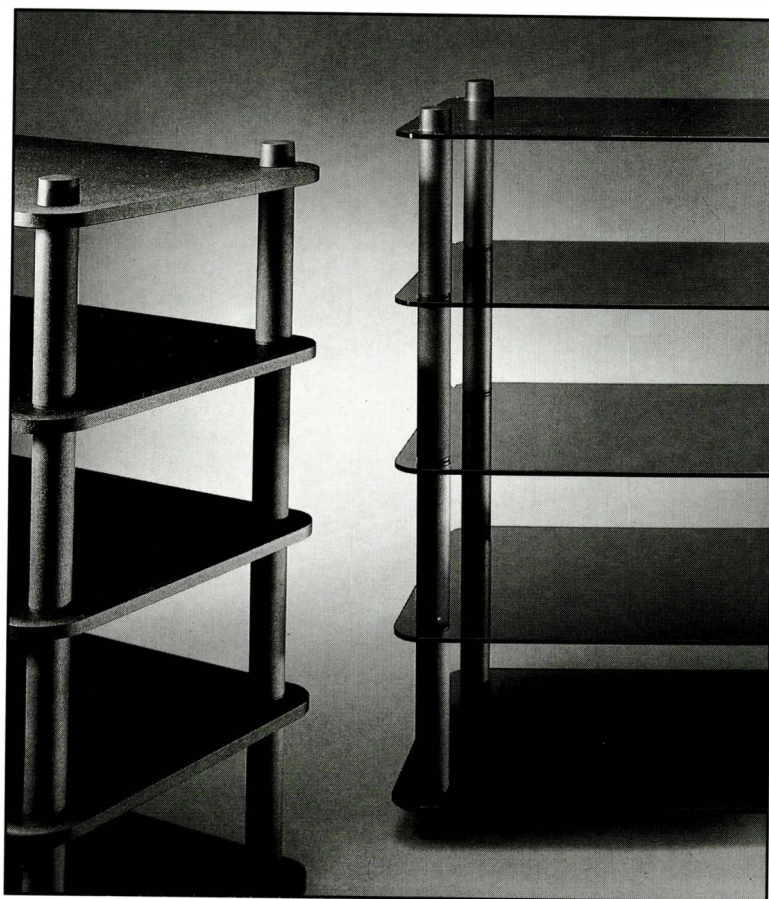
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Clean Sweep

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The list on this page gives you the addresses and telephone numbers of a selection of record shops/hi-fi dealers that

Looking to get the best out of your precious vinyl? Why not check out the record cleaning facilities available in your local area?

provide a record cleaning service, most using either the Keith Monks machine or the *Nitty Gritty*.

The list came about as a result of a request from the Consumer's Association – the publishers of *Which?* magazine – to

BADA (the British Audio Dealers Association) for a list of all the shops which are able to provide this service, something *Which?* wanted to run in an issue which had a report about cleaning up your records. Unfortunately *Which?* didn't have the space to publish it but we thought it might be of interest to our readers so it is produced in full on this page.

If you have any additions to the list they should be passed onto BADA, PO Box 229, London N1 7UU. The list will be updated at regular intervals and copies of the updated list will be available from BADA.

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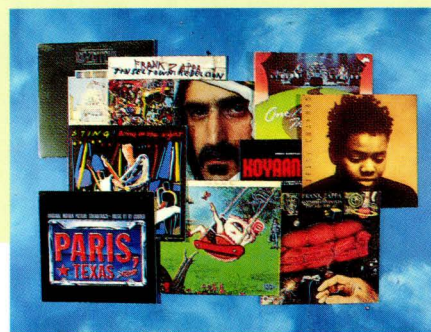
IMAGE HI-FI, 17, The Springs.
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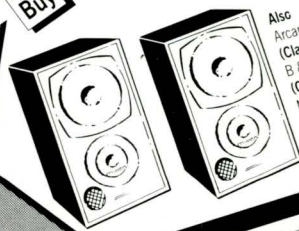
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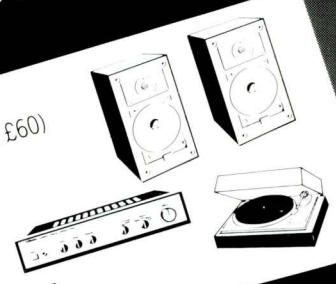


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SPEAKERS	Widale Delta 30.2 JPW Minim Gate GS210 JPW Sonata (vinyl) Mission 760	Celestion 3 JPW Sonata M/Short MS 3 1.0 W/Date Diamond 4 Royd A7 Tannoy 603	Celestion DL4 II Tannoy E11 JPW Sonata+ M/Short MS3 2.0 Mission 761	Nad 8225e Celestion 5 B&W DM600 Ker K120 Tannoy 605	Monitor Audio R7 Celestion DL6 II Tannoy M15 Wharfedale 505.2	Mission 762 Castle Warwick Celestion DL8 II Monitor Audio R9 M/Short MS 3 3.0 B&W DM610 Tannoy 607	Castle Durham Heybrook HB1/3 Tannoy 609 Rogers LS44-2 (Add £30) B & W DM620 (Add £50)
Rotel RA820AX	324.95	336.95	356.95	368.95	388.95	404.95	444.95
Rotel RA820BX4	299.95	312.95	332.95	344.95	364.95	379.95	419.95
Kenwood KA3020	308.95	319.95	339.95	352.95	372.95	388.95	428.95
Pioneer A300	324.95	336.95	356.95	368.95	388.95	404.95	444.95
Rotel RA930AX	336.95	348.95	368.95	372.95	388.95	404.95	444.95
Harman HK6100	339.95	352.95	372.95	384.95	399.95	416.95	456.95
Sony TAF440E	379.95	392.95	412.95	424.95	444.95	459.95	499.95
Sony TAF540E	324.95	336.95	356.95	368.95	388.95	404.95	444.95
Technics SUVK500K	356.95	368.95	388.95	419.95	432.95	452.95	492.95
NAD 3240	388.95	399.95	404.95	416.95	436.95	468.95	509.95
Marantz PM40SE	372.95	384.95	399.95	404.95	416.95	436.95	476.95
Kenwood KA5020	332.95	344.95	364.95	376.95	396.95	412.95	452.95
Nad 3225PE	316.95	328.95	348.95	359.95	379.95	396.95	436.95
Nad 3020 i	316.95	312.95	332.95	344.95	359.95	379.95	419.95
Marantz PM 30SE	299.95	308.95	328.95	338.95	359.95	379.95	419.95
Rotel RA920AX	356.95	368.95	388.95	404.95	416.95	436.95	476.95
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 - Denon DCD580 add £35
 - Denon DCD660 add £55
 - Denon DCD860 add £115
 - Denon DCD960 add £155
 - Denon DCD960 add £25
 - Marantz CD41 add £55
 - Marantz CD42 add £155
 - Marantz CD52 add £255
 - Marantz CD62 add £35
 - Nad 5420 add £55
 - Nad 5425 add £55
 - Nad 5440 add £155
 - Philips CD604 add £35
 - Philips CD610II add £5
 - Philips CD618 add £35
 - Philips CD624 add £55
 - Philips CD834 add £115
 - Philips CD850 MkII add £155
 - Pioneer PD4700 add £25
 - Pioneer PD5700 add £55
 - Pioneer PD6700 add £105
 - Pioneer PD7700 add £115
 - Pioneer PD8700 add £155
 - Rotel RCD955AX add £15
 - Technics SLPG200AK add £35
 - Technics SLPG400AK add £35
 - Technics SLPG500AK add £55
- TURNTABLES**
- Dual CS505-4 add £25
 - AR EB 101 add £100
 - Nad 5120 add £55
 - Arston Q Deck add £20
 - Rotel RP855 add £55
 - Systemdek IX900 + MOTM + AT110E add £155
 - Thorens TD280II add £45

FREE
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344 COLDHARBOUR LANE
LONDON SW9
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*We are the system builders.
Some are listed with Dual CS503/2 Turntable*

Table with columns: SPEAKERS, Delta 30 II, Celestion 3, Tannoy E II, KEF C25, Infinity 2001, Tannoy M15, BW DM610, Tannoy M20, and T/T & C.D. PLAYER OPTIONS.

AMPLIFIERS section listing Denon PMA 250 MkII, Denon PMA 350, Denon POA 4400, Dual CV 600, Kenwood KA1030, Kenwood KA3020, Kenwood KA4040R, Kenwood KA5020, Kenwood KA7020, Marantz PM30SE, Marantz PM40SE, Marantz PM50, Marantz PM80, NAD 3020, NAD 3225PE, NAD 3240PE, Pioneer A300, Rotel RA920AX, Rotel RA930AX, Rotel RA940BX, Rotel RA960BX, Rotel RA980BX, Rotel RA990BX, Rotel RA820B4X, Rotel RA840B4X, Rotel RC950BX, Rotel RB960BX, Rotel RC980BX, Rotel RB980BX, Rotel RT3050, Rotel RT850, Sony TAF440E, Sony TAF540E, Suggden A25, Suggden A4811, Sumo Ulysses, Teac X8000, Technics Stocked, Yamaha AX330.

AMPLIFIERS section listing Marantz CD42, Marantz CD52, NAD 5420, NAD 5425, Pioneer Stocked, Philips CD818, Philips CD824, Philips CD834, Philips CD840, Philips CD850, Rotel RCD955AX, Rotel RCD955BX, Sony CDP991, Yamaha CDX530, Yamaha CDX650.

TURNABLES section listing AREG101, Ariston PRO DECK, Ariston Pro Maxm/Rega, Ariston Pro Deck, Dual CS430, Dual CS505/4, Dual CS503/2, NAD 5120, Systemdek 11X/900, Systemdek 11X/900, Technics SL1200/1210, Thorens TD166, Thorens TD180, Thorens TD280 MkII, Thorens TD166V, Thorens TD160VBC, Bose AM5, B&W DM 600, B&W DM 810, B&W DM 820, Celestion III, Celestion 5, Celestion DL8II, Celestion DL8I, Celestion SL 2II, Celestion SL6Si, Celestion SL600Si, Celestion SL700, Carwin Vega, Infinity RS Series, JBL LK65, JBL HP520, JBL XE 1, JBL XE 2, Pro 3, JPW Sonata, Mission 760, Mission 761, Mission 762, Mission 763, KEF C Series, KEF Construction Series, Monitor Audio 1, Monitor Audio M7, Monitor Audio M9, Mordaunt Short M14, Mordaunt Short MS10, Mordaunt Short MS30, Mordaunt Short MS30, Mordaunt Short MS340, Mordaunt Short MS350, Rogers LS2A-2, Rogers LS35A, Rogers LS4A-2, Rogers LS6A-2, Rogers Studio 1A, Tannoy 603, Tannoy 605, Tannoy 607, Tannoy 609, Tannoy Prestige Series, Vharredale Diamond IV.

AMPLIFIERS section listing Monitor Audio 352MD, Tannoy SGM-10, Tannoy DC100, Tannoy DC200, Tannoy Venus II, Tannoy M20BK, Tannoy M15BK, Tannoy E11BK, Rogers LS7, Rogers LS7T, AR A04 Receiver, Cambridge A60, Dual PA5030, Dual CV 6010, Dual CV6030, Kenwood KA7010, Quad 34 PRE-AMP, Quad 44 PRE-AMP, Quad 306 PWR-AMP, Rotel RA810A, Rotel RC870BX, Rotel RA820B2X, Rotel RA820A2X, Rotel RA820B4X, Sansui AUX201, Yamaha AX430, Yamaha AX530.

TUNERS section listing Denon TU260L, Denon TU560, Denon TU660L, NAD 4225, Kenwood KT1030, Kenwood KT2030, Marantz ST40L, Marantz ST50L, Revox B260, Rotel RT930AX, Rotel RT950BX, Rotel RT970BX, Pioneer F656, Sony STS370, Suggden DTFM, Sumo Aurora, Teac TX3000, Technics STG470, Technics ST610, Yamaha TX330, Yamaha TX350L, Yamaha TX530.

CASSETTE DECKS section listing Aiwa ADWX 777, Aiwa ADWX 888, Aiwa AD F370, Aiwa AD F810, Aiwa AD F410, Denon DRMS10, Denon DRM70A, Denon DRM800A, Denon DRMS910, Denon DRFW650A, Denon DRW750Atwin, Dual CC850twin, Kenwood KX1010, Kenwood KX3010 HXPRO, Kenwood KX3010, Marantz SD45, Nakamichi CASS. DECK 1, 1.5 & 2, Pioneer Stocked, Revox B771 Orirel, Rotel RD95A4X, Rotel RD955AX, Rotel RD965BX, Sony TCK 520, Sony TCK 570, Technics Stocked, Yamaha X250, Yamaha KX330, Yamaha KX530.

SPEAKERS section listing Bose AM5, B&W DM 600, B&W DM 810, B&W DM 820, Celestion III, Celestion 5, Celestion DL8II, Celestion DL8I, Celestion SL 2II, Celestion SL6Si, Celestion SL600Si, Celestion SL700, Carwin Vega, Infinity RS Series, JBL LK65, JBL HP520, JBL XE 1, JBL XE 2, Pro 3, JPW Sonata, Mission 760, Mission 761, Mission 762, Mission 763, KEF C Series, KEF Construction Series, Monitor Audio 1, Monitor Audio M7, Monitor Audio M9, Mordaunt Short M14, Mordaunt Short MS10, Mordaunt Short MS30, Mordaunt Short MS30, Mordaunt Short MS340, Mordaunt Short MS350, Rogers LS2A-2, Rogers LS35A, Rogers LS4A-2, Rogers LS6A-2, Rogers Studio 1A, Tannoy 603, Tannoy 605, Tannoy 607, Tannoy 609, Tannoy Prestige Series, Vharredale Diamond IV.

AMPLIFIERS section listing Denon DCD 300, Denon DCD 1420, Hitachi DA-006, Hitachi DA-009, Nakamichi OMS1, Philips CD473, Rotel RC820B, AR A04 Receiver, Cambridge A60, Dual PA5030, Dual CV 6010, Dual CV6030, Kenwood KA7010, Quad 34 PRE-AMP, Quad 44 PRE-AMP, Quad 306 PWR-AMP, Rotel RA810A, Rotel RC870BX, Rotel RA820B2X, Rotel RA820A2X, Rotel RA820B4X, Sansui AUX201, Yamaha AX430, Yamaha AX530.

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RECEIVERS section listing Denon DRA 335, Kenwood KR-V7030, Marantz SR50L, Marantz SR50L, NAD 7225PE, NAD 7240PE, NAD 7250PE, NAD 7220, Revox B285, Rotel RX850, Yamaha RX330, Yamaha RX530, Aiwa Z-D200CD, Aiwa Z-D95CD, Aiwa Z-D92CD, Aiwa Z-D87CD, Aika FX600, Kenwood M24CDS, Kenwood M34CDS, Kenwood M74CDS, Pioneer Stocked, Sony Stocked, Technics CDX10, Technics CDX30, Technics CDX510, Technics CDX910, Yamaha AST/Ci.

RECEIVERS section listing Denon DRA 335, Kenwood KR-V7030, Marantz SR50L, Marantz SR50L, NAD 7225PE, NAD 7240PE, NAD 7250PE, NAD 7220, Revox B285, Rotel RX850, Yamaha RX330, Yamaha RX530, Aiwa Z-D200CD, Aiwa Z-D95CD, Aiwa Z-D92CD, Aiwa Z-D87CD, Aika FX600, Kenwood M24CDS, Kenwood M34CDS, Kenwood M74CDS, Pioneer Stocked, Sony Stocked, Technics CDX10, Technics CDX30, Technics CDX510, Technics CDX910, Yamaha AST/Ci.

TURNABLES section listing Goldring G202 arm, Thorens TD316 MkII, Rotel RP830, Apollo CKD Column Stands, AT.1, AT.14, AT.3, AT.4, AT.5.

CD PLAYERS section listing Aiwa XC700, Denon DCD480, Denon DCD580, Denon DCD660, Denon DCD860, Denon DCD960, Denon DCD1460, Dual CD100, Kenwood Stocked.

MIDI SYSTEMS section listing Aiwa Z-D200CD, Aiwa Z-D95CD, Aiwa Z-D92CD, Aiwa Z-D87CD, Aika FX600, Kenwood M24CDS, Kenwood M34CDS, Kenwood M74CDS, Pioneer Stocked, Sony Stocked, Technics CDX10, Technics CDX30, Technics CDX510, Technics CDX910, Yamaha AST/Ci.

MIDI SYSTEMS section listing Aiwa Z-D200CD, Aiwa Z-D95CD, Aiwa Z-D92CD, Aiwa Z-D87CD, Aika FX600, Kenwood M24CDS, Kenwood M34CDS, Kenwood M74CDS, Pioneer Stocked, Sony Stocked, Technics CDX10, Technics CDX30, Technics CDX510, Technics CDX910, Yamaha AST/Ci.

SYSTEM RACKS section listing AT.1, AT.14, AT.3, AT.4, AT.5, All Apollo products inc free delivery.

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Choosing and Using . . . Cartridges

A phono cartridge, when you come to think of it, has a very great responsibility. Almost alone among items of hi-fi equipment, it can actually damage the source material it is endeavouring to reproduce. Now, while LPs are biting the dust faster than dodos in the hunting season, is not the time to push another haystack off the old BSR ceramic cartridge and wonder how many thousand hours those sapphires are good for. On the contrary; unless you are pretty confident that your entire LP collection is imminently going to be reissued on CD (and by an engineer who isn't power-crazed with the latest DSP 'improver', at that), I would suggest that now is the time to look long and hard at allocating a good bit of your hi-fi budget to obtaining a good quality cartridge that will do your LPs proud for years to come.

Looking for the ideal component to attach to the end of your tonearm? Richard Black gets the needle.

What's all this about damaging records? It's simple, really; as long as the stylus is in good contact with the record groove, following accurately through thick and thin, it is in no position to cause any wear to the surface, nor to be worn out itself. On the other hand, once that stylus leaves proper contact, even for the minutest fraction of a second, it will come back into contact with a bump that will do far more damage than any amount of proper tracing.

Here's an analogy; imagine balancing a scalpel on the tip of your finger, sharp point downwards. It won't pierce the skin, but if you raise it even a few millimetres and drop it, the tip will probably go in and do some damage. A diamond stylus on a record behaves in exactly the same way. It's surprisingly easy to determine whether a stylus is following the groove (tracing and tracking) properly. Just listen. If the sound is perfectly clear and undistorted at all levels, your records are in no danger. Any distortion you can hear is the clearest possible proof that the stylus is banging around and wrecking both the record and itself. If you can't hear any distortion, it's a pretty damn fine cartridge.

Off the beaten track

This is all a bit alarmist, perhaps, but although most modern cartridges are pretty safe, I know from experience with my own test records that the high quality cartridges I use by choice (Highphonic, Shure, Dynavector and Glanz among them) do less damage than some of the wide selection I have tested. Of course, no cartridge does zero damage, since every imperfection in the stylus or the record, and every spot of dust, provides plenty of scope for wear, but one might as well take what steps one can. So as usual, if for slightly unusual reasons, the basic advice for choosing a cartridge comes down to 'listen'.

The following reviews give some observations on the sound of each cartridge, observations which I hope will be helpful in as wide a context as possible, but there is always room for individual taste (mine and yours!) and of course the ever-present problem of equipment matching applies with a vengeance. So do make every effort to audition any cartridge you think of buying, if possible in your own model of deck and arm.

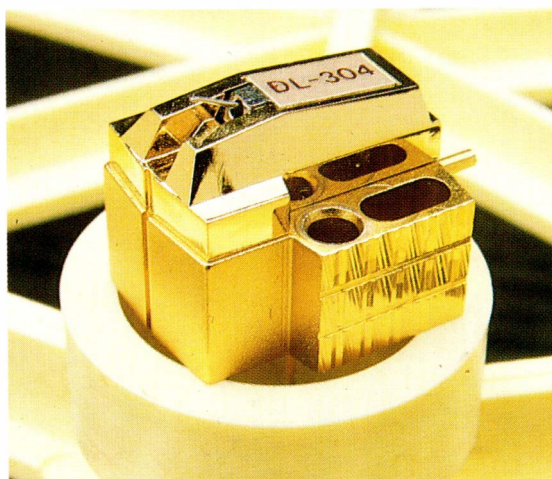
Two particular features of cartridges which (among others) are fundamental in determining their sound have, I feel, been less than fully addressed of late; compliance and tracking ability. Tracking is of course related to damage, as mentioned above, and must obviously be perfect if the cartridge is to have any pretensions to accuracy. Although tracking is usually pretty good in modern designs, it still sometimes leaves a bit to be desired, hence my frequent comments on the subject.

Forces of reaction

Compliance is generally considered only in relation to arm/cartridge resonance; a high mass arm is well matched to a low compliance cartridge, and vice versa. But it is often forgotten that low compliance (stiff suspension) implies greater reaction force on the arm, and greater excitation of arm and deck resonances. For this reason, high compliance cartridges can often sound less coloured than low compliance ones.

Since high compliance cartridges generally require a lower tracking force and therefore also cause less wear to records, they seem in principle preferable. But as usual that isn't the whole story and many lower compliance cartridges can actually achieve good results.

A final word; do make sure that whatever cartridge you choose is properly set up for offset/overhang (absolutely critical), azimuth (if it's adjustable), tracking force and VTA (arm height, effectively). The latter two can best be optimised by ear. It's surprising how much difference some careful adjustment can make — and it's free!



WHEN THE SUM IS EVEN GREATER THAN THE PARTS.

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For example, no single integrated amplifier has been so widely praised around the world as the NAD 3020 series, making it the largest selling amplifier in audio history.

With the introduction of the new, upgraded 3020i, Hi-Fi Choice commented; 'This latest version of the classic 3020 is as competitive as ever, it sounds fresh and buoyant but still sharply focused and delightfully detailed.' Not surprisingly, the NAD 3020i was judged as a 'Best Buy' by the same magazine.

The NAD 5420 compact disc player has also received extraordinary acclaim from the audio critics. 'Genuinely convincing music that lives and breathes!' is one quote from Hi-Fi Choice which we feel says it all. Once again, a

'Best Buy' was awarded.

On to the final link. British loudspeaker design at its very best. The NAD 8225 Mini-Monitor – the latest advance

beyond measure ... the 8225 gets you closer to the music than other speakers at this price – and closer than some at twice this price or more.'



from our research and development team. Here's what High Fidelity magazine had to say; 'Captivating ... this little speaker impressed me

Now, add up the parts, and what do you get? Quite simply, the classic hi-fi system from NAD.

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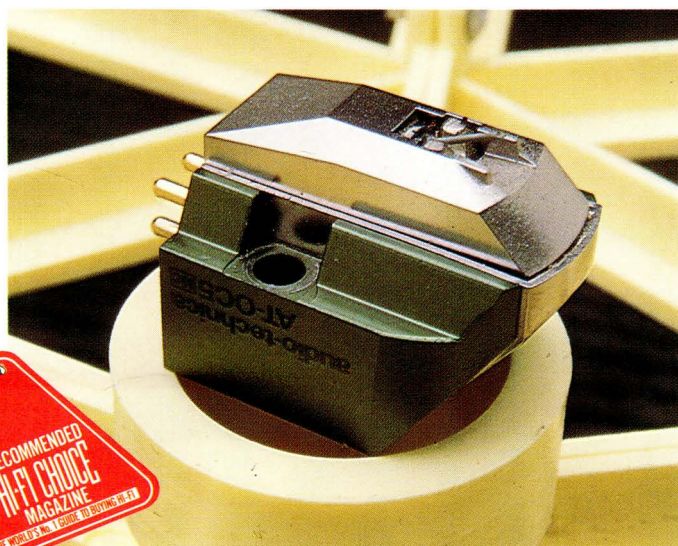
In fact, the only sum which is less than you may have thought is the price.

Check it out at your nearest NAD specialist dealer today.

The Classic System

Audio-Technica OC-5

Audio Technica Ltd, Technica House,
Lockwood Close, Leeds LS11 5UU.
Tel: (0532) 771 441



This model has now been around for a few months (see *Sessions*, issue 97), replacing the venerable *AT-F5*. It is partnered by the cheaper *OC-3* and the dearer *OC-10* (see right), which share the same body design.

Beneath the rather futuristic aluminium shell, the cartridge has a low-output generator assembly using high purity '6N' PCOCC wire – for what that's worth – and a neodymium magnet. In this case, the stylus has an elliptical profile.

On test

My first reaction to the *OC-5* was quite positive, and I found it quite detailed and pleasingly lively. As familiarity grew, however, so did a feeling that there was a certain relentless quality to the sound, which made it rather tiring in the long term, especially with heavy orchestral music.

It's not as if there is any obvious compression of dynamics or prominent coloration, but something about the upper midband makes it sound unduly present, almost strident. Although it's not a very large effect, it is quite noticeable after extended listening. Comparing the *OC-5* with master tape, I felt that it made detail seem slightly 'enhanced', and the musicians seemed to be too close up.

Given those comments, one might expect to find a rather off-beam frequency response, but in fact it looks quite harmless, as the small dip around 20kHz is unlikely to have any major audible results. Distortion is obviously very good, and tracking is comfortably secure, so it's not clear

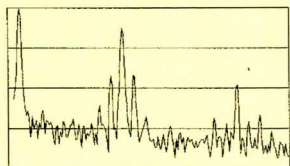
what is amiss unless body resonances are in some way to blame.

Conclusion

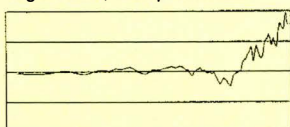
There are certainly some good points about the *OC-5*; it is generally neutral, it tracks well and it has a well-extended frequency range, but I unfortunately can't get on with the upper midrange. Then again, some listeners evidently don't notice that, and it is pretty cheap . . . go on, then; Recommended.

TEST RESULTS

Type, body mass	Moving-coil, 8g
Stylus type	Elliptical
Compliance, vert/lat	18/18 mm/N
Tracking force recommended/test	1.25-1.75/1.5g
Tracking ability, L/R	>80/>80µm
LF res., vert/lat	9Hz @ 10dB/9Hz @ 6dB
Output at 5cm/s	0.4mV
Channel balance	0.1dB
Separation at 1kHz	25dB
Separation broadband	Around 20dB up to 20kHz
Impedance	12Ω + 19µH
Tip resonance, damping	60kHz, moderate
Typical retail price	£123



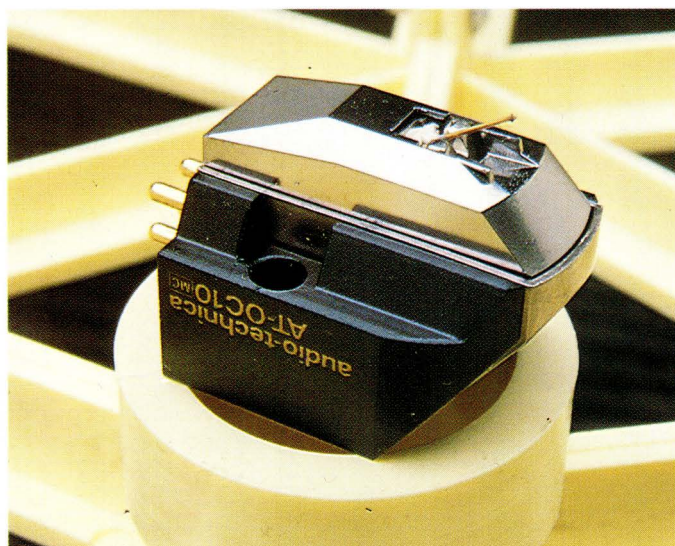
Intermodulation distortion
log 0-10kHz, 20dB per division



Frequency response
log 0-50kHz, 5dB per division

Audio-Technica OC-10

Audio Technica Ltd, Technica House,
Lockwood Close, Leeds LS11 5UU.
Tel: (0532) 771 441



Externally identical to the *OC-5* (left) except for body colour, the *OC-10* differs principally in the stylus, which in this case is a micro-linear type. Construction is in aluminium and high-tech plastics, and the generator armature is in the shape of a V rather than the more common X; this is generally reputed to be rather sensitive to VTA and downforce, although AT seems to have largely overcome this.

On test

The *OC-10* proved to be equally at home with a wide variety of programme material. Full orchestra is reproduced with quite good detail and a full dynamic range, with no feeling of strain at high levels.

Jazz is nice and crisp with low coloration, although the bass could perhaps be tightened up just a fraction. Solo piano is well defined, though lacking the last word in leading edge security, and solo violin showed that the cartridge's high treble is very well extended and effortless.

However, despite the generally good detail, there is at times a slight haze of congestion affecting the sound, a touch of coloration which makes for less clear separation of instruments in some passages, and has the effect, most noticeable in the light textures of chamber music, of closing in the sound field a little. I suspect this is a milder version of the affliction I noted in the *OC-5*.

The frequency response shows a treble rise which certainly didn't seem objectionable on audition, but allowing for that

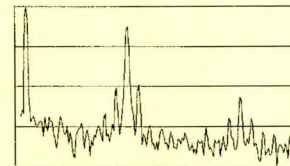
there is the same odd dip near 20kHz as shown by the *OC-5*. Again, distortion and tracking are fine. Compliance is higher than average but certainly no problem. Output is high enough to suit most MC stages with no problems.

Conclusion

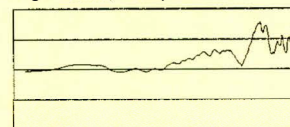
The extra money over the *OC-5* seems to do away with the latter's main drawback, but still more is required, I feel, for formal Recommendation.

TEST RESULTS

Type, body mass	Moving-coil, 8g
Stylus type	Micro linear
Compliance, vert/lat	22/22mm/N
Tracking force recommended/test	1.25-1.75/1.5g
Tracking ability, L/R	>80/>80µm
LF res., vert/lat	8Hz @ 6dB/8Hz @ 8dB
Output at 5cm/s	0.4mV
Channel balance	0.4dB
Separation at 1kHz	25dB
Separation broadband	Around 18dB up to 20kHz
Impedance	12Ω + 21µH
Tip resonance, damping	58kHz, moderate
Typical retail price	£307



Intermodulation distortion
log 0-10kHz, 20dB per division



Frequency response
log 0-50kHz, 5dB per division

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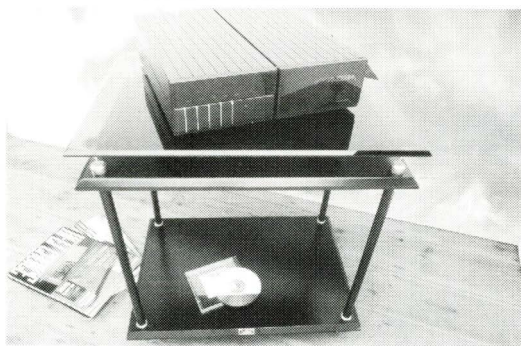
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Dick Olsher, Stereophile. Vol.14 No.11 November 1991

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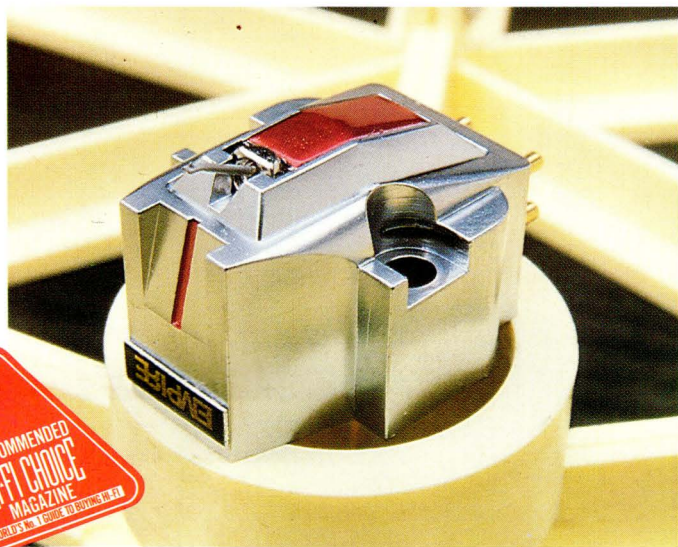
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Benz-Micro MC-Silver

Audiofreaks, 15 Linkway, Ham,
Surrey TW10 7QT.
Tel: (081) 948 4153



The high-output version of the *MC-Gold* (see right), this cartridge has exactly the same construction but is silver in body colour. In order to boost the output it has a generator with more turns of wire in the magnet's field. This has the advantage of doing away with the need for a step-up device (or relaxing the requirements of the amplifier's phono input). The disadvantages, however, are slightly higher moving mass and higher losses in the generator electro-magnetic circuit.

On test

Maybe I've just been unlucky in the past, but I've found quite a few high-output MCs sound rather rough and edgy, and it is good to find the *MC-Silver* which, while still not perfectly smooth, largely avoids that flaw. There is just a hint of treble boost, but detail is quite good with better than average reproduction of typical trouble spots, for example on dense orchestral strings.

Solo piano suffers from slight instability and some 'twang', and saxophone comes across with some coloration in evidence, but information about the recording acoustic is not flattened out and the sound is quite spacious. Rhythm is kept crisp and well controlled.

Distortion appears to be slightly higher than with the *Gold*, but otherwise measurements are much the same – the treble is in fact very slightly flatter. Once again, good tracking requires a downforce of around the nominal 2g or higher. It is worth noting that the review sample seemed to require the back of the arm to

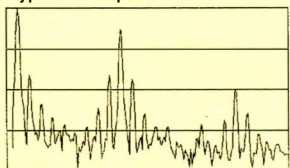
come up unusually high for the sound to snap into place – sample variation perhaps?

Conclusion

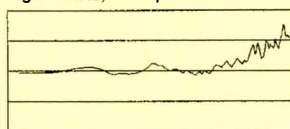
On balance, I marginally preferred the *Gold*, so recommending only the *Silver* may seem perverse. However, I was using relatively esoteric amplification, and given the likely partnering equipment for a £130 cartridge, the high output pushes the value-for-money equation past the critical point. Hence, Recommended.

TEST RESULTS

Type, body mass	High output moving-coil, 5.7g
Stylus type	Elliptical
Compliance, vert/lat	4/14 mm/N
Tracking force recommended/test	1.8-2.2/2.0g
Tracking ability, L/R	>80/>80µm
LF res., vert/lat	10Hz @ 5dB/10Hz @ 6dB
Output at 5cm/s	2mV
Channel balance	0.3dB
Separation at 1kHz	29dB
Separation broadband	Around 22dB up to 20kHz
Impedance	110Ω ± 390µH
Tip resonance, damping	45kHz, not very good
Typical retail price	£130



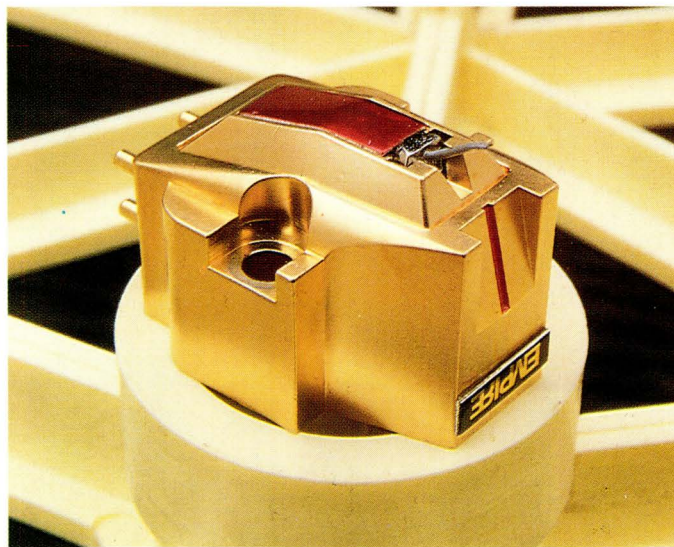
Intermodulation distortion log 0-10kHz, 20dB per division



Frequency response log 0-50kHz, 5dB per division

Benz-Micro MC-Gold

Audiofreaks, 15 Linkway, Ham,
Surrey TW10 7QT.
Tel: (081) 948 4153



The *MC-Gold* is a low-output moving coil cartridge from the lower end of the Empire Benz range, which extends upwards to some rather appetising high-end designs. The basic design was apparently derived originally from the *Coral* range of MC cartridges of yore, with suspension modified to taste by Empire. Construction is conventional with an aluminium cantilever bearing an elliptical tip.

On test

Any cartridge at this price is likely to offer either a general compromise of qualities or good performance in one area at the expense of some of the others. This one falls into the former category.

If it has a fault, it is the very common one of slightly insecure tracking of high level transients, but apart from that there isn't really anything one could point at as being wrong.

Tonal balance is pretty neutral, dynamics sound natural, instrumental and acoustic detail is fairly clear, and altogether the cartridge is pleasant to listen to. On the other hand, no single area is stunning, and it didn't seem to be in any danger of giving any new insights into my record collection.

Lab test results are good. The frequency response rises rather faster than some, but oddly this was hardly reflected in the sound. Distortion is low and the moderate compliance (slightly higher than specified, probably due to sample variation) will give no compatibility problems with most arms.

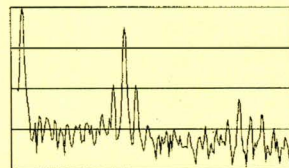
Conclusion

At the risk of damning with faint praise, I would say that this is an inoffensive cartridge, but in the best sense of the term. It is competent rather than inspired but still likely to make a decent fist of any material it is asked to transduce.

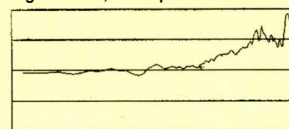
However, it doesn't seem all that competitive in the context of other £100 - £130 moving coils and so cannot be awarded formal Recommendation, but nonetheless it remains worth a listen.

TEST RESULTS

Type, body mass	Moving-coil, 5.7g
Stylus type	Elliptical
Compliance, vert/lat	17/17 mm/N
Tracking force recommended/test	1.8-2.2/1.8g
Tracking ability, L/R	>80/>80µm
LF res., vert/lat	9Hz @ 8dB/9Hz @ 8dB
Output at 5cm/s	0.4mV
Channel balance	0.4dB
Separation at 1kHz	30dB
Separation broadband	Around 21dB up to 18kHz
Impedance	24Ω ± 14µH
Tip resonance, damping	52kHz, fair
Typical retail price	£130



Intermodulation distortion log 0-10kHz, 20dB per division



Frequency response log 0-50kHz, 5dB per division

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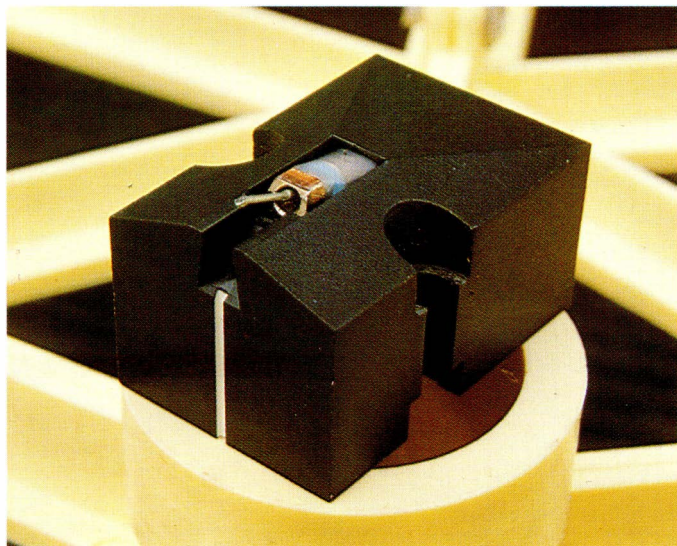
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Denon DL103

Hayden Labs Ltd, Hayden House, Chiltern Hill,
Chalfont St Peter, Bucks SL9 9EW.
Tel: (0753) 888 447



Amazingly, the *DL103* has been around now for 27 years. It was Denon's first moving-coil cartridge, developed for use by the Japanese broadcasting authorities. There used to be several versions available with different styli and cantilevers, but now only the plain *103* remains with its original spherical stylus. Its body is a plain black plastic affair, and even the packaging looks out of date – in short, the whole thing's an anachronism. But why not, if it's good?

On test

Let's not pretend that a spherical stylus profile is going to give the last word in subtlety, especially towards the centre of a record. I wouldn't in all honesty recommend the *DL103* for classical music; at worst it can sound coarse and rather muddled, and it does deteriorate noticeably as it moves across the record, in a way that more modern styli avoid. But with the right material, for example Little Feat, it is a great cartridge to tap feet to.

Its bass performance is driving and persuasive, and while it is still noticeably less subtle and detailed than other cartridges, and more coloured, it makes such enjoyable noises that one can easily forget that they aren't strictly accurate ones.

Apart from its slightly indifferent tracing, it is largely free of the vices that affect many competitive cartridges, particularly the slight graininess that many MMs possess.

The 2.5g downforce is about what's required for good tracking, but other measurements

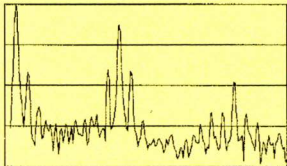
show a very well behaved cartridge. The frequency response is unusually well behaved for a cartridge at this price, and distortion is low. Compliance is low enough to make medium to high-mass arms advisable.

Conclusion

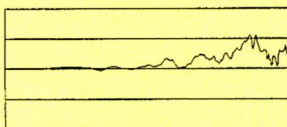
I see no reason why Denon couldn't fit at least a simple elliptical stylus and make a real bargain out of the *DL103*. As it stands, it is still impressive but flawed.

TEST RESULTS

Type, body mass	Moving-coil, 8.5g
Stylus type	Spherical
Compliance, vert/lat	9/10 mm/N
Tracking force recommended/test	2.2-2.8/2.5g
Tracking ability, L/R	>80/>80µm
LF res., vert/lat	13Hz @ 10dB/12Hz @ 12dB
Output at 5cm/s	0.3mV
Channel balance	0.7dB
Separation at 1kHz	31dB
Separation broadband	Above 25dB up to 18kHz
Impedance	38Ω + 31µH
Tip resonance, damping	56kHz, quite good
Typical retail price	£99



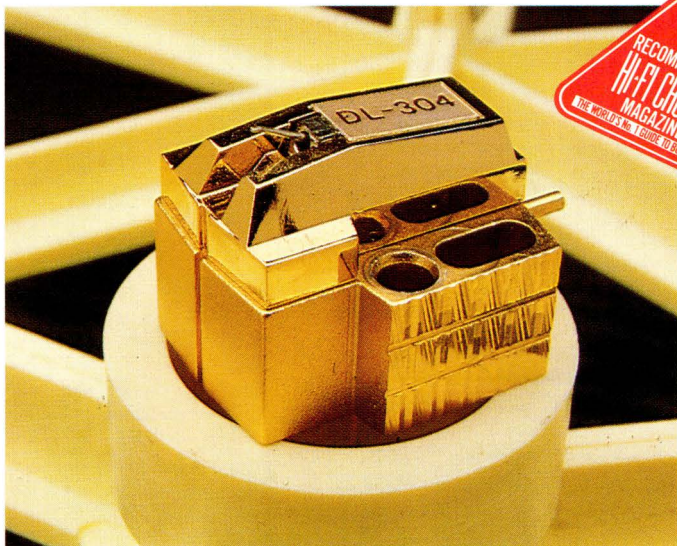
Intermodulation distortion
log 0-10kHz, 20dB per division



Frequency response
log 0-50kHz, 5dB per division

Denon DL304

Hayden Labs Ltd, Hayden House, Chiltern Hill,
Chalfont St Peter, Bucks SL9 9EW.
Tel: (0753) 888 447



Denon's *DL1000A* had a reputation as perhaps the finest cartridge ever made, but it was very fragile and there are very few left. The more practical *DL300* series – to which the *DL304* is the latest addition – embodies some of the same principles of low tip mass and high compliance/low tracking force, with a similar generator design. This one has a tapered aluminium cantilever, a 'special elliptical' stylus profile and mounting holes for four bolts when the headshell permits it.

On test

Not to mince words, the *DL304* sounds superb. In common with very few cartridges, in or out of production, it remains smooth, detailed and absolutely clear with any sort of material, at any level.

The best records have a certain purity of sound which most never achieve, and which many cartridges lose in replay, but with a unit of this calibre one can instantly identify such records and marvel at the extra level of musical detail they reveal. Comparing the *DL304* with master tape showed a rare combination of excellence in all areas; tonal balance, clarity of sound and detail are all close to the original.

Measurements are exemplary; the 80 micron tracking figure is clearly nowhere near the cartridge's true capability as it could be achieved at less than 1g tracking force. The high compliance is useful in placing less tough demands on arms from the high frequency resonance point of view, without leading to low frequency instability. Given

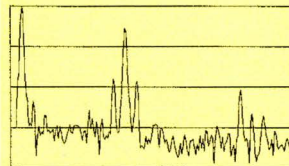
the low output, a high quality step-up device is recommended.

Conclusion

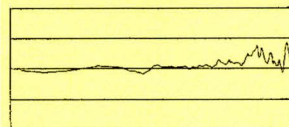
In sound and specifications, this cartridge is very close to my all-time favourite, the Highphonic *MC-A3* – close enough, indeed (if not absolutely as good in matters of transparency), to convince me that it is one of the very best handful of cartridges available today. At the price, it's clearly a colossal bargain. Recommended? I should coco!

TEST RESULTS

Type, body mass	Moving-coil, 7g
Stylus type	'Special elliptical'
Compliance, vert/lat	24/24 mm/N
Tracking force recommended/test	1.0-1.4/1.2g
Tracking ability, L/R	>80/>80µm
LF res., vert/lat	8Hz @ 8dB/8Hz @ 8dB
Output at 5cm/s	0.18mV
Channel balance	0.2dB
Separation at 1kHz	28dB
Separation broadband	Around 22dB up to 20kHz
Impedance	42 + 13µH
Tip resonance, damping	70kHz, quite good
Typical retail price	£200



Intermodulation distortion
log 0-10kHz, 20dB per division



Frequency response
log 0-50kHz, 5dB per division

AUDIO NOTE COPPER & SILVER CABLES

It is perhaps on time that I introduce the most important Audio Note product; the Audio Note cables.

Without the Audio Note Silver wires and cables, none of the qualities of the Audio Note products would be possible, the ONGAKU has several kilometers of 99.99% pure silver wire in its output transformers, the Audio Note lolly and loltd cartridges have a few centimetres of the same wire, and the wire contribute, in both cases to a great deal of the sonic qualities that both these outstanding products possess, the wire is as integral and proprietary a part of each design, just as silver is central to the total Audio Note philosophy.

Audio Note was the first company in the world to realize and demonstrate that the cable materials and their manufacturing processes affect the sound quality of a hifi system. In so doing Audio Note were also the first to see the benefits of pure silver wire (99.99%) and as such are the originators of audio cables as a science.

Audio Note have since then gained a totally unique knowhow in the art and science of making audio cables and wires that perform far above their price range, regardless whether they have silver or copper conductors.

Audio Note Silver Cables

The first Audio Note audio interconnect cable, the AN-V, was designed in 1974, and offered to audiophiles and music lovers in Japan in 1976. It was produced in very small quantity and only in late 1978 did the AN-V reach Europe. In 1985 the AN-V was joined by the AN-S silver cable, which is basically a downscaled AN-V, its production time, and therefore cost, reduced through the use of less critical materials. The original AN-V remained unchanged until mid 1989, when it was replaced by its current version. The AN-V was replaced at the top of the Audio Note cable range in October this year by the AN-Vx reference, which is the culmination of several years study into all aspects of cable design, suffice to say that all who have heard it agree that it has the most amazingly uncluttered sound they have ever heard.

Audio Note introduced a silver speaker cable in 1979, dubbed the AN-SP. It was unavailable for a considerable time during the 1980's and was reintroduced in 1988 following a substantial order from me.

A fully silver wired system has yet to be assembled here in the UK, although that should happen sometime in 1992, but for every part of the system where copper wire or cable is replaced with Audio Note silver cable

or wire the improvement is always immediate, but don't take my word for it, try for yourself, using our no-nonsense 14 day try-before-you-buy offer.

Audio Note silver cables fall in the following price categories,

Interconnects

AN-S	£110.00/m terminated
AN-V	£175.00/m terminated
AN-Vx	£485.00/m terminated

Speaker cables

AN-SP	£110.00/m per channel
AN-SPx	£350.00/m per channel

Termination of speaker cable costs £16.00 per set with either gold 4mm banana plugs or spades.

Using the purest available silver as a conductor, naturally has the same effect on price as it has on sound quality, it is automatically high.

Audio Note Copper Cables

The desire to offer some more affordable cables in the Audio Note range as well as ultimate ones, made Mr. Kondo start an investigation into the use of copper wire in audio cables in 1983.

One problem with copper wire is that when it is produced, it is not normally coated immediately after it is drawn and the wire therefore oxidizes before it is coated. The copper wire therefore develops clusters of copper oxide crystals on its surface, which generate a rectifying effect (this is the reason why so many copper and silver cables sound best in one direction, which is the direction where the rectifying effect is the smallest!). This rectifier effect is present in all copper wires, regardless of whether they are oxygen or hydrogen-free or have single crystal structure or not, unless they have been coated immediately upon leaving the die.

If you try to solder a copper wire where an oxide film has formed, the solder will not stick without flux, the oxide layer also has a hardening effect on the wire itself.

Low level electrical signals are not able to pass easily through the oxide film on the surface of the wire, and this worsens an already existing problem in copper wire. The cohesion between crystals in copper is quite poor, and if you stretch a copper wire it breaks relatively easily, this lack of flexibility is caused by weak crystal boundaries. This weakness in the contact between the crystals creates a fairly high "electrical wall" between crystals, which disables small signal transfer between crystals, as the electrons have difficulty passing the "wall".

This is the reason for the continued attempts by many manufacturers of cables and wire to make copper wire with long crystals.

The emergence of oxygen-free coppers like OFC, OFHC, POGC etc., made it possible to design cables around better quality wires provided the wires were manufactured to the right specification.

As a result the first Audio Note audio cable with copper wire, the AN-C (red), was launched in mid 1985, it shared most construction details with the original AN-V silver cable, as it was a twin coax, with symmetrical conductors, in a heavily damped double jacket.

The copper wire used was an OFHC, 99.99% pure copper, drawn in true Audio Note tradition through a diamond die and coated immediately after the die with six coats of polyurethane, to prevent any oxidation forming on the surface.

After six years the AN-C is still available and was joined by the AN-A, yellow, in 1989, both these cables represent exceptional sonic value at a very modest price.

In 1990 the first Audio Note copper speaker cable, the AN-B, arrived. This speaker cable incorporated a number of new ideas, partly to reduce cost without sacrificing sound quality, but also to incorporate reduced RF interference problems, which is not found in the Audio Note silver speaker cables.

The two main problems in speaker cable are caused by the amount of current passing through the cable, this firstly creates considerable "magnetic distortion" in the wire itself, more so in copper than in silver, regardless of copper type and cable design. "Magnetic distortion" is always accompanied by "wire crying", which is a resonance in the surface molecules, this is caused by a weight change in the molecule itself, as the electrons pass. As copper has higher DC resistance than silver, the electrons affect the molecule mass more, with increased "wire crying" as a result.

Secondly, the low frequency content of the signal always leaves an amount of mechanical energy behind, which "smears" the signal following, mainly concealing the low level content of that signal.

To combat this phenomenon, Mr. Kondo chose to use two thicknesses of wire for the AN-B, with the thinner wires bundled tightly at the center of the cable, surrounded by thicker wire bundles on the outside, all very tightly compounded in a vinyl jacket. This provides an efficient and inexpensive damping system (damping by differential masses), which reduces inter-conductor resonance by more than 80% because the different gauges of wire will damp each other as they have different resonance frequencies.

The vinyl jacket is surrounded by a screen, which allows AN-B to be used in a pseudo-balanced mode to reduce incoming RF interference.

To further allow the use of Audio Note quality speaker cables in lower priced systems the AN-D was introduced only a month ago, being a derivative of the AN-B it shares the simple and effective damping arrangement of this Audio Note cable, as well as most of its qualities.

So today Audio Note offers the following audio cables with copper wire,

Interconnects

AN-A	£25.00/m terminated
AN-C	£49.50/m terminated

Speaker cables

AN-D	£6.99/m per channel
AN-B	£12.50/m per channel

It is strongly recommended to buy the AN-B in terminated sets to achieve the full benefit of the pseudo-balanced configuration. Termination cost per set with high quality gold plated 4mm banana plugs, £16.00.

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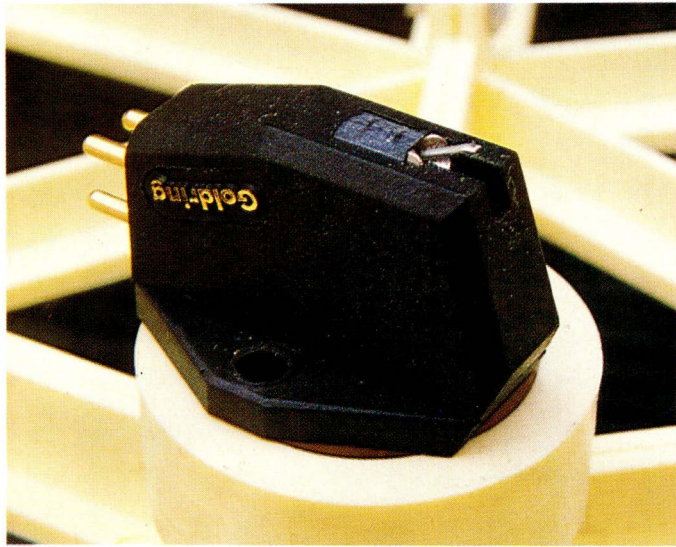
Peter Qvortrup

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**Tel. 0273 821371
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Goldring Elite

Goldring Ltd, 8 Greyfriars Road, Bury St Edmunds, Suffolk IP32 7DX.
Tel: (0284) 701101



What with its black plastic body and mounting plate, and its apparently identical generator assembly, the *Elite* looks a lot like the *Eroica*. However, its beauty is more than skin deep, as the body has been slightly altered from that of the *Eroica* to give greater structural rigidity. In addition, a van den Hul type I stylus has been fitted in the interests of even better high frequency tracing, and the coils are wound with silver wire.

On test

Looking back at my notes on the *Eroica LX*, I find myself generally saying more positive things about the *Elite*. However, one niggle remains common to both; there seems to be a residual dirtiness to the sound of any instrument, at any level, which detracts from the cartridge's otherwise quite good impression. This effect doesn't seem to be due to mistracking, as tracking is actually pretty assured and high levels are handled with aplomb. Tonal balance is also pleasingly neutral, making for good performance with complex sounds such as orchestra and large rock bands. Solo voice seemed just a little coloured, but I didn't notice any real coloration on instruments.

The measurements presented give no real clue as to where this particular distortion may come from. Intermodulation distortion is pretty much on par, and the frequency response shows the treble rise common to many moving coil cartridges is well suppressed, although the tip resonance is a little lower than usual. Tracking is satisfac-

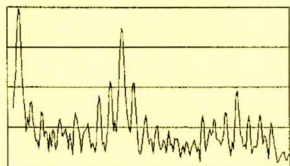
tory within the recommended downforce range.

Conclusion

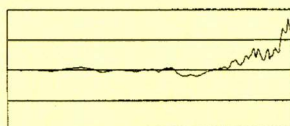
Despite its good performance in some areas, the *Elite* is let down by the dirtiness mentioned above. Admittedly, that is the sort of flaw that some people may hardly notice, in which case the overall impression made may be more positive, but I feel it is possible to equal the *Elite*'s good points without copying its drawbacks, for no more money.

TEST RESULTS

Type, body mass	Moving-coil, 5.7g
Stylus type	van den Hul type I
Compliance, vert/lat	14/14 mm/N
Tracking force recommended/test	1.5-2.0/1.8g
Tracking ability, L/R	>80/>80µm
LF res., vert/lat	11Hz @ 8dB/11Hz @ 6dB
Output at 5cm/s	0.5mV
Channel balance	0.5dB
Separation at 1kHz	28dB
Separation broadband	Around 20dB up to 15kHz
Impedance	8Ω + 9µH
Tip resonance, damping	46kHz, moderate
Typical retail price	£200



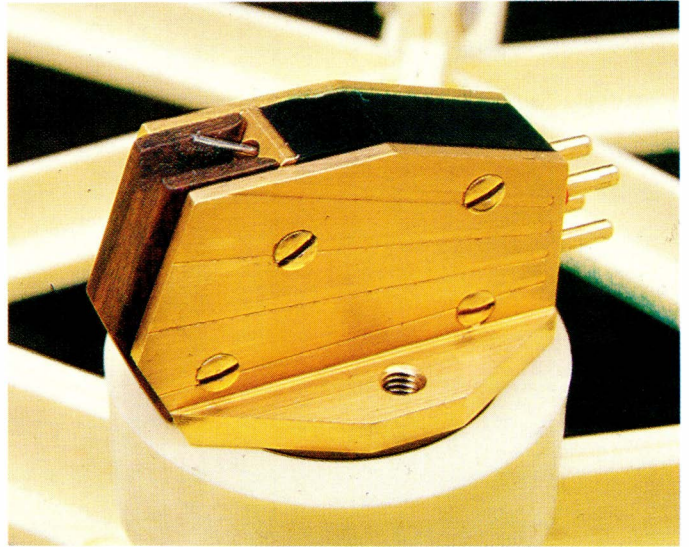
Intermodulation distortion
log 0-10kHz, 20dB per division



Frequency response
log 0-50, 5dB per division

Goldring Excel-GS

Goldring Ltd, 8 Greyfriars Road, Bury St Edmunds, Suffolk IP32 7DX.
Tel: (0284) 701101



Goldring's top model, the *Excel-GS* fully looks the part with its smart 22-carat gold-plated metal body and wooden front piece. Its construction is clearly aimed at achieving the greatest possible structural rigidity and cutting resonances, and to this end it is made from thick pieces of strong alloy, securely screwed together to form a very solid unit.

It differs from the standard *Excel* in having a Gyger-S diamond fitted, which is specially shaped to fit straight through the cantilever without requiring the usual flattening and bending of the end; this makes the stylus/cantilever interface much stronger than normal.

On test

The elaborate construction seems to have paid off in very low levels of resonance and coloration, making for a particularly neutral balance and good – if not fantastic – detail resolution. However, the overall performance varies with different materials. A work for voice and orchestra was very well served, with excellent differentiation between voice and instruments, while allowing both to be clearly heard. On the other hand, solo instruments can sometimes sound a little rough and edgy, particularly at high levels – in fact, I ended up increasing the tracking force to 1.9g, just above Goldring's quoted maximum, to make tracking acceptable without affecting tonal balance too much. In addition, there was some veiling and 'wooliness' about very complex music which other cartridges managed to dispel, and which was confirmed by

comparison with master tape.

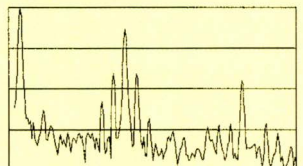
Measurements show that essentials have been well tended to, especially the very flat frequency response. For a high-end cartridge, separation and tip resonance are not state of the art.

Conclusion

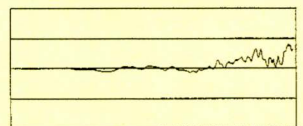
A bit of a flawed gem, the *Excel-GS* has some real high-end quality in its lack of coloration, but at this exalted price I consider better tracking and greater clarity a not unreasonable expectation.

TEST RESULTS

Type, body mass	Moving-coil, 8.5g
Stylus type	Gyger S
Compliance, vert/lat	12/12 mm/N
Tracking force recommended/test	1.6-1.8/1.9g
Tracking ability, L/R	>80/>80µm
LF res., vert/lat	11Hz @ 10dB/11Hz @ 8dB
Output at 5cm/s	0.5mV
Channel balance	0.1dB
Separation at 1kHz	26dB
Separation broadband	Around 18dB up to 15kHz
Impedance	7.5Ω + 8µH
Tip resonance, damping	50kHz, quite good
Typical retail price	£600



Intermodulation distortion
log 0-10kHz, 20dB per division



Frequency response
log 0-50, 5dB per division



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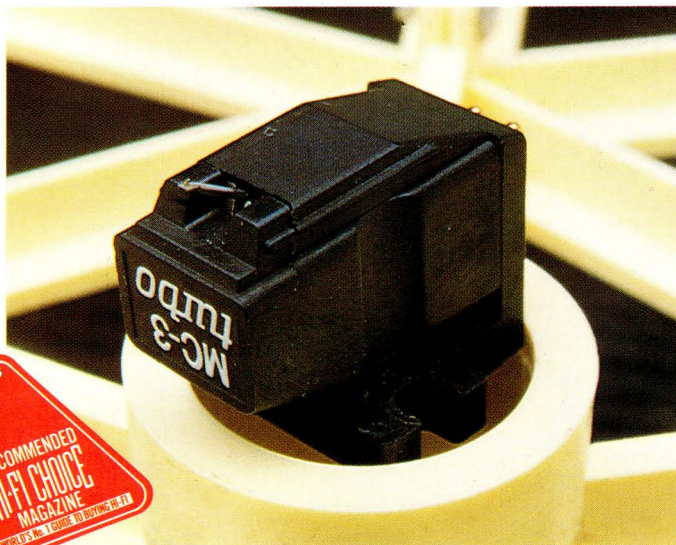
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Ortofon MC3 Turbo

Ortofon UK, Hayden House, Chiltern Hill,
Chalfont St Peter, Bucks SL9 9EW.
Tel: (0753) 889 949



'Turbo' seems to get applied to everything these days, whether or not it actually has a turbine fitted, to imply some sense of being 'souped up'. It also frequently manages to imply vulgar, an impression strengthened here by the rather garish logo. In more concrete terms, this is a high-output moving coil cartridge priced to compete with many moving magnet designs, while presumably offering the extended frequency range generally associated with moving coils.

On test

Not quite vulgar, maybe, but there is certainly something of the fast and loud aspects of a turbo-charger to the MC3T's performance. It's really not terribly subtle, and to me, as a predominantly classical listener, that's rather a drawback. But it is such a lively little number with upbeat rock music and the like that it is hard not to taking a liking to it. The tonal balance is bright, pianos sound distinctly wooden and other instruments suffer from some coloration, and tracking is adequate rather than good. Even in rock 'n' roll there is often a tendency towards unnatural high-lighting of certain instruments, but with all this there is some excellent life and 'kick' in evidence. Lively jazz is also well portrayed, and some orchestral music can sound very exciting if one isn't too fussed about the last degree of transparency.

With its sharply rising treble, the MC3's frequency response confirms its sound, nor is the distortion plot quite the best yet. The lowish compliance, in con-

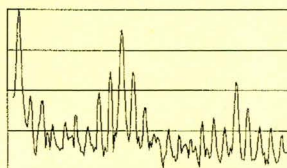
junction with the low body mass, is likely to lead to slightly 'enhanced' bass due to a high arm/cartridge resonant frequency. Tracking just about achieves 80 microns at 2g.

Conclusion

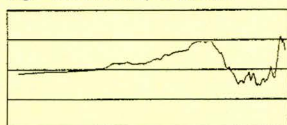
It's cheap and cheerful, and if it were only a slightly better all-rounder the MC3 Turbo might well be in the running for a Best Buy award. Taken strictly on its own terms, it is certainly Recommended.

TEST RESULTS

Type, body mass	High output moving-coil, 4.1g
Stylus type	Elliptical
Compliance, vert/lat	11/9mm/N
Tracking force recommended/test	1.8-2.2/2.0g
Tracking ability, L/R	>80/>80µm
LF res., vert/lat	12Hz @ 8dB/13Hz @ 11dB
Output at 5cm/s	3.3mV
Channel balance	0.7dB
Separation at 1kHz	26dB
Separation broadband	Around 20dB up to 15kHz
Impedance	110Ω + 850µH
Tip resonance, damping	45kHz, moderate
Typical retail price	£100



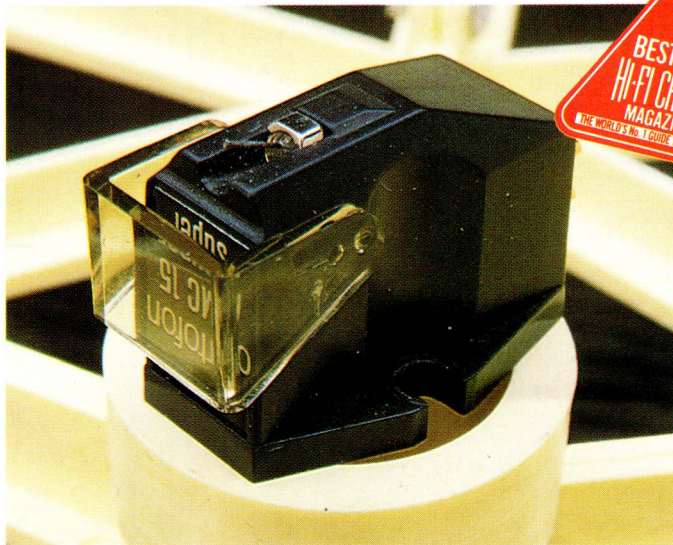
Intermodulation distortion log 0-10kHz, 20dB per division



Frequency response log 0-50, 5dB per division

Ortofon MC15 Super

Ortofon UK, Hayden House, Chiltern Hill,
Chalfont St Peter, Bucks SL9 9EW.
Tel: (0753) 889 949



Given that £100 is not a lot of money for a moving coil cartridge, Ortofon appears to have packed quite an impressive collection of features into the MC15 Super. It has a lowish output generator of the same basic design as is used in Ortofon's top models, a tapered boron cantilever and a Fine Line stylus, as well as a metal body (though the outer shell and mounting plate are plastic).

On test

Writing about this cartridge a few months back, I admired its resolution of individual instruments within groups, and listening to it again confirmed this admiration. There is certainly some tendency to treble lift, and this is probably related to the way in which ambience information can sometimes be a little suppressed, but frankly, if the MC15 were not so revealing in the first place, one would hardly even notice those deficiencies. Overall it is certainly very informative, its brightness never tending to aggressiveness.

Against master tape it showed quite good control with the tricky sound of a piano, although its tracking fell a little short of perfect with the odd loud chord, and it was not perfectly neutral tonally. It is at its most impressive in complex music, where its strengths can be used to the full. Bass is nicely balanced between 'speed' and fullness.

The frequency response plot shows the treble rise clearly enough - larger, in fact, than I would have expected from the sound, and large enough perhaps to interact badly with already

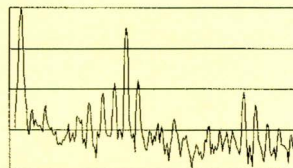
bright-sounding record decks. Otherwise everything is fine, especially channel separation and tip resonance, which are excellent. The MC15 is rather fussy about downforce; I ended up with 2.1g.

Conclusion

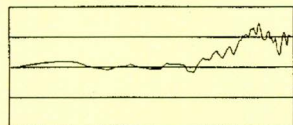
One can't expect a cartridge at this price to do everything, but the MC15 meets the criterion of excelling in some areas without losing out in others, making it a natural contender for a Best Buy.

TEST RESULTS

Type, body mass	Moving-coil, 7g
Stylus type	Fine Line
Compliance, vert/lat	12/12 mm/N
Tracking force recommended/test	2.0-2.4/2.1g
Tracking ability, L/R	>80/>80µm
LF res., vert/lat	13Hz @ 8dB/12Hz @ 7dB
Output at 5cm/s	0.35mV
Channel balance	0.2dB
Separation at 1kHz	31dB
Separation broadband	Around 26dB up to 20kHz
Impedance	6Ω + 15µH
Tip resonance, damping	55kHz, moderate
Typical retail price	£100



Intermodulation distortion log 0-10kHz, 20dB per division



Frequency response log 0-50, 5dB per division

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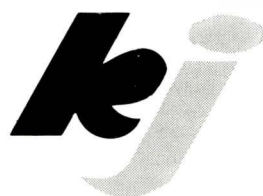
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Ortofon Quattro

Ortofon UK, Hayden House, Chiltern Hill, Chalfont St Peter, Bucks SL9 9EW. Tel: (0753) 889 949



In the middle of Ortofon's range of three *Q* series cartridges comes the *Quattro*, sharing the same aluminium body as the other two and possessed apparently of the same generator assembly as the dearer *Quasar*. However, in place of the Replicant 80 stylus on the *Quasar*, the *Quattro* sports an FG II Nude profile, one of various line contact types made by the Swiss firm of Fritz Gyger. With a body mass of 10g – due in no small part to the sturdy metal mounting plate – and medium compliance, this cartridge should suit a wide variety of arms.

On test

There is a certain family resemblance between the *Qs*. In particular, my listening notes for all three refer to good balance and good resolution of the timbres of different instruments, whether playing together or solo. Comparing the *Quattro* with tape, I felt it had just a slight edginess on sharp transients, due most likely to tracking limitations, and this made it sound a little bright in loud passages. In general, however, it is pleasingly laid-back and neutral, quite detailed and certainly never rough or grainy. Coloration is kept to a low level.

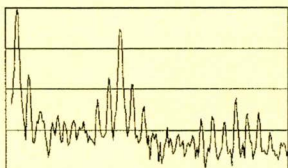
On the test bench, the *Quattro* showed a good set of results. Frequency response is very flat and wide, distortion is low and separation good. Output is low enough to benefit from a really quiet MC stage or a good transformer. I wouldn't recommend going below the nominal tracking force if good tracking is to be maintained.

Conclusion

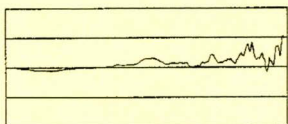
Due presumably to its stylus, the *Quasar* offered something of the quality of the *MC3000*, while the *Quartz* is just very good value. The *Quattro*, however, I felt to be less successful in finding its niche, suffering not least from comparison with Ortofon's own cheaper cartridges. For its price, and bearing in mind that the £200 standard is pretty high these days, it doesn't seem in any way outstanding and thus misses Recommendation.

TEST RESULTS

Type, body mass	Moving-coil, 10g
Stylus type	Fine line
Compliance, vert/lat	13/13 mm/N
Tracking force recommended/test	1.6-2.0/1.8g
Tracking ability, L/R	>80/>80µm
LF res., vert/lat	10Hz @ 12dB/10Hz @ 7dB
Output at 5cm/s	0.2mV
Channel balance	1.0dB
Separation at 1kHz	25dB
Separation broadband	Around 20dB up to 20kHz
Impedance	5Ω + 8µH
Tip resonance, damping	53kHz, fair
Typical retail price	£200



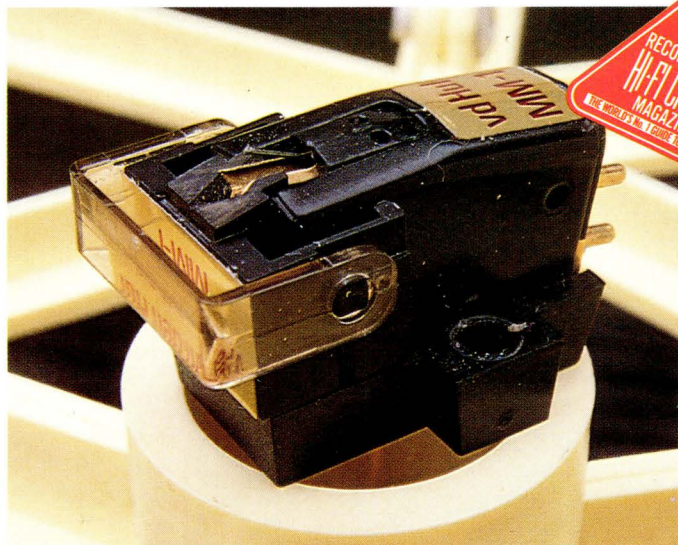
Intermodulation distortion log 0-10kHz, 20dB per division



Frequency response log 0-50kHz, 5dB per division

van den Hul MM1

Teac UK Ltd, 5 Marlin House, The Croxley Centre, Watford, Herts WD1 8YA. Tel: (0923) 225 235



The van den Hul catalogue has remarkably little to say about the *MM1*, and the cartridge itself was supplied without so much as a skeletal specification. However, two van den Hul trademarks are present in the vdH Type II stylus and the boron cantilever. As usual for a moving magnet cartridge, the stylus assembly is detachable from the body, and the basic appearance of the *MM1* is somewhat reminiscent of classic Shure models with its metal-clad body glued into a rather insubstantial-looking plastic mounting bracket.

On test

This proved to be rather an unusual-sounding cartridge. Among its good points are excellent clarity and definition of separate instruments in complex music, good tracking (at rather more, however, than the very low recommended downforce), good imaging and a general feeling of stability. Wide dynamic range is handled happily, transients are fast without distortion and bass is good and weighty. It can be a touch bright unless the load resistance is lowered a little.

On the debit side, there is a distinct tendency to coloration in the midband, which makes piano sound more wooden than it should, and can, in some music, lead to a hard and 'reproduced' character. It is quite a noticeable distance from master tape, although taken in isolation it may be viewed more favourably as it is at least essentially believable.

The frequency response plot was taken with normal (47k/250pF) loading, but with lower resistance (33k or so) this be-

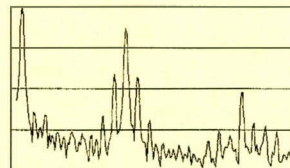
comes even flatter. Tip resonance is very high for a moving magnet design, and other parameters are also good. My inclination is to point the finger at body resonances as the cause of the coloration noted.

Conclusion

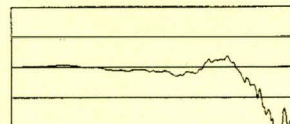
Although it is flawed, this cartridge does offer excellent performance in some areas and will be greatly valued by some listeners. Recommended therefore, reservations notwithstanding.

TEST RESULTS

Type, body mass	Moving-magnet, 6.5g
Stylus type	van den Hul type II
Compliance, vert/lat	20/20 mm/N
Tracking force recommended/test	0.75-1.0/1.2g
Tracking ability, L/R	>80/>80µm
LF res., vert/lat	9Hz @ 8dB/9Hz @ 9dB
Output at 5cm/s	3.5mV
Channel balance	1.0dB
Separation at 1kHz	24dB
Separation broadband	Around 18dB up to 20kHz
Impedance	820Ω + 190mH
Tip resonance, damping	45kHz, good
Typical retail price	£200



Intermodulation distortion log 0-10kHz, 20dB per division



Frequency response log 0-50kHz, 5dB per division

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GREAT HI-FI STORIES

N 12

Take a walk on the wild side

A sunny afternoon in West Hampstead - too nice to spend in a dark demo room. But Mr Brown wanted to hear a system, and we never disappoint our customers.

I was baffled. Despite having an impressive record collection, he was prepared to make do with a cheap turntable. "What sort of music do you like?" I asked. "Anything - and everything", he replied.

"Listen to this, then" and I got out Lou Reed's 'Walk on the Wild Side'. I gently placed the vinyl on a Thorens TD280II. 'And all the coloured girls go doo-doo-doo-doo....' (you know the rest). The sound seemed to glide along the walls, no trickery, no hallucinogenics. Just a great song on a great turntable. A few records later and he was converted.

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Conclusions, Best Buys & Recommendations

Starting from the bottom in price and the top in accolades, Ortofon's *MC15* strikes me as well worthy of a Best Buy award. It is sufficiently wide-ranging in its abilities to be by any reckoning a strong competitor in its class, but in addition to that it picks out detail in a manner one would expect of a product at twice its price. It might not be all things to all users on all record decks, but with a reasonably neutral deck I can see it being just the thing.

Another Ortofon, the *MC3 Turbo*, is an altogether different proposition. I have my doubts about whether I could live with it, but if you want excitement from your hi-fi it's going to be hard to beat. Lively, bouncy, bright — and Recommended, strictly for achieving what it evidently sets out to achieve. Audio Technica's *OC-5* leaves me with some slight reservations about its long-term listenability, as I found it a touch fatiguing. However, in some applications, and with some listeners, that is likely to go unnoticed, in which case its strengths in overall neutrality, good tracking and balance will be appreciated. For such cases, it is Recommended.

Richard Black tracks down the cream of the cartridges from this month's survey.

The Empire Benz Micro *MC-Silver* is, like the *MC3 Turbo*, a high output moving coil cartridge, but an unusually clean sounding member of a breed which is often a little disappointing. It is still not perfect, but compared with typical moving magnets at its price, it manages a clearer and more extended treble and good resolution. Its high output makes it seem a considerably better deal than its low output relative, and it is Recommended. Another 'curate's egg', the van den Hul *MM1*, provides good clarity, secure tracking and excellent imaging and stereo, but has a rather pronounced coloration in the midband which detracts from tonal neutrality. Nevertheless, the overall result is certainly Recommendable.

Possession by Denon

Finally, the real discovery for me was the Denon *DL304*. A superb tracker, this cartridge also combines first rate neutrality, excellent detail resolution and effortlessly extended treble. Despite its (in context) bargain price, I would happily recommend it for use with almost any rank of equipment, and would expect no compatibility problems except in the heaviest of arms. A confident and enthusiastic Recommendation.

Looking back at the dozen cartridges reviewed in this issue, I can't honestly say they make the most inspiring group of hi-fi components I've ever seen. Original research and development in cartridges simply doesn't look too healthy. Only Ortofon still seems to be carrying out any fundamental research into cartridge design. That said, such advances as have

been made, principally in such matters as the fitting of better styli as standard and the widespread use of non-resonant body design and construction, are undoubtedly beneficial.

Listening and measurements for the reviews were carried out on a Pink Triangle *PT TOO* with SME 309 arm, using Moth and Pink Triangle preamplifiers and power amplifiers from Harman/Kardon and John Shearne. Alignment was carried out by a mixture of ear and measurement. An important part of the listening tests was comparison of a record with a first generation open reel copy of the master tape used to make the record.

Absolute phase was checked and found to be correct with all the cartridges reviewed here; this can be important, but only about 70 per cent of records are actually 'correct' - there's no professional standard for it. Running briefly through the measurements as presented: Compliance was calculated from the arm resonance (low frequency resonance), as measured using an Ortofon test disc.

Damping evidence

Resonance figures refer to the cartridge mounted on the SME 309 (effective mass 9.7g) and the height of the resonance peak is also given as an indication of the degree of cantilever suspension damping. Opinions on additional damping vary; I sometimes use a Townshend *Rock* and find it beneficial. Tracking ability was also measured with the Ortofon disc, 80µm being the maximum measurement and an indication of adequate performance. Output is the manufacturer's figure, checked to the nearest dB (normal manufacturing tolerance), and channel balance and 1kHz separation are spot figures taken via the Test Computer, averaged across the channels.

Stereo separation is dependent on cartridge azimuth, and I aligned azimuth using this figure. Broadband separation was measured using pink noise signals cut one channel at a time; a brief description only is given. Tip resonance was measured using square waves cut at 33rpm and played back at up to 150rpm, until clear resonance was observed on an oscilloscope, a crude but highly effective technique! Intermodulation distortion measurements, shown as a spectrum plot, used SMPTE tones but at a lower level of +2dB. Second order IMD (3.6 and 4.4kHz) is harmless and due to geometric effects; third order indicates cartridge nonlinearity and should be practically absent.

Frequency response was measured using pink noise and Fast Fourier Transform techniques. Measuring this really accurately is probably impossible (there are so many variables that one can't calibrate the system absolutely) but pink noise is a very informative way of doing it and I believe these results are accurate to about 0.75dB up to 25kHz, 1.5dB to 40kHz and 3dB to 50kHz. Little wiggles in the plots are due to the random nature of the test signal, but trends are important. Low frequency response is dominated by arm resonance and was not plotted.

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GREAT HI-FI STORIES

NO. 13

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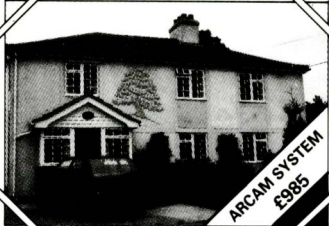
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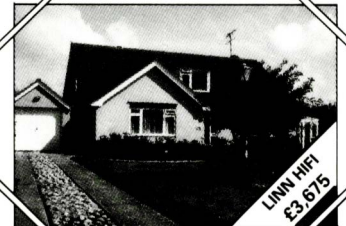
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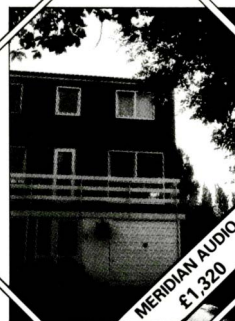
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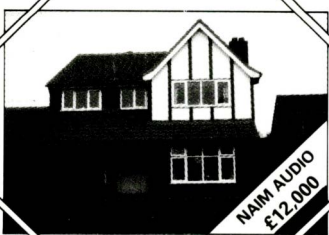
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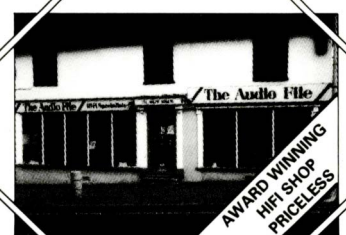
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Outboard DACs, add-on convertors, call them what you will, this is one area of the audio scene that's witnessing an explosion of interest. And it's not difficult to see why. After all, purchasing a new DAC must seem like the ideal upgrade: it allows you to keep your trusty CD player with all its familiar facilities while using the digital output to drive an external convertor. Hey presto, revitalised sound quality without the unnecessary expense of splashing out on an entirely new integrated player.

Choosing and Using . . . DACs

Thinking of buying a digital to analogue convertor but don't know where to start? Paul Miller explains what to look for — just like DAC!

Furthermore, because the digital output of all CD players must conform to an agreed standard (called S/PDIF or Sony/Philips Digital Interface Format) it is quite possible to upgrade an old 16-bit player with a modern bitstream convertor! So whether the digital output comes in the form of a coaxial socket or Toslink optical transmitter, the format of the digital data remains the same. They simply take the form of pulses of red light (optical) or pulses of electricity (coaxial). Peer around the back of your CD player (or CD transport) and you'll find one or both of these connections.

Meanwhile, back in the real world we find that nothing can be taken for granted. Sure, the format of the data is fixed; but different digital outputs still 'sound' very different from one another because of extraneous factors like jitter (a blurring of the digital edges) and RF noise. Theoretically, optical connections should offer an advantage over their coaxial cousins because fibre-data travels one-way only - there's no return path to circulate interference. Yet many coaxial connections still end up sounding superior because the digital 'edges' are more sharply defined.

Unfortunately the optical transmitters (in the CD player) and receivers (in the outboard DAC) are hampered by their restricted data rate. This doesn't mean that data is slowed down. Instead, the vertical edges of the digital signal become slanted and this leads to a degree of uncertainty in the exact position of these 1s and 0s in the outboard convertor. So freedom from interference is often traded for an increase in jitter.

There are other reasons why a randomly chosen CD transport/DAC combination or CD player plus

DAC upgrade might not sound any better than a decent integrated CD player. Certainly separating the noisy digital electronics and power supply of the transport from the sensitive analogue electronics of the DAC is worthwhile, but the improvements are not for free. You see, before communicating the data from digital output (in the CD player or transport) to the digital input (in the DAC) it's first changed from the standard language of I²S to that of S/PDIF.

The data is squirted over where it's translated back again into I²S within the outboard convertor. Now, because a conventional one-box CD player avoids all this malarky it also avoids the chance of extra jitter or, in the worse case, corrupted data. Choosing an outboard DAC should be straightforward, but when manufacturers fail to stick to the 'rules' (see *Tech Talk*) it makes life very difficult indeed.

The influence of facilities is another area that shouldn't be taken for granted as far as DACs are concerned. Now, none of these units is equipped with a variable output so the pros and cons of this option needn't concern us. However, several of our DACs are equipped with a phase invert facility. This changes the sign of each digital bit before the data is converted back into analogue music, shifting its phase by 180 degrees. It's the equivalent of swapping over the red and black speaker cables and can have the effect of sharpening the stereo focus of individual performers, depending on the absolute phase of the recording or tracks within a recording.

It has been suggested that phase-inversion has no audible effect, but many listeners report hearing obvious changes in performance with it engaged. Now, I'm not going to argue about the subjective effects of phase but it is worth knowing that changing the sign of the digital data can influence both the low-level linearity and nature of distortion produced by the DAC itself. And these effects may well be audible (see *Tech Talk*).

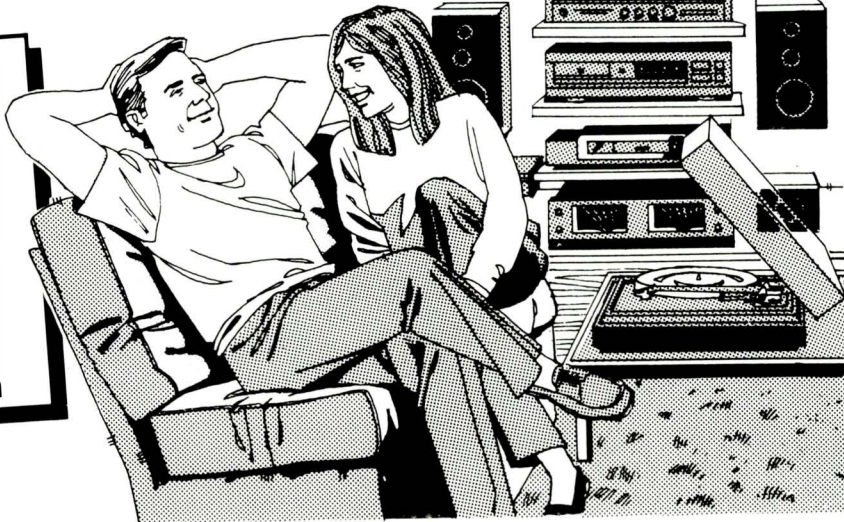
The tests

Before our (blind) listening commenced every converter was left powered-up in the lab for at least 48 hours, ensuring that each was thoroughly warmed up. Once again our panel selected a range of music that extended from folk (Mary Black and Christy Moore) through jazz (Marty Paich's Big Band) to classical (Prokofiev's *Classical Symphony*). Furthermore, because we could not rely on any one digital output being typical of the breed we took an overview of each DACs performance with three separate CD transports.

Clearly, we could not audition every available permutation of transport and DAC, nevertheless our choice of Meridian 200, Teac P-10 and Wadia WT3200 represents a very broad cross-section of the market in terms of both price and technology. In each 'Sound quality' section you'll find the CD transports listed in order of preference for that particular DAC. Some of the most encouraging combinations are not necessarily the most obvious and our results provide you with a comprehensive starting point for making your personal choice of outboard D/A convertor.

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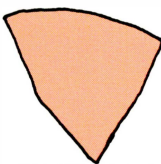


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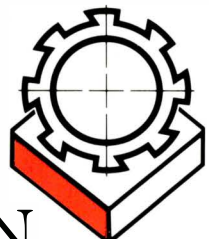
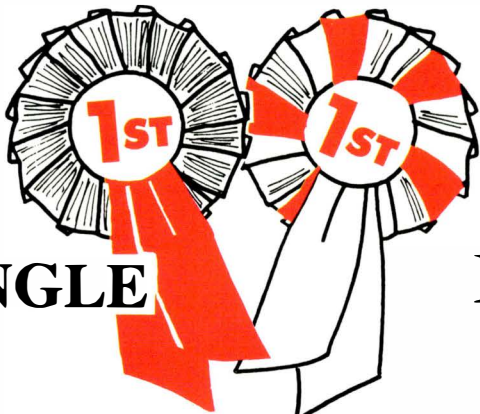
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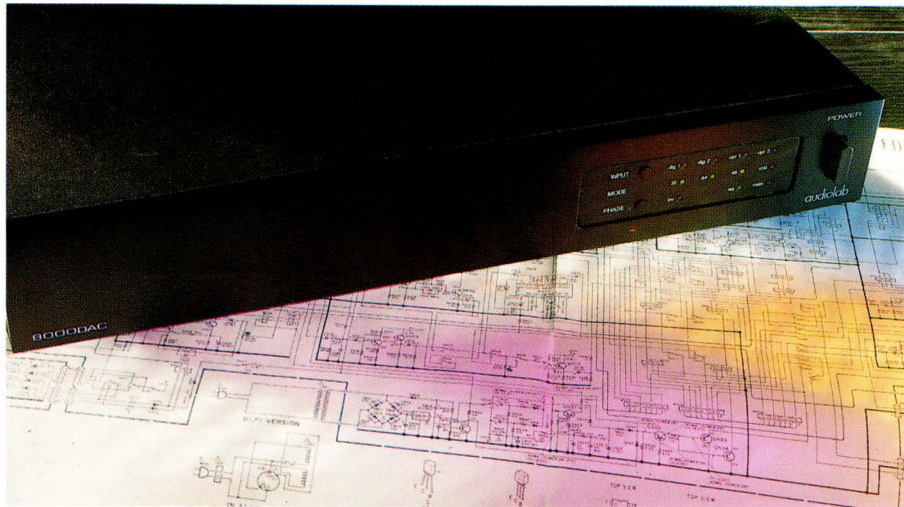
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Audiolab 8000DAC

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Sophisticated hardly does justice to Audiolab's new Bit Stream converter, for even its luxurious black alloy casework gives little clue to the wealth of technology that lies within. Indicators reveal which of the coaxial, optical and AES/EBU (balanced) digital inputs are engaged while others denote operation of the phase invert facility and incoming sample frequency. But prise off the bonnet and the true complexity of the 8000DAC is disclosed.

Not content with recovering clock data from the digital input using a single PLL (phase locked loop), Audiolab has included three further crystal based oscillators to home in on the master clock of 32, 44 or 48kHz inputs. These secondary comparators use a low frequency loop filter (just 13Hz or thereabouts) to reduce signal dependent jitter, but because the oscillator is crystal based any digital input that lies outside the Class I (50ppm) specification will slip its grasp. Owners of Kenwood's DP-X9010 beware!

Lab report

This is an extremely competent piece of engineering, squeezing state-of-the-art performance from Philips' SAA7350 Bit Stream DAC. Distortion increases to just 0.005 per cent at 20kHz while the NPC oversampling filter (as used by Proceed) all but banishes any stop band noise (see 3D plot). There's a maximum compression of 1.9dB over a 100dB dynamic range but the final 104-107dB S/N ratio is superior to that of competing DAC7 converters from Deltec and Meridian (see issue 101).

The plot of 1kHz/-70dB is instantly recognisable as 7350 noise-shapers working with a 16.9MHz rather than 11.3MHz clock, a full 384 times oversampling, in other words. Problems? Not really, though the midband crosstalk is dominated by (second order) distortion products some 15dB higher than the test frequency.

Sound quality

Via the Wadia WT3200 transport:

Griffes' piano sequence was thought to be particularly good on this occasion, the incisive nature of each note coupled with the sense of grip and definition all led to a colourful and vivid sound. Julia Fordham's voice was 'naturally' sibilant, an out-of-the-box and very expressive splash of sound if one that lacked the imagery of the Forte, for instance. A very enjoyable performance, solid with plenty of drive.

Via the Teac P-10 transport:

A middling reaction suggested things were beginning to go downhill. Here the panel thought the 8000DAC was superficially impressive even though, long term, it failed to communicate. There was a reasonable sense of weight and 'grunt' but a loss of coherence. So vocals sounded very smooth, certainly not sibilant, but lacked clarity and bite. One listener actually liked the piano sequence but considered the string and vocal tracks to be significantly more brash.

Via the Meridian 200 transport:

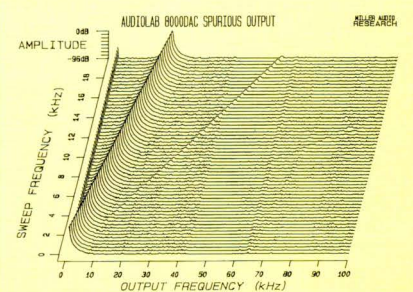
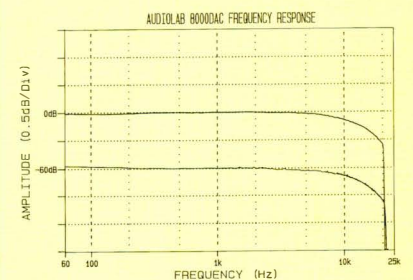
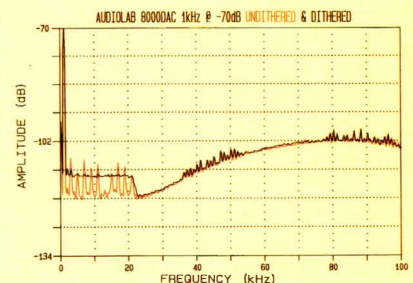
Very clean and clear but just a little too 'hi-fi'. 'Sounds like it's been designed in a hospital' ventured one listener. To this end both string and vocal performances were over emphasised, spot-lit in a broad if not especially deep soundstage. If anything it seemed a trifle bass shy, prompting one listener to suggest it could become tiring even though it was not overtly aggressive.

Conclusion

Audiolab has obviously been extremely attentive in the design of this DAC, so what has gone wrong? Perhaps the 8000DAC is simply too complicated for its own good. After all, it's positively festooned with TTL logic. So though our listening panel found it difficult to pin down obvious flaws, on the whole it still failed to generate real enthusiasm with anything other than the Wadia transport - an unlikely bedfellow.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.11dB	0.11dB	0.12dB
Channel Separation	113.8dB	115.6dB	97.6dB
THD vs Level, 0dB	-98.9dB	-98.1dB	-86.2dB
-30dB	-78.3dB	-77.8dB	-68.4dB
-60dB	-50.5dB	-47.8dB	-37.2dB
-80dB	-24.4dB	-30.0dB	-17.9dB
Dithered, -90dB	-12.9dB	-17.3dB	-10.2dB
Dithered, -100dB		-17.4dB	
Dithered, -110dB		-4.45dB	
Resolution @ -60dB		+0.04dB	+0.03dB
-80dB		+0.33dB	+0.38dB
-90dB		+0.90dB	+0.89dB
-95dB		+1.21dB	-0.10dB
-100dB		+1.88dB	
Peak Output L		2.027V	
R		2.051V	
Relative Output Level		+0.17dB	
Output Impedance		105ohm	
RF Spurious		121.4MHz @ 6.4mV	
0.34Hz Noise Modulation			+5.9dB
CCIR IMD, 0dB			-98.8dB
Suppression of stop-band IMD			104.8dB
De-emphasis Accuracy, 1kHz			-0.11dB
5kHz			-0.19dB
16kHz			-0.44dB
S/N Ratio (A-wtd), w/emp, 0LSB			106.7dB
w/oemp, 0LSB			104.3dB
w/oemp, 1LSB			104.4dB
Typical Retail Price			£695

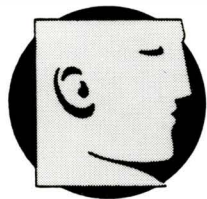


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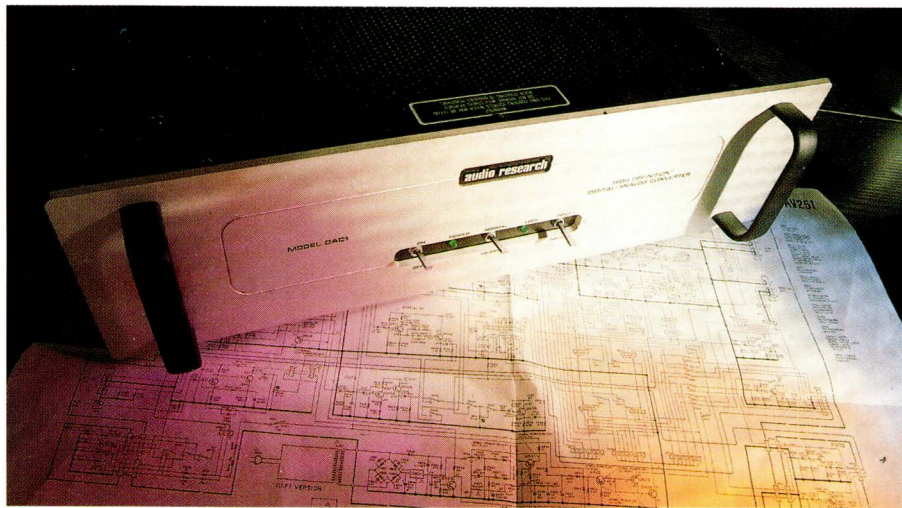
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Audio Research DAC1-20

Absolute Sounds Ltd, 58 Durham Road, London SW20 0DE. Tel: (081) 947 5047



If you are looking for a cost-effective CD upgrade then Audio Research is not a name to conjure with. At a mite under £4,000 the *DAC1-20* shares all the features of the earlier *DAC1-18* with no less than two electrical BNC inputs, one Toslink and one ST-connected AT&T optical input. These are selected via toggle switches on the distinctive 'AudioResearch' alloy fascia along with a facility for phase inversion.

Under the bonnet you'd find a total of three small mains transformers feeding some seven separately regulated supplies. Wima polypropylene caps and a FET-based analogue gain stage complete the list of goodies.

A dependable Yamaha interface chip and NPC oversampling filter do all the real work. The DAC is a 20-bit device from UltraAnalog which, apparently, uses Burr Brown PCM63Ps in conjunction with an external and individually trimmed resistive ladder network. Costly stuff.

Lab report

This DAC gives of its best in the musically relevant area of -10dB to -70dB where distortion and noise are both very low. Just look at the 1kHz/-70dB plot which shows the *DAC1-20* making ideal use of the dithered (black) input, achieving a dynamic range on a par with both the Teac and Thresold converters.

The contoured ultrasonic noise floor implies a degree of digital noise shaping in either the oversampling filter or 20-bit DAC, though the overall S/N ratio is the widest of the lot at 112dB (A-wtd).

Nevertheless this also exposes the FIR ripple frequency of 22.05kHz which is clearly visible as a track on the three dimensional plot. Furthermore, at peak level (0dB) there's some compression which leads to more distortion than expected, 0.007 rather than 0.0009 per cent or so (see the three dimensional plot).

Sound quality

Via the Meridian 200 transport:

The panel liked it, yet considered the *DAC1-20* something of a 'con' in the way it stealthily covered its tracks. Fordham's vocals were especially involving, her voice held solidly in an expansive acoustic even if there was a loss of low level detail. Similarly the structure, architecture and weight of the piano from Griffes' duet was really impressive, very engaging despite losing freshness and explicit clarity. Not as good as the Threshold, concluded the panel, but still very entertaining.

Via the Wadia WT3200 transport:

Cosmetically detailed, thought the listeners, providing detail that translated into plenty of space and ambience rather than note-for-note accuracy. The *DAC1-20*'s warm midrange seemed to elicit a favourable response on the classical sequences even though its more ragged top end aggravated the electronic quality of our pop selection. As a result both vocals and strings were strained at times even though the overall presentation was as much bland as offensive.

Via the Teac P-10 transport:

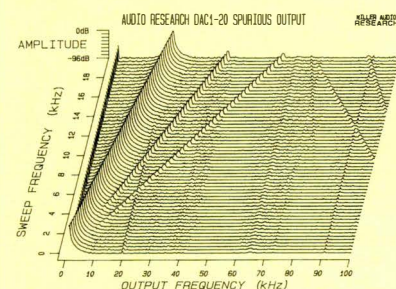
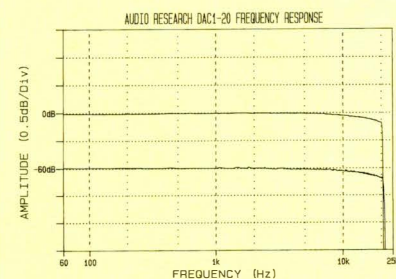
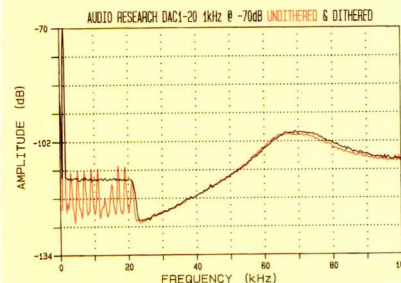
Nothing to write home about, muttered a panel of unimpressed listeners. The flute and piano sounded phasy, swimmy and generally unfocussed just as the string section was jangly and lacking in space. All this was linked to a light but plodding balance which failed to accurately reflect dynamic contrasts. Yep, it bombed!

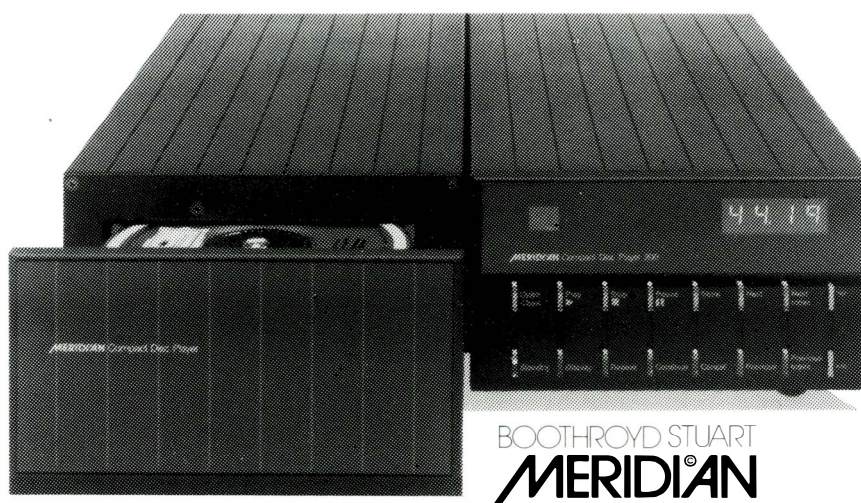
Conclusion

Technically impressive, yes, but subjectively Audio Research's grip on the DAC scene would appear to be on the wane. No doubt there are systems better suited to the Audio Research 'flavour', but on the basis of these extremely thorough tests a general recommendation seems quite impossible. In the cold light of day, the *DAC1-20* remains rather poor value.

TEST RESULTS

Channel Balance	20Hz	1kHz	20kHz
	0.01dB	0.01dB	0.03dB
Channel Separation	119.0dB	127.8dB	98.7dB
THD vs Level, 0dB	-83.7dB	-83.2dB	-66.9dB
	-30dB	-85.5dB	-80.9dB
	-60dB	-57.3dB	-54.4dB
	-80dB	-27.9dB	-34.3dB
Dithered, -90dB	-17.4dB	-22.4dB	-9.55dB
Dithered, -100dB		-22.3dB	
Dithered, -110dB		-13.0dB	
Resolution@ -60dB		-0.01dB	-0.01dB
	-80dB	-0.10dB	-0.05dB
	-90dB	-0.26dB	-0.43dB
	-95dB	+0.03dB	-0.10dB
	-100dB	+0.12dB	
Peak Output	L	1.748V	
	R	1.746V	
Relative Output Level		-1.17dB	
Output Impedance		28.8ohm	
RF Spurious		124MHz/2.8MHz@14mV	
0.34Hz Noise Modulation		+10.5dB	
CCIR IMD, 0dB		-78.9dB	
Suppression of stop-band IMD		>105dB	
De-emphasis Accuracy, 1kHz		-0.01dB	
	5kHz	-0.01dB	
	16kHz	-0.12dB	
S/N Ratio (A-wtd), w emp, 0LSB		112.6dB	
	w/o emp, 0LSB	112.3dB	
	w/o emp, 1LSB	112.4dB	
Typical Retail Price		£3898	





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Deltec Bigger Bit

Deltec Ltd, Unit 7, East Moors Business Park, East Moors Road, Cardiff CF1 5EG. Tel: (0222) 482 818



This is a fully-fledged DAC7 unit, combining the same dual-PLL digital processing circuits as the *PDM1* and *PDM2* with analogue electronics culled from the *Little Bit*.

Costs are saved by trading the advanced DH-OA32 op-amps for mundane NE5534s but the critical ICs, Yamaha's eight times oversampling filter and Philips' DAC7 chipset, remain unchanged. All this is contained within a single box, a stretched version of the sleek alloy case first seen with the original *PDM1*.

Input selection is automatic while alongside you'll find the 'Deltran' facility, enabling the clocks of both DAC and a forthcoming CD transport to be fully synchronised. A feature for the future.

Lab report

As you might expect, there are great similarities between the *Bigger Bit*, *PDM1* and *PDM2*. Very low distortion and excellent linearity are hallmarks of Philips' SAA7350/TDA1547 DAC7 system, though the 1kHz/-70dB plot indicates it's better implemented in the *Bigger Bit* than the costlier *PDM1*. On the other hand the -60dB response is rippled through a gentle intermodulation between master clock, digital data and analogue signal - something that's avoided by two box construction.

Meanwhile the revised 0.34Hz noise modulation seems massively high at +12dB, yet the distribution of this noise completely avoids the region where the ear is most sensitive (see Tech Talk). Oh yes, the deterioration in S/N ratio seen when using a non offset digital zero is caused by a mild instability in the NE5534 op-amps,

Sound quality

Via the Teac P-10 transport:

An abundance of musical detail, very tight control and command of dynamics all led to an exceedingly spacious and ambient

sound from this duo. The panel noted that vocals were distinguished by a decidedly human quality, with no exaggeration of natural sibilance.

Meanwhile the flute from Griffé's duet was thought to enjoy a delightful 'singing' quality though there was a slight loss of bass weight, especially noticeable with the plucked bass from Prokofiev's Symphony. Nevertheless the *Bigger Bit* was still put on a par with the *PDM1* in the blind listening test.

Via the Meridian 200 transport:

What struck our listeners first and foremost was the very good sense of space, reflecting changes in the acoustic (particularly those midway through the Julia Fordham track) that were masked by all others save the Threshold. This, they considered, was indicative of good resolution, for the DAC would easily distinguish between artificial digital reverb and the natural, rich colour of her voice. Another great result.

Via the Wadia WT3200 transport:

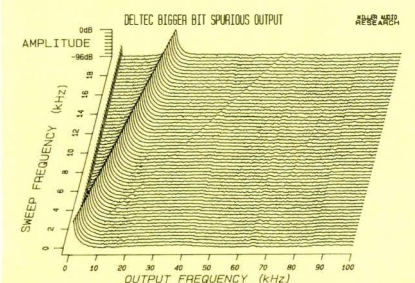
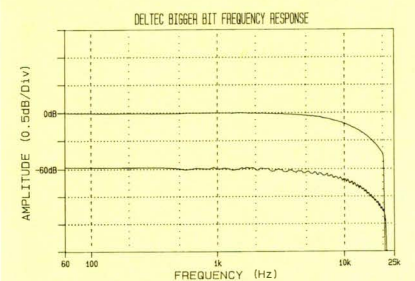
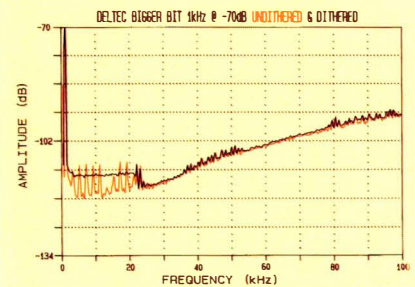
The listening panel thought left/right separation of the duet for flute and piano was more impressive than the accompanying sense of depth. Furthermore though the introduction of bowed strings was weighty enough, there was some hardening of both strings and voice at higher levels. Vocals were otherwise described as very clear and, once again, 'human'. A rounded and seamless sound.

Conclusion

On balance, Deltec's *Bigger Bit* proved to be the most consistent performer in this month's survey with a fresh, solid and dynamic sound packed with intricate detail. Deltec's proprietary RF mains filter is a mandatory accessory for all its DACs yet, in this instance, the overall cost disqualifies it from a Best Buy. Deltec will just have to make do with our very heartiest Recommendation.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.00dB	0.00dB	0.02dB
Channel Separation	123.6dB	119.0dB	113.5dB
THD vs Level, 0dB	-108.2dB	-98.6dB	-80.3dB
-30dB	-93.9dB	-81.2dB	-63.6dB
-60dB	-63.2dB	-52.7dB	-32.0dB
-80dB	-28.2dB	-29.6dB	-11.7dB
-90dB	-21.6dB	-20.2dB	-4.50dB
Dithered, -100dB		-15.6dB	
Dithered, -110dB		-10.0dB	
Resolution@ -60dB		-0.01dB	-0.01dB
-80dB		-0.02dB	-0.08dB
-90dB		-0.78dB	-0.02dB
-95dB		-0.25dB	+1.58dB
-100dB		-0.25dB	
PeakOutput L		1.942V	
PeakOutput R		1.941V	
Relative Output Level		-0.26dB	
Output Impedance		<0.1ohm	
RF Spurious		2.5mV broadband	
0.34Hz Noise Modulation			+12.4dB
CCIRIMD, 0dB			-98.4dB
Suppression of stop-band IMD			102.3dB
De-emphasis Accuracy, 1kHz			+0.12dB
5kHz			+1.03dB
16kHz			+0.23dB
S/N Ratio (A-wtd), w/emp, 0LSB			99.8dB
w/oemp, 0LSB			98.9dB
w/oemp, 1LSB			102.6dB*
Typical Retail Price			£650 + £98



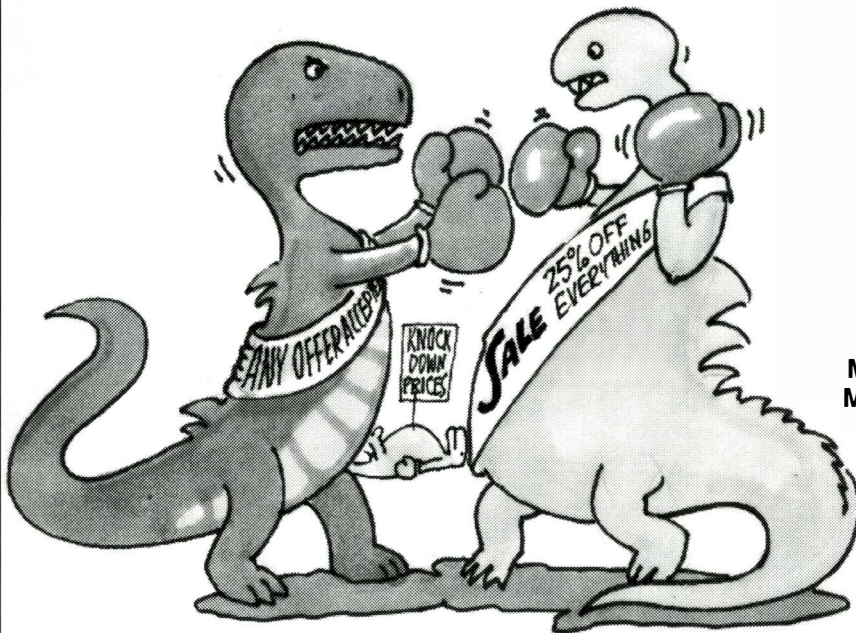
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Deltec PDM1 Series 3

Deltec Ltd, Unit 7, East Moors Business Park, East Moors Road, Cardiff CF1 5EG. Tel: (0222) 482 818



Remember Deltec's two box *PDM2* converter (issue 101)? Well, two months on, Deltec has launched a bargain basement version called the *PDM1 Series 3* - same two box construction and Philips' DAC7 Bit Stream technology but cheaper passive componentry and power supplies.

The top digital processor box is virtually identical to that of the *PDM2* with its dual PLL clock regeneration, Yamaha interface chip, eight times oversampling filter and SAA7350 noise shaper. However the coax and optical inputs are now self selecting while the phase invert facility has been abandoned.

Four (rather than six) optical datalines feed the 'analogue' box which contains a single DAC7 convertor with proprietary DH-OA32 op-amps. Basically, costs are saved by running single rather than dual L/R datalines though the maximum theoretical data rate is reduced from 384 times to 192 times.

Lab report

Numerically at least, the *PDM1 Series 3* bears close comparison with the *PDM2*. Distortion is almost identical at all frequencies, the response falls by 0.9dB (L) and 1.1dB (R) at 20kHz while its linearity is only a little less impressive. Yet there are differences.

The 3D plot shows stop band noise is about 10dB higher than the *PDM2* (due to the DH-OA32 op-amps) while, more importantly, the 1kHz/70dB trace reveals the characteristic upsweep of noise beginning within - rather than beyond - the audio range.

So the S/N ratio is compressed by about 3dB because Deltec has increased the value of the DAC's damping capacitor too far in an effort to further reduce distortion. Critical adjustments like this are known to have an impact on sound quality

Sound quality

Via the Teac *P-10* transport:

With its 'immense presence, marvellous sense of scale and dynamics' this combination brought the music closer to our listeners without flattening perspectives in the process. The overall balance was judged slightly lighter in tone than the Teac/Forte but its soundstaging was almost ethereal by comparison, the compelling interplay between different instruments prompting remarks like 'beautiful presentation' and 'sonorous' from the panel.

The flute from Griffes' duet was large but vivid while Julia Fordham was at her seductive best without labouring over any natural vocal sibilance. By unanimous vote, this was the pairing of the day!

Via the Meridian *200* transport:

Although this combo was hardly offensive it didn't have the endearing qualities heard earlier. It was not lean or stark yet both the harp and female vocals tended to be propelled forward in an unnatural fashion. Overall the listeners pitched it on a par with the Forte but thought it substantially worse than the Proceed.

Via the Wadia *WT3200* transport:

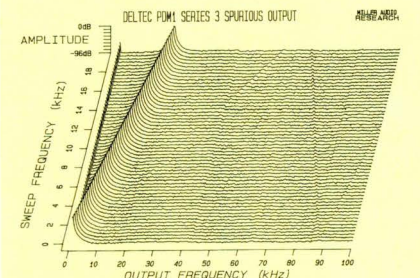
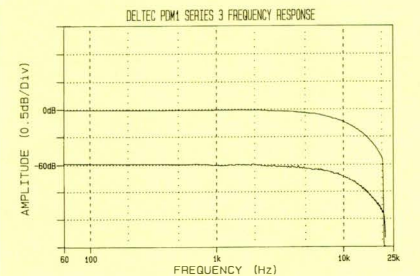
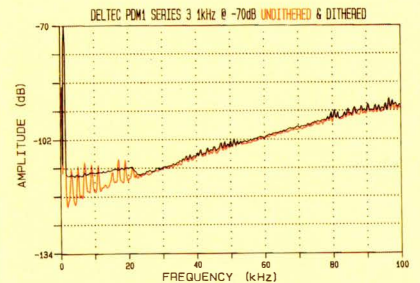
Now our listeners were confused, for on the one hand the Prokofiev Symphony ebbed and swelled convincingly with a delightful string tone while, on the other, Julia Fordham's performance was less natural and dominated by sibilance. Similarly the piano/flute combination was also very well balanced while the harp lacked air and subtlety - sounding like a 'tightly strung bicycle wheel'.

Conclusion

Hardly a model of consistency but clearly something of a winner with Teac's trusty *P-10*. Nevertheless its rollercoaster ride with other transports means we must fight shy of a general Recommendation, leaving Deltec to tidy up a few loose ends.

TEST RESULTS

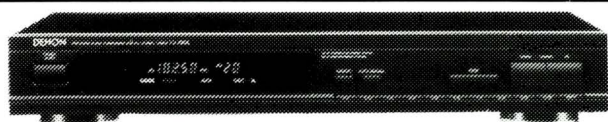
	20Hz	1kHz	20kHz
Channel Balance	0.14dB	0.14dB	0.41dB
Channel Separation	135.7dB	120.6dB	114.7dB
THD vs Level, 0dB	-110.5dB	-101.0dB	-82.9dB
-30dB	-92.1dB	-82.4dB	-63.6dB
-60dB	-57.9dB	-53.7dB	-34.6dB
-80dB	-28.5dB	-34.2dB	-13.8dB
Dithered, -90dB	-29.4dB	-22.5dB	-4.95dB
Dithered, -100dB		-18.1dB	
Dithered, -110dB		-10.5dB	
Resolution@ -60dB	0.00dB	-0.01dB	
-80dB		-0.15dB	-0.18dB
-90dB		-0.49dB	-0.55dB
-95dB		-0.13dB	+1.15dB
-100dB		-0.35dB	
Peak Output L		2.286V	
Peak Output R		2.321V	
Relative Output Level		+1.23dB	
Output Impedance		<0.1ohm	
RF Spuria		<1mV broadband	
0.34Hz Noise Modulation			+10.5dB
CCIR IMD, 0dB			-102.8dB
Suppression of stop-band IMD			91.3dB
De-emphasis Accuracy	1kHz		-0.04dB
	5kHz		-0.21dB
	16kHz		-0.95dB
S/N Ratio (A-wtd), w emp, 0LSB			106.7dB
w/o emp, 0LSB			102.6dB
w/o emp, 1LSB			102.5dB
Typical Retail Price			£1195 + £196



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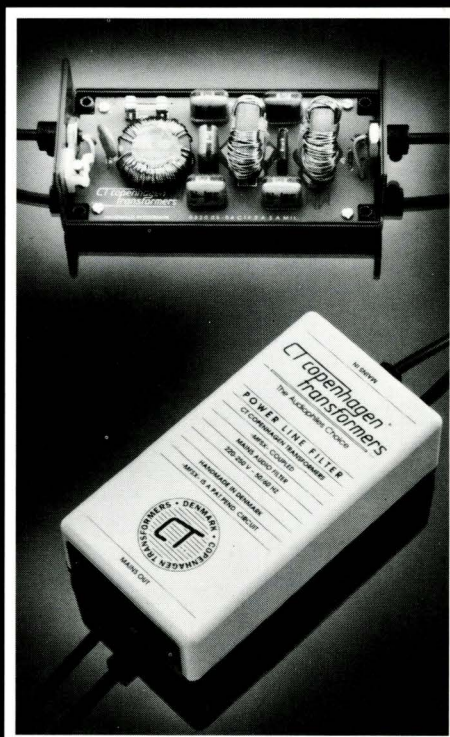
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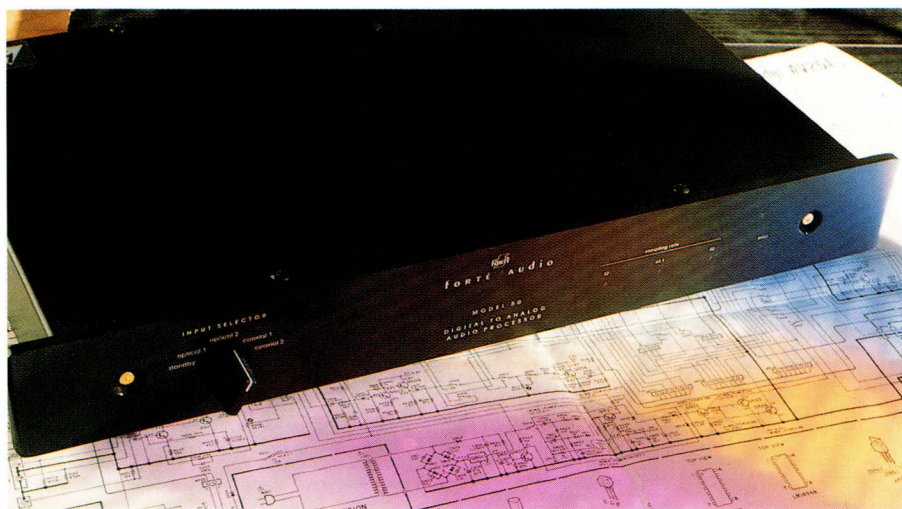
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Forte Audio Model 50

Acoustic Energy Ltd, 3A Alexandria Road, Ealing, London W13 0NP. Tel: (081) 840 6305



Another newcomer to our shores and one that's blazing a parallel trail to Threshold. Both brands are controlled by a mother company called In-Concert, with all the top gear flying the Threshold banner, leaving Forte to satisfy the 'affordable' end of the market.

The two In-Concert DACs look very different but there are similarities in the gentle analogue filtering, crystal-lock and digital processing circuitry used by each. Thus the *Model 50* also offers both balanced and unbalanced outputs in addition to pairs of coax and optical digital inputs.

Unfortunately Threshold's paranoia also extends to the Forte *Model 50* where no less than 16 ICs (including the interface, logic, oversampling, DAC and analogue op-amps) are camouflaged with the traditional black paint. Don't look to the literature if you want straightforward illustrations of technology!

Lab report

Following the listening tests I set my trusty spectrum analyser to work on the guts of the *Model 50*.

So what's going on inside? Well, take a look at the 1kHz/70dB plot and compare this with either Deltec or Audiolab DACs (or *PDM2* from issue 101). This shows that Forte are using Philips' SAA7350 chip or, more correctly, its third order noise shapers while the 'shape' of the noise indicates that it's running at 192 times oversampling with a 16.9MHz clock.

Furthermore, the excellent linearity, low distortion, wide S/N ratio and peculiarly high 0.34Hz noise modulation (see *Tech Talk*) reveals the final chip to be Philips' TDA1547. So the *Model 50* turns out to be the first fully-fledged DAC7 unit to emerge from the US.

The oversampling filter? Just look at the clean 3D plot - it's an eight times device from NPC.

Sound quality

Via the Wadia *WT3200* transport:

With its fine reproduction of ambient detail and front to back imaging, especially on the piano and flute sequence, this combination immediately attracted the interest of our listeners. Its music seemed bigger and more full bodied than usual, with one panelist describing it as 'warm and yet explosive'.

Another listener thought there was a slight 'bloom' to its sound but the others felt that any euphonic quality actually enhanced rather than muddled the clarity of the music. Strings, for instance, were warm and engaging rather than electronic or edgy in character - a sound with body and resolution, they concluded

Via the Teac *P-10* transport:

A big and solid sound greeted our panelists, revealing plenty of each disc's underlying character. The piano, for instance, had more bite and weight while the bowed strings now played a more integrated role with the harp and guitar.

Most important was the underlying sense of purpose, of drive and conviction behind the music as a whole. A good 'un, by all accounts.

Via the Meridian *200* transport:

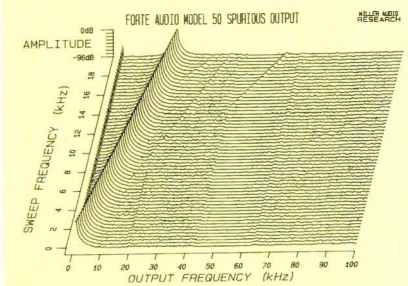
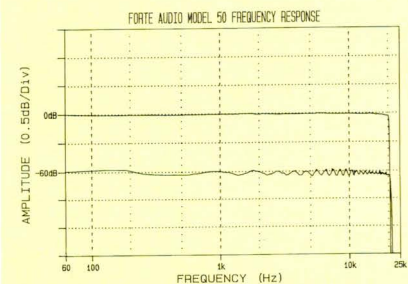
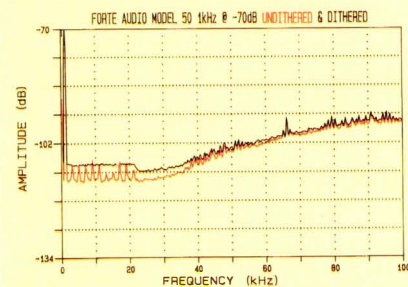
By contrast we were disappointed with this pairing, for though the *Model 50* was not as 'matter of fact' as the Teac *D-500*, it still lacked the finesse and subtlety of either the Threshold or Deltec. A processed rather than natural, flowing sound with an indistinct sense of positioning.

Conclusion

Not a perfect entry, but two out of three is still good going by current standards. Meanwhile its warm and full bodied sound is sufficient to guarantee a Recommendation, even if Forte lose brownie points in my book by attempting to conceal the DAC7 technology that lies within.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.02dB	0.02dB	0.05dB
Channel Separation	121.1dB	91.6dB	66.7dB
THD vs Level, 0dB	-102.8dB	-99.3dB	-85.8dB
	-30dB	-83.4dB	-76.9dB
	-60dB	-56.4dB	-52.7dB
	-80dB	-28.6dB	-32.3dB
Dithered, -90dB	-18.6dB	-20.7dB	-5.15dB
Dithered, -100dB		-20.2dB	
Dithered, -110dB		-10.6dB	
Resolution@ -60dB		-0.01dB	-0.01dB
	-80dB	-0.18dB	+0.04dB
	-90dB	-0.67dB	-0.18dB
	-95dB	-0.50dB	-0.18dB
	-100dB	-0.77dB	
Peak Output L		2.335V	
Peak Output R		2.328V	
Relative Output Level		+1.33dB	
Output Impedance		306ohm	
RF Spurious		33.8/169MHz	@13.6mV
0.34Hz Noise Modulation			+12.2dB
CCIR IMD, 0dB			-98.4dB
Suppression of stop-band IMD			104.2dB
De-emphasis Accuracy, 1kHz			+0.01dB
		5kHz	0.00dB
		16kHz	-0.14dB
S/N Ratio (A-wtd), w emp, 0LSB			112.9dB
		w/o emp, 0LSB	110.5dB
		w/o emp, 1LSB	110.4dB
Typical Retail Price			£950



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Kelvin PDM DAC

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If ever a DAC were deserving of the title 'Black Box' then it would be Kelvin's PDM converter. The PDM's Lilliputian case finds room for just one unswitched digital input, L/R outputs and a power LED on the front panel. And that, as they say, is your lot.

Inside this slim matchbox you'll find an unlikely assortment of ICs, including an old data reception chip from Sony and the very first PDM DAC to emerge from Philips - the historic SAA7320. Philips has stopped making this IC but Kelvin has sufficient numbers stockpiled to satisfy production for the time being.

Another Kelvin quirk concerns its use of a tuned-amplifier instead of a crystal oscillator and PLL (Phase Locked Loop) to extract incoming clock data. As a result this PDM DAC is very resistant to momentary lock outs caused by spikes from your fridge or central heating.

Lab report

Kelvin really has stretched the performance of this early Bit Stream DAC.

Its linearity is on a par with today's SAA7323, for example, while the 3D plot shows the characteristic odd order distortion and stop band images of this single ended DAC. Philips' noise shaping and oversampling coefficients are off beam in the SAA7320 series so the -60dB response shows an exaggerated ripple (check out the Audio Alchemy DDE which we reviewed in issue 101).

Meanwhile the 98-99dB S/N ratio is compromised by idle pattern tones at 5.17kHz and 15.5kHz. Nevertheless the 1kHz/-70dB plot proves that its dynamic range is up with the best even if the 0.85V output is less than half that of conventional DACs.

Otherwise the de-emphasis accuracy is good while both noise modulation and RF garbage are kept tightly in check.

Sound quality

Via the Wadia WT3200 transport:

The initial impression of the panel was of a 'lyrical and natural sound' with an incisive edge to both piano and string tone. The powerful *El Condor* strings were neither as zingy nor as metallic as they had seemed before and there was a better sense of ambience and decay.

Julia Fordham's voice was still a little sibilant yet very well integrated with the percussion and guitars. Pretty good for £200, the listeners concluded.

Via the Meridian 200 transport:

This duo is at its best with up-beat, tactile pop rather than the more fluid classical pieces where subtlety is at a premium. With Griffé's poem our listeners thought the piano was veiled, the pianist pounding away in a dark corner in an effort to be heard above the flute. Both instruments vied for attention but only succeeded in tripping over one another in the attempt. On the other hand the sharp, tactile strings from *El Condor* and the bright voice of Julia Fordham were very much more solidly defined. Take your pick.

Via the Teac P-10 transport:

'Inoffensive with no sense of performance, depth or weight' barked the panel in unison. They thought it tonally weak rather than thin or scratchy, but for all its sweetness it still lacked sufficient bite and clarity. A poor result but still voted ahead of the Teac/Threshold combination.

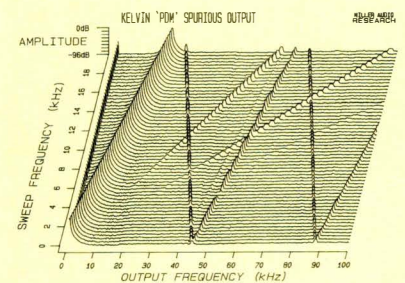
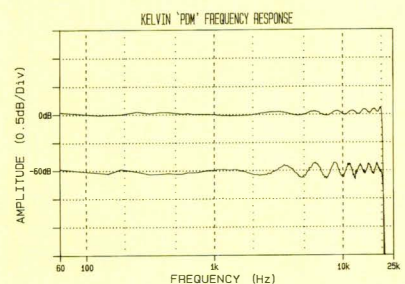
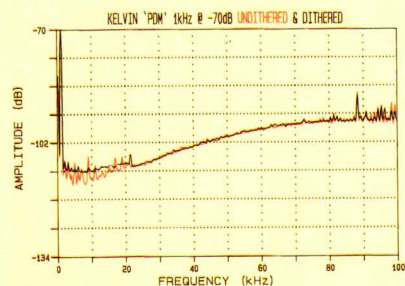
Conclusion

Kelvin's DAC offers just a tantalising glimpse of PDM's true potential yet, technically, it's possibly the most impressive implementation of this very early converter. It can easily sound dusty or lacklustre but if there's just the faintest chance of it duplicating its best performance here then, at just £200, it must surely warrant Recommendation.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.01dB	0.01dB	0.01dB
Channel Separation	87.5dB	87.2dB	91.2dB
THD vs Level, 0dB	-97.7dB	-97.5dB	-65.5dB
-30dB	-76.0dB	-77.1dB	-57.6dB
-60dB	-44.5dB	-43.5dB	-32.3dB
-80dB	-21.6dB	-23.3dB	-10.1dB
-90dB	-15.6dB	-15.7dB	-1.35dB
Dithered, -100dB		-12.1dB	
Dithered, -110dB		-6.35dB	
Resolution@ -60dB		-0.08dB	-0.10dB
-80dB		-0.75dB	-0.81dB
-90dB		-3.59dB	-2.56dB
-95dB		-2.65dB	-1.23dB
-100dB		-2.35dB	
Peak Output L		0.849V	
Peak Output R		0.850V	
Relative Output Level		-7.44dB	
Output Impedance		489ohm	
RF Spurious		<1mV broadband	
0.34Hz Noise Modulation			+2.75dB
CCIR IMD, 0dB			-98.6dB
Suppression of stop-band IMD			55.3dB
De-emphasis Accuracy, 1kHz			-0.10dB
5kHz			-0.24dB
16kHz			-0.13dB
S/N Ratio (A-wtd), w emp, 0LSB			98.9dB*
w/o emp, 0LSB			98.2dB*
w/o emp, 1LSB			98.7dB
Typical Retail Price			£200

* see Lab report



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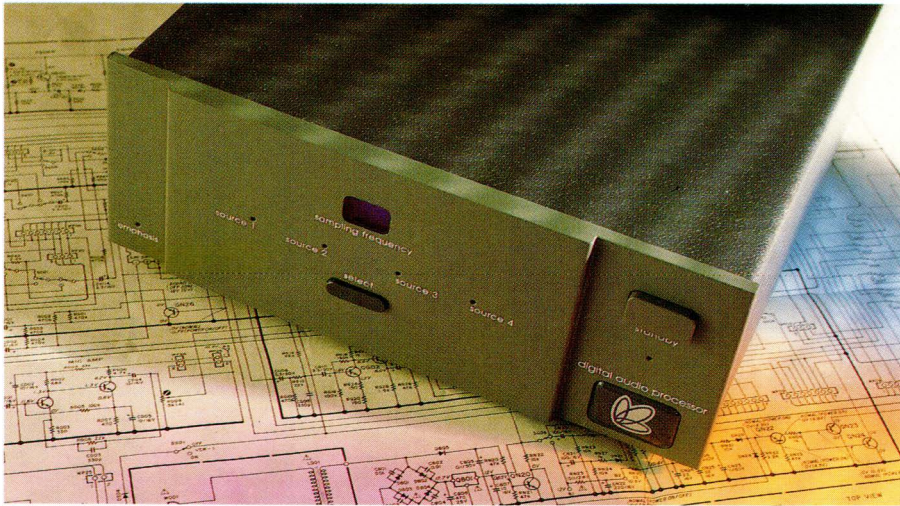
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Proceed PDP2

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Proceed is not an audio company in its own right but a tradename of Madrigal Audio Labs. Madrigal uses the name to distinguish the line from its very high end Mark Levinson products, although the appearance of the *PDP2* DAC is so distinctive, with its heavy grey painted chassis and attractive red display, that you're unlikely to confuse it with anything else.

Around the back you'll find four digital inputs including three coax and one XLR conforming, I assume, to the AES/EBU format. Proceed has also taken the trouble to fit both balanced (XLR) and unbalanced (phono) analogue outputs, complete with a miniscule output impedance which ensures that the *PDP2* is very tolerant of long or esoteric styles of interconnect cable.

Technology? Well, Proceed has plumped for 18-bit PCM58s from Burr Brown together with a fancy 20-bit eight times oversampling filter from NPC.

All this plus a chunky low noise power supply, quality op-amps and passive components in the analogue stage means solid engineering, weighing in at an equally solid price.

Lab report

Here we see the pros and cons of a top notch multibit converter. The S/N ratio is a fabulous 108-112dB (A-wtd) while the peak level distortion clocks in around 0.0014 per cent.

However at the lower levels, say below -10dB, distortion is dominated by odd-order products (see 1kHz/70dB) which are not mollified by the use of dithered signals.

Furthermore the wide S/N ratio only tends to exaggerate the +9.5dB noise modulation, itself a reflection of errors in linearity which compress the 90dB dynamic range by nearly 8dB at 20kHz. The discrimination of Proceed's transformer-coupled digital input is covered in *Tech Talk* elsewhere in this issue.

Sound quality

Via the Meridian 200 transport:

Our listeners were in complete accord over the expressiveness of this DAC, for it has an enticing quality that's especially compelling with simple, well recorded vocals. Griffes' duet for piano and flute sounded a little more forward than usual but, more noticeable, was its new found strength of bass. Similarly, the bowed double bass from the *El Condor* selection also rumbled across with a satisfyingly full, rich and resonant tone. A little coloured, insisted the panel, but still very attractive.

Via the Wadia WT3200 transport:

This combination inspired a mixed reaction from our panel, for though it could be spitty or strident with the Julia Fordham CD its upper-mid emphasis brought a light, bright and quick feel to the piano sequence. Some listeners felt the Prokofiev Symphony was approached in a purposeful and confident manner while two others complained that it lacked guts, body and drive. Strings, they countered, were rather pedestrian while the music as a whole was both vague and boring. No consensus here.

Via the Teac P-10 transport:

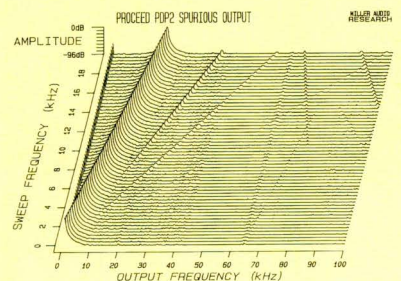
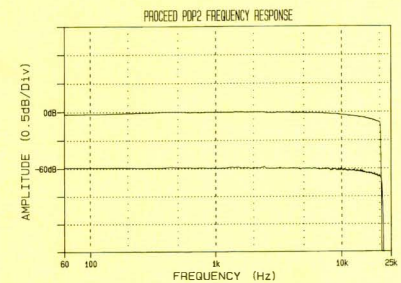
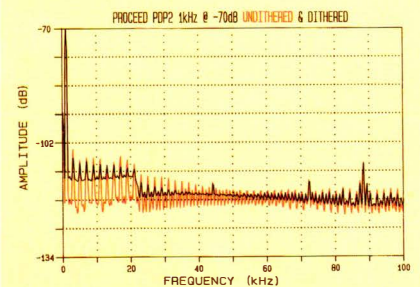
While this duo was obviously more delicate and natural sounding than, say, the Teac/PS Audio combination, it did seem less able to grapple with busy dynamic contrasts. So while the flute pulled the piano along quite convincingly there was also a smearing, not a dirtiness as such, but a vague, wishy-washy feeling about the vocal and Prokofiev tracks.

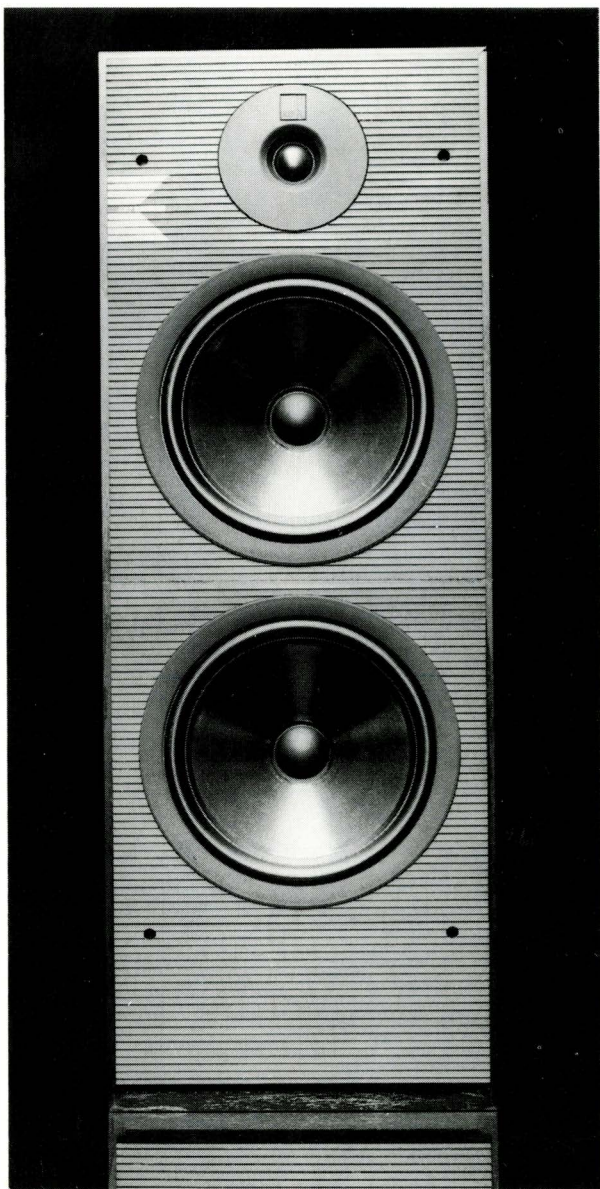
Conclusion

Partnered with a sympathetic transport, the *PDP2* seems to provide a deeper but also slightly more coloured and euphonic picture than the competition. In less favourable circumstances this might transpire as a loss of grip and attack, so the *PDP2* falls short of an all-round recommendation.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.00dB	0.00dB	0.02dB
Channel Separation	139.5dB	130.6dB	129.7dB
THD vs Level, 0dB	-96.6dB	-96.9dB	-84.8dB
-30dB	-69.7dB	-68.9dB	-56.5dB
-60dB	-48.5dB	-44.5dB	-24.5dB
-80dB	-25.7dB	-27.3dB	-6.20dB
Dithered, -90dB	-15.0dB	-18.2dB	-3.55dB
Dithered, -100dB		-18.1dB	
Dithered, -110dB		-6.60dB	
Resolution@ -60dB		+0.14dB	+0.14dB
-80dB		+0.43dB	+1.62dB
-90dB		+1.11dB	+6.61dB
-95dB		+1.46dB	+7.95dB
-100dB		+1.88dB	
Peak Output L		2.121V	
Peak Output R		2.121V	
Relative Output Level		+0.51dB	
Output Impedance		<1ohm	
RF Spurious	2.8MHz/87MHz @ 68mV		
0.34Hz Noise Modulation		+9.5dB	
CCIR IMD, 0dB		-90.8dB	
Suppression of stop-band IMD		99.8dB	
De-emphasis Accuracy, 1kHz		-2.16dB	
5kHz		-2.06dB	
16kHz		-2.27dB	
S/N Ratio (A-wtd), w emp, 0LSB		111.8dB	
w/o emp, 0LSB		108.3dB	
w/o emp, 1LSB		108.8dB	
Typical Retail Price			£1595





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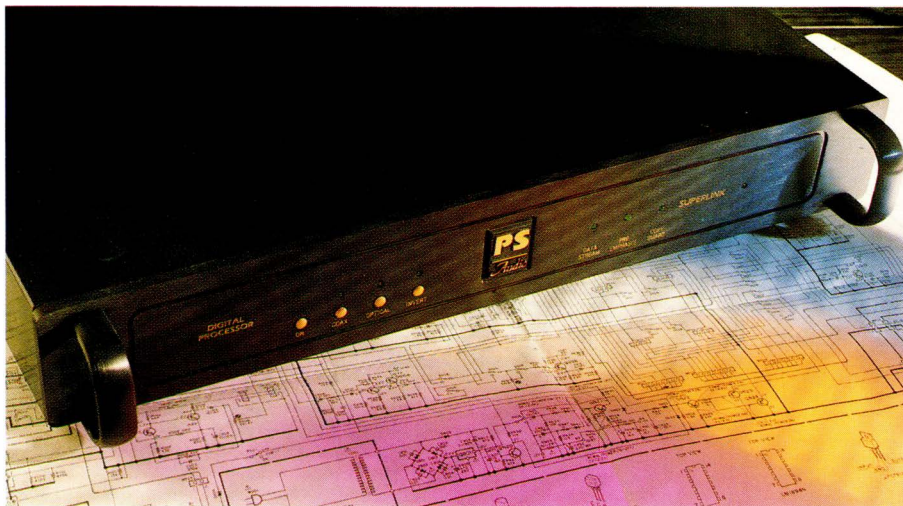
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Glance at the sleek profile and touch-sensitive controls of the *Superlink* DAC and it's hard to believe that PS Audio began life producing DIY amp kits for impoverished audiophiles.

But that was then and the *Superlink* with its coax and optical inputs, phase invert facility and Copy Guard indicator is most certainly 'now'.

PS Audio's literature suggests that it's using Burr Brown PCM61 DACs but this unit was equipped with good old AD1860s, 18-bit pin-for-pin equivalents made by Analogue Devices. This same company supplies the op-amps used in *Superlink*'s main gain stage though the DC coupled output is beefed up by FET current sources.

With its vast 3.4V output and negligible source impedance, PS Audio has obviously geared the *Superlink* for use with a passive pot and power amp. Just beware of straight A/B demos!

Lab report

A bit weird, this one. For a start PS has opted for passive current to voltage conversion, compromising the S/N ratio to the tune of 94-95dB (A-wtd). No real problems here but, by magnifying truncation errors, the YM3434 eight times oversampling filter seems responsible for a 688Hz ripple in the -60dB response.

Meanwhile the passively loaded DACs abandon any pretence of linearity at 20kHz. So though treble distortion looks low enough on paper, in practice it's accompanied by vast swathes of non-harmonic sampling intermodulation.

The 3D plot highlights leakage of both 44.1kHz and 88.2kHz sample frequencies which also crop up (together with clusters of sampling IM distortions) on the trace of 1kHz/-70dB. Dithered or undithered, the *Superlink* has got problems. Channel separation is very poor while the digital input... well, see *Tech Talk*.

Sound quality

Via the Meridian 200 transport:

Enthusiastic applause greeted this combination, our panel remarking on the piano's substance and attack, its notes rich in harmonic detail while the flute was surrounded by a marvellous sense of space. The bowed bass that introduces *Ei Condor Pasa* now seemed to grumble with weight and energy - ignore at your peril, they thought!

Similarly, the flourish of the harp was clean cut, etched into a soundstage that seemed packed with dynamic contrasts. Turning to Julia Fordham our listeners identified a lone cello which had previously been less distinct, but now appeared bold and authoritative. A great result.

Via the Wadia WT3200 transport:

By way of contrast the *WT3200* encouraged a warm and distinctly inoffensive quality from the *Superlink*, a smoothness that was engaging enough with our flowing classical sequences but tended to 'bloat' the bowed bass, lending a boxy colouration to the music as a whole. A droning quality was also detected on the bass line of Julia Fordham's track.

Via the Teac P-10 transport:

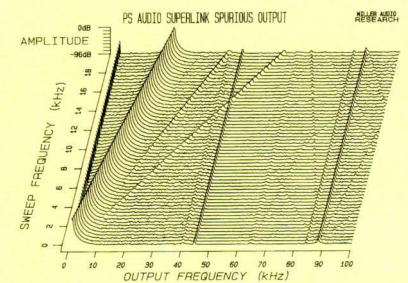
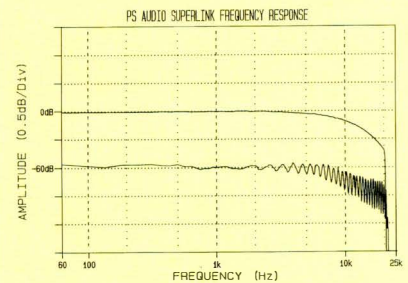
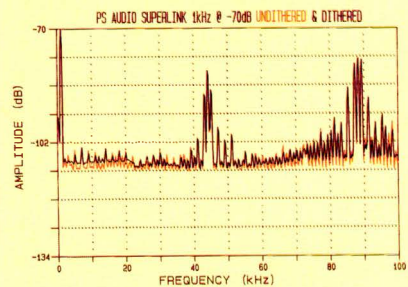
Now things were obviously on the slide with the *Superlink* suffering a messy, 'electronic quality' that brought a nasal or glassy colouration to bear on the strings. This also seemed to veil the piano whose ambience - impressive enough in isolation - was compromised once the flute joined in. Vocals were either pinched, gritty or sibilant, prompting one listener to damn it as a 'strident and jangly mess'. Oh dear.

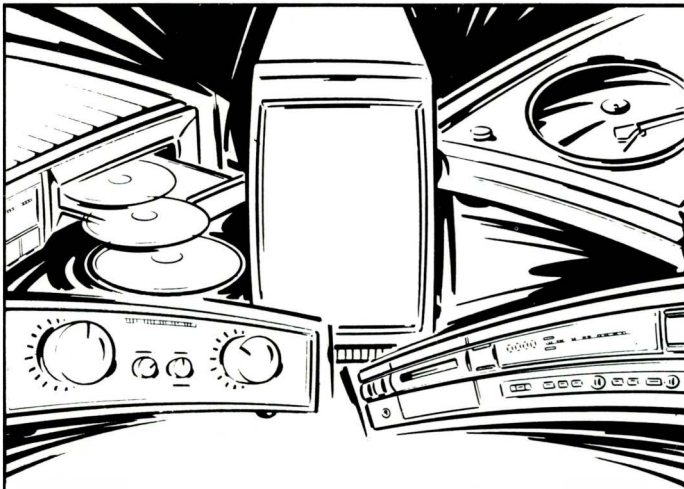
Conclusion

This DAC started off well enough with the Meridian 200 transport, a combination that's well worth pursuing. But problems with the oversampling filter and, more importantly, the configuration of the digital input cast a cloud over any general recommendation.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.03dB	0.04dB	0.03dB
Channel Separation	65.3dB	66.1dB	46.2dB
THD vs Level, 0dB	-90.3dB	-91.0dB	-78.7dB
-30dB	-83.3dB	-75.4dB	-59.1dB
-60dB	-55.7dB	-45.6dB	-27.5dB
-80dB	-27.4dB	-22.9dB	-10.4dB
Dithered, -90dB	-10.4dB	-12.8dB	-9.45dB
Dithered, -100dB		-9.25dB	
Dithered, -110dB		-4.05dB	
Resolution@ -60dB		+0.05dB	+0.39dB
-80dB		+0.23dB	+4.18dB
-90dB		+0.38dB	+9.88dB
-95dB		+1.10dB	+8.80dB
-100dB		+1.65dB	
Peak Output L		3.418V	
Peak Output R		3.407V	
Relative Output Level		+4.64dB	
Output Impedance		<1ohm	
RF Spurious		121MHz @	18.6mV
0.34Hz Noise Modulation			+2.3dB
CCIR IMD, 0dB			-98.4dB
Suppression of stop-band IMD			92.4dB*
De-emphasis Accuracy 1kHz			+0.03dB
5kHz			+0.40dB
16kHz			+0.21dB
S/N Ratio (A-wtd), w emp, 0LSB			94.6dB
w/o emp, 0LSB			94.1dB
w/o emp, 1LSB			94.2dB
Typical Retail Price			£1498





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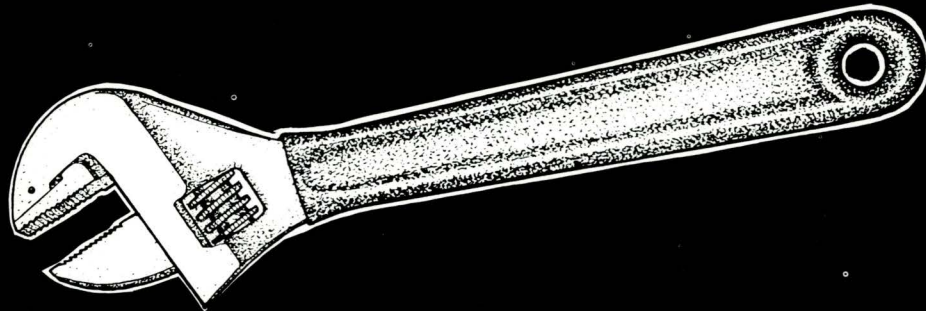
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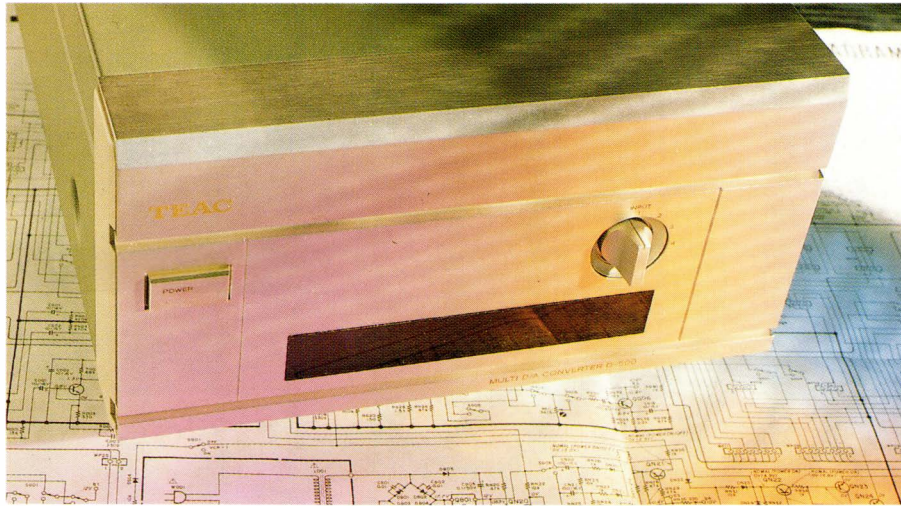
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Teac D-500

Teac (UK) Ltd, 5 Marlin House, The Croxley Centre, Watford, Herts WD1 8YA. Tel: (0923) 225 235



It's not new or even improved, but Teac's *D-500* converter continues to offer great value at the base of their three-strong range. You get a lot of DAC for £400, all wrapped up in an attractive champagne gold case that is designed to match the *P-500* transport. A simple rotary selector is provided on the fascia to accommodate any one of four digital inputs while both digital and fixed analogue outputs bring up the rear.

Inside the case Teac has separated the Yamaha interface chip and NPC oversampling filter from the 'analogue' board which houses a pair of Philips' traditional TDA1541A 16-bit DACs. These are selected 'Crown S1' chips, operated in complementary fashion to squeeze out a 17-bit dynamic range in concert with Teac's own ZDII circuit which is claimed to mask any 'digital harshness'.

Lab report

In practice, however, the effectiveness of Teac's high-level dither (ZDII) is questionable as the 1kHz/70dB plot still shows the usual spray of (red) harmonics due to fixed quantisation errors, even if the dithered input is free of distortion.

At higher frequencies distortion builds up anyway, climbing from 0.001 to 0.07 per cent (see 3D plot) just as the massive increase in THD from 0dB to -30dB is almost solely attributable to third order effects.

Meanwhile the complementary DACs do offer worthwhile improvements in linearity and S/N over single ended TDA1541As - a point in Teac's favour. Furthermore Teac has opted for the same SM5803 eight times oversampling filter as Audio Research, so the peak level stop band pattern is very similar.

Sound quality

Via the Teac *P-10* transport:

Just nudging ahead of the Wadia/Teac combination this duo was praised for its

handling of spatial detail, combining solidly focussed images in the lateral plane with a great sense of stereo depth. The placement of instruments throughout the Prokofiev selection was, to coin a phrase, spot-on. Good stuff so far. Nevertheless, some listeners thought it lacked a little clout at times even though the general balance of the sound was never less than agreeable. Sure, there was also a hint of graininess about Julia Fordham's voice (ZDII where are you?) but the flow and expressiveness of the music bundled across unhindered.

Via the Wadia *WT3200* transport:

Once again a positive reaction was prompted by the fact that our medley of music still sounded very 'interesting'. For instance the string selection now enjoyed a vibrant and expansive sound with good dynamic resolution, yet the metallic harshness so often associated with this track was now removed. A sweet but not particularly heavy sound.

Via the Meridian *200* transport:

In this instance the *D-500* gave the impression of being a very safe sounding piece of equipment, a little soft perhaps but thoroughly inoffensive. It was possible to place individual instruments within the soundstage but, courtesy of a general softness, their exact focus was unclear.

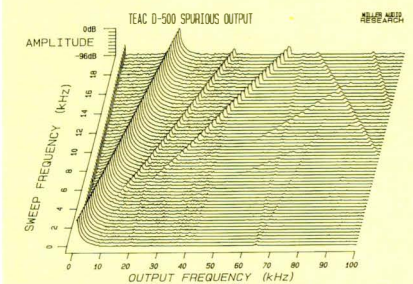
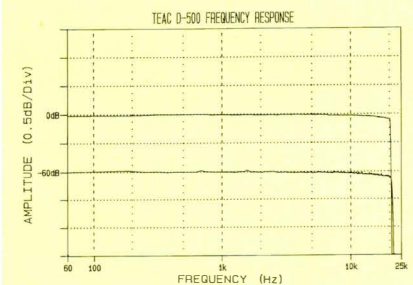
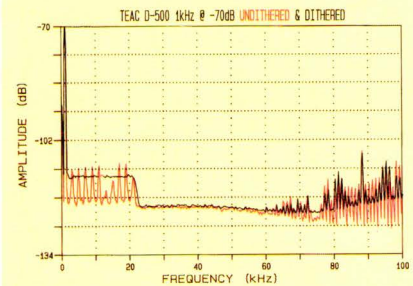
Our central listener thought the sound lacked body and weight and this, in turn, gave it a thinner, brighter appearance. Clean and technically dynamic, they suggested, but lacking allure or soul.

Conclusion

Though nothing should be taken for granted in this business the correlation with Teac's own CD transport was still gratifying and a testimony to the passive 75ohm load - free of interference - offered up by the *D-500*. Hardly innovative then but still darn good value at £400 and a potentially reliable candidate for CD upgrades.

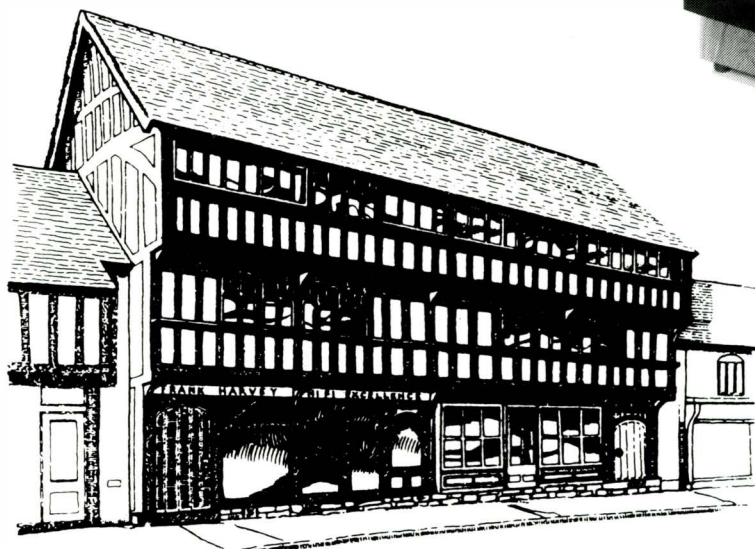
TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.15dB	0.15dB	0.11dB
Channel Separation	140.7dB	130.5dB	125.9dB
THD vs Level, 0dB	-100.9dB	-99.3dB	-62.9dB
	-30dB	-63.9dB	-64.2dB
	-60dB	-57.8dB	-52.8dB
	-80dB	-28.2dB	-35.8dB
	-90dB	-18.0dB	-22.8dB
Dithered,	-100dB	-20.9dB	-28.5dB
Dithered,	-110dB	-13.0dB	
Resolution@	-60dB	-0.01dB	-0.03dB
	-80dB	-0.02dB	-0.08dB
	-90dB	-0.21dB	-0.67dB
	-95dB	+0.02dB	-0.35dB
	-100dB	+0.18dB	
Peak Output L		2.001V	
Peak Output R		1.967V	
Relative Output Level		-0.07dB	
Output Impedance		35.3ohm	
RF Spurious		85MHz @ 23mV	
0.34Hz Noise Modulation			+8.6dB
CCIR IMD, 0dB			-75.2dB
Suppression of stop-band IMD			104.2dB
De-emphasis Accuracy	1kHz		0.00dB
	5kHz		-0.01dB
	16kHz		-0.06dB
S/N Ratio (A-wtd), w emp, 0LSB			110.2dB
	w/o emp, 0LSB		109.8dB
	w/o emp, 1LSB		109.9dB
Typical Retail Price			£399



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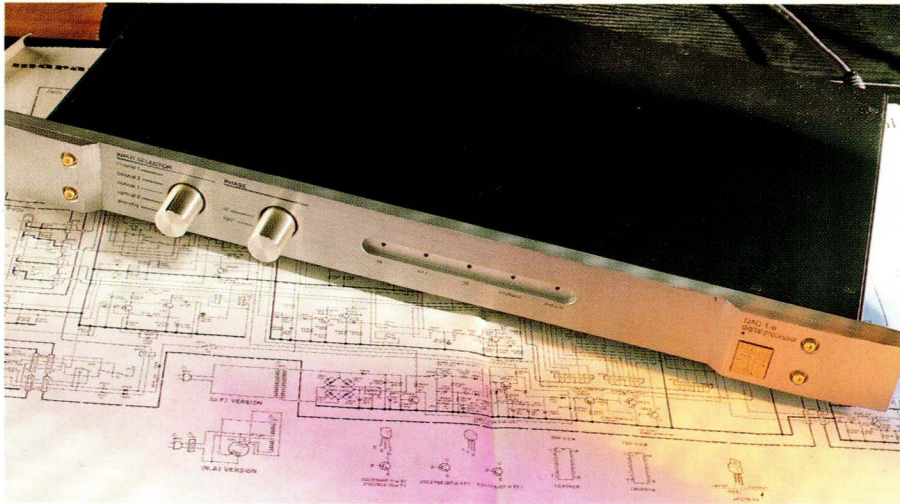
BECAUSE PEOPLE LIKE MUSIC

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Threshold DAC 1/e

Acoustic Energy Ltd, 3A Alexandria Road, Ealing, London W13 0NP. Tel: (081) 840 6305.



Eight DACs in a dual mono, dual parallel, balanced differential topology, declares the blurb that heralds the arrival of Threshold's first outboard converter. Construction and finish is up to Threshold's customary high standards but, even for a US product, it has surpassed itself in the hype department.

The front of this attractive design features rotary controls for the two coaxial and optical inputs in addition to a phase invert facility. Meanwhile, around the back you'll find both phono and balanced (XLR) outputs which are beefed up to over 3V - more than enough to slam any power amp into clipping.

Lab report

Inside, the secrecy continues with paint covering the data acquisition chip and an upgradable resin-cast 'block' that conceals the oversampling/DAC and filtering circuits. But what's the point? Just look at the plots which shout 'MN6476 bitstream DAC', a single chip with on-board 64 times oversampling and eight PWM networks. Compare these with Technics' *SL-PS900* in issue 100.

So its linearity is the best of the group even if the DAC's 'cheat-mode' is exposed on the signal to noise ratio tests. The 103dB figure is the more representative. THD and stop-band noise follow the pattern for Technics' CD player except at high frequencies where Threshold's passive filters have been deferred to 80kHz or so.

The 1kHz/70dB plot indicates that more ultrasonic noise escapes as a result, but this is easily offset (subjectively) by the gentler contouring of the filter itself. I am more concerned by the huge belt of RF noise that accompanies the audio output.

Sound quality

Via the Meridan 200 transport:

'A class act' was the unanimous verdict of our panel who were duly impressed by

the substantial sound of this combination. It underpinned all selections of music with a marvellous sense of scale, a dark acoustic populated with sharp, solid images. Other DACs might seem busier or more superficially detailed, they thought, but the Threshold is simply so much cleaner and natural. No fuss, no bother or grittiness - just involving and expressive music from a combination that was clearly the best of its day.

Via the Wadia WT3200 transport:

This combination was undoubtedly sweeter, with bags of detail that accentuated the 'human' quality of vocals. Bass was a little muddled so the bowed strings that announce *El Condor* were not quite as deep or raunchy as possible while the oboes from Prokofiev's *Classical Symphony* lacked solidity and purpose.

On the other hand the decay and separation of Griffes' piano was well represented, ensuring the entire piece was both involving and compelling. Judging from this the overall reaction was clearly a trifle mixed.

Via the Teac P-10 transport:

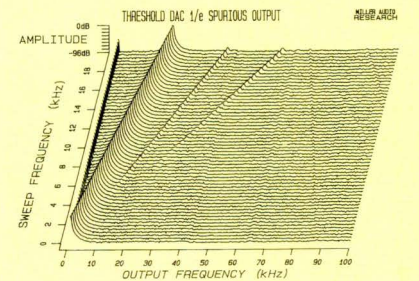
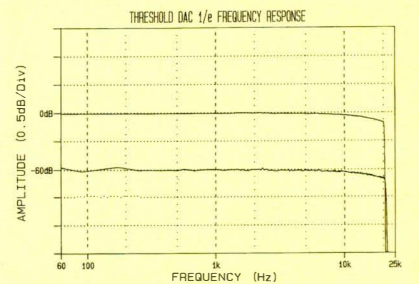
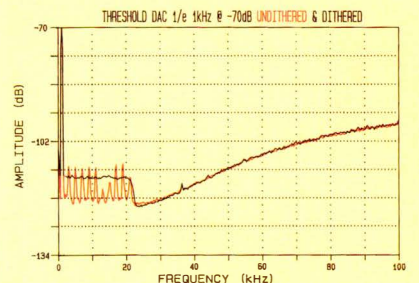
Darker, slower and seemingly unstable in pitch, especially as far as the string section was concerned. Two listeners felt genuinely nauseated through this piece, its amorphous quality eating away at the impact and order of the music. With closing remarks like 'sandy and synthetic' we moved very swiftly on...

Conclusion

I remain unimpressed by Threshold's dressing up of established technology and feel it should give credit where it's due: Technics, in this case. Nevertheless the technical performance of the *DAC 1/e* remains quite superb even if it misses recommendation because, in the words of one listener, 'at £3,000 this should dish out tea and cakes'.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.01dB	0.01dB	0.01dB
Channel Separatio	129.5dB	121.5dB	99.5dB
THD vs Level, 0dB	-90.4dB	-91.2dB	-76.5dB
-30dB	-91.7dB	-82.3dB	-63.1dB
-60dB	-56.1dB	-54.6dB	-34.5dB
-80dB	-27.9dB	-33.1dB	-13.0dB
-90dB	-17.9dB	-22.6dB	-6.90dB
Dithered, -100dB		-14.1dB	
Dithered, -110dB		-11.4dB	
Resolution@ -60dB	0.00dB	0.00dB	-0.00dB
-80dB	0.00dB	0.00dB	-0.10dB
-90dB	-0.45dB	-0.37dB	
-95dB	-0.20dB	-0.20dB	+0.25dB
-100dB		-0.24dB	
Peak Output L	3.153V		
Peak Output R	3.150V		
Relative Output Level	+3.95dB		
Output Impedance	116ohm		
RF Spurious	33.8/101MHz @ 109mV		
0.34Hz Noise Modulation			+7.2dB
CCIR IMD, 0dB			-83.4dB
Suppression of stop-band IMD			105.6dB
De-emphasis Accuracy, 1kHz			+0.02dB
5kHz			+0.06dB
16kHz			-0.12dB
S/N Ratio (A-wtd), w emp, 0LSB			115.8dB
w/oemp, 0LSB			114.5dB
w/oemp, 1LSB			103.2dB
Typical Retail Price			£3,150





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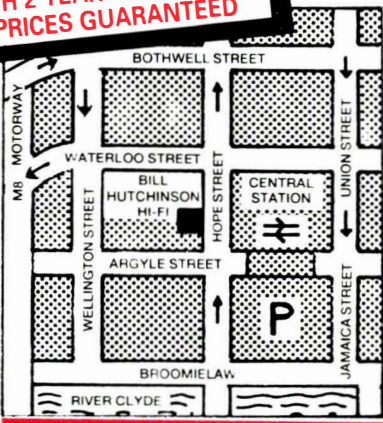
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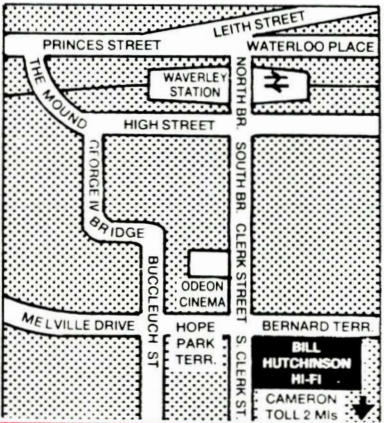


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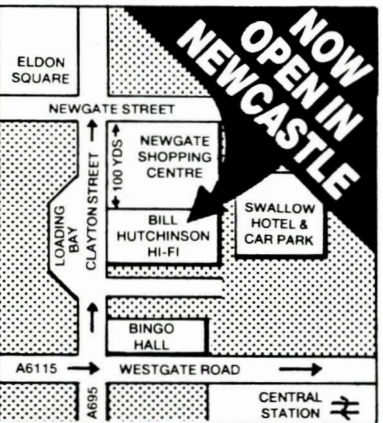
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Conclusions, Best Buys & Recommendations

With this second batch of ten outboard DACs we've now covered a good 90 per cent of what's available, spanning products as affordable as the Kelvin *PDM* at £200 to the Wadia *X64.4* at £5,000 (issue 101). Furthermore, a full range of technologies is represented, including no less than four generations of bitstream and as many variations on the traditional multibit theme.

The listening panel reached some important conclusions, first and foremost being the fact that the least inspiring DACs are not necessarily the least expensive — a trend carried over from our tests of conventional CD players. Fortunately every DAC performed pretty well with at least one of the test transports but, at £3,000 and over, models like the

Paul Miller, our man in the DAC chair, sorts out the best from the rest in this month's survey.

Threshold and Audio Research should have been inspirational.

Threshold's *DAC 1/e* did craft a genuinely expansive sound with Meridian's *200* transport, capturing subtleties easily squashed by others. But with the other transports one listener consistently observed that certain notes were 'oddly out of tune'. Perhaps its unusual input impedance trend (see *Tech Talk*) explains this DAC's sensitivity to different transports.

A bit streamlined

As for the Audio Research *DAC1-20*, it may have clocked up a bunch of technical trophies but, subjectively, it was quickly overtaken by far cheaper models in both blind and sighted listening tests. In the listeners' words it placed 'smack dab in the middle' of the test, being neither offensive nor terribly communicative.

Then we have the PS Audio *Superlink* and Proceed's *PDP2*, two DACs that share many common features in the performance of their digital inputs — just one reason why both DACs give of their best with Meridian's transport. Neither DAC is particularly consistent but, at its best, the PS seems capable of great subtlety while also being able to swell at an instant's notice. Problems? Well, vocal sibilance is not always handled sympathetically but the conviction of its music is still hard to ignore.

By contrast the *PDP2* sounds deeper but also a little bloated. Yet it has a richness or plumminess that's unusually engaging, ensuring that this DAC was a real favourite from the musical standpoint even if its technical presentation was less convincing.

By comparison Audiolab's new *8000DAC* was both technically on the ball and, subjectively, a real hit with Wadia's CD transport. Nevertheless the gloriously expressive, out-of-box sound enjoyed on that occasion was not sustained with the other transports where its 'high resolution' sound failed to rouse the passions of our listeners. This DAC is beautifully

engineered but is also extremely complex, packed to the gunnels with TTL logic including flip-flops, OR- and NAND-gates, two to four-line decoders, data selectors, binary counters, monostables and (puff, puff) Schmitt triggers. This is one noisy electrical environment (see *Tech Talk*).

The contrast with Kelvin's diminutive and featureless *PDM* DAC could not be greater. This is Bit Stream technology stripped to the bone, but it's both surprisingly successful and inherently reliable. It can easily sound tailored, rolled-off at both frequency extremes and lacking in detail, but responds favourably to up-beat material that injects a little life into its sober performance.

A bit stream of consciousness

If you're about to abandon a dusty old CD player (equipped with a coaxial digital output) then try upgrading with Kelvin's DAC before spending £200 or more on an entirely new machine. Try before you buy and you might just save yourself a lot of cash.

Twice the asking price of the Kelvin brings you vast improvements in style and construction with Teac's longstanding *D-500*. Technically unusual but, once again, pleasantly successful with a sound that's smooth and easy going rather than astringent or overtly dynamic. This is one DAC that's likely to give reliable and repeatable results with a wide range of different CD players and for this alone Teac has earned itself a Recommendation.

From an unusual multibit application we move on to three DAC7 models, convertors armed with the pinnacle of Philips' Bit Stream technology. Forte's *Model 50* is from the Threshold camp where secrecy is a watchword. Hokum aside, the *Model 50* turned in a sterling performance with both Teac and Wadia transports, combining a decent sense of scale with a warmth that pervaded the entire soundstage. This DAC is gently coloured, undemanding yet thoroughly beguiling. Tonally it's poles apart from Deltec's DAC7 offerings which are better suited to those of you who prefer a faster, tighter and more transparent sound.

While the costlier *PDM1 Series 3* missed Recommendation, the *Bigger Bit* continued to score with its blend of composure, power and realism. The *Bigger Bit* enabled the piano to sound confident and very positive while promoting a very relaxed feel to the music. The *PDM1 Series 3* was able to reproduce a similarly big picture with both Teac and Meridian transports, yet was deemed more intrusive and less comfortable with the most up-beat recordings.

All this suggests that the current *PDM1* is no cut-price *PDM2* nor, indeed, a worthwhile upgrade on the cheaper DAC7 *Bigger Bit*. This was confirmed by a final series of 'sighted' A/B listening tests, including one between the two Deltec convertors. On this occasion the panel agreed that — with the Teac *P-10*, at least — the subjective differences between the two DACs were too small to justify the difference in price, especially when two *Power Filters* are added onto the bill. The *Bigger Bit* continues to set the pace for DACs below £1,000.

Tech Talk

Like a conventional CD player, these DACs are supposed to adhere to a nominal 2V output, though some manufacturers will hike this up to 3V or more to give them several dBs edge in A/B listening tests. For our auditioning the final voltage level reaching the speakers was adjusted for each and every DAC, ensuring that the sound level was consistent from product to product — a degree of diligence peculiar to *Choice* reviews. So, although our listeners still felt some DACs were 'louder' or 'quieter' than the norm, these were genuine observations relating to balance and presentation rather than absolute level.

In common with the CD player tests, I've provided running totals of distortion vs frequency from 0dB (peak level) to -90dB. The CD format uses a uniform quantisation scheme so the lowest distortion is

All hands on DAC. Paul Miller explains the lab test procedures and the results in part two of our digital to analogue survey.

achieved with the highest (loudest) signal level where more, or all, of the 65536 quantisation values are engaged. At lower levels there are progressively fewer quantisation values, or steps, available to describe the amplitude of each sample so an error begins to build up which, in turn, increases distortion. You'll also notice that distortion mounts up faster at 20kHz, particularly with bitstream convertors where their ultrasonic noise climbs away from the audioband.

This effect can be seen on the plots of 1kHz @ -70dB which also allow you to compare any improvement in performance with a dithered (black trace) rather than undithered (red trace) 1kHz tone. Dither is usually introduced as a Gaussian or Triangular noise which has the effect of re-randomising the fixed and predictable quantisation errors that accompany low-level signals. So, not only do ADCs (Analogue to Digital Convertors) require dither when recording but so do many quantisers used by oversampling filters and noise-shapers in both multibit and bitstream DACs.

Take a look at the plot for Audio Research's *DAC1-20* or the Teac *D-500*. Here the red trace shows a characteristic sequence of odd harmonics that are linked to quantisation errors in the digital coding of the -70dB signal. Yet when dither is introduced (black trace) this fixed error is 'smeared' and so appears as a slight increase in noise rather than harmonics. Most music discs are dithered these days so the trade-off between noise and distortion is well worth having, especially as it concerns quiet, subtle musical detail that can make or break a performance. Not all the DACs, by any means, proved to be entirely successful in this regard.

Noise modulation (see issue 100) is also a reflection of quantisation errors, errors that accumulate as noise covering the entire audio band. It's a type of distortion that's generated by any unevenness in the value of the 65536 quantisation 'steps' or, failing this, by 'jitter' (an uncertainty in the timing of the digital transitions). I've previously used a 1Hz tone to excite

noise modulation, forcing the DAC to move through just three LSBs per sample period.

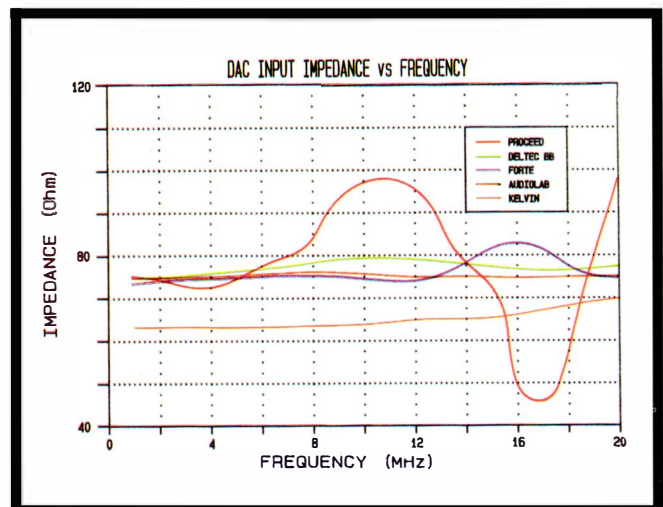
Now, however, I am using a 0.34Hz signal which means the DAC must go up or down just one of the 65536 steps (LSBs) in each 44.1kHz sample period. Any difference in the magnitude of these LSBs transpires as an increase in background noise, but a figure alone tells only part of the story. Just look at the third octave plots showing the noise modulation suffered by Audio Research's *DAC1-20* (+10.5dB) and Deltec's *Bigger Bit* (+12.4dB). Numerically both are pretty poor yet the traces show that where the ear is most sensitive, through the critical midband, the *Bigger Bit* is almost devoid of any extra noise. Therefore the subjective influence of this noise is likely to be quite different from DAC to DAC.

The sheer fact that all the DAC7 units showed a high noise mod figure is unusual in itself. With a 1Hz input the value falls to +1 to +2dB, the sort of figure you'd expect from a highly monotonic bitstream convertor. But with a 0.34Hz input this figure shoots through the roof, implying an instability in the DAC7 Bit Convertor itself (the TDA1547). How about it, Philips?

This brings us to a commonly overlooked yet potentially crucial specification: the impedance trend of the coaxial digital input. This is something we touched upon in our CD transport survey (issue 96) as we wrestled with the relative compatibility of digital outputs and digital inputs. We've already mentioned that the serial datastream passing from transport to DAC must adhere to the S/PDIF standard, appearing as blocks of 384 32-bit words.

This data is transmitted at 2.8224Mbits/sec, a very high frequency which is firmly in the RF (Radio Frequency) spectrum. So, like any RF signal, for this data to be transmitted most efficiently the characteristic impedance of transmitter (digital output), receiver (digital input) and connecting cable must all be matched. In this instance the impedance is 75ohm, so you'll find that most decent well shielded 75ohm coaxial FM downloads make great digital interconnects.

However, cast an eye over the two multi-colour impedance plots and it's easy to see that not all DACs offer a consistent 75ohm input impedance over their



working 500kHz-20MHz range. The Kelvin DAC (orange, graph 1) hovers between 63-70ohm, a value that doesn't present the mismatch of either the Meridian 203/606 or Micromega Duo (issue 101), but is sufficient to reflect about 15-16 per cent of the original signal, setting up standing waves within the cable.

Meanwhile Kelvin also transformer-couples the digital input via a ferrite 'balun' to help suppress extraneous noise, but this also has the effect of slowing the risetime of the digital transitions. Hence the good showing with Wadia's WT3200, the transport with the fastest output risetime. It's important to appreciate that while no data is 'lost' by this mismatch, the knock-on effects of RF noise, reflected signals and decreased edge definition may well contribute to digital jitter within the convertor itself, transformer-coupled or not.

Only after it's run the gauntlet of a mis-matched line does the data reach the ADIC (Audio Digital Input Circuit) housed within the convertor. The ADIC recovers the clock signal buried within this serial datastream before demodulating the signal to reveal the three parallel lines of data, clock and word select (L or R). This is necessary to return to the inter-chip standard called I2S, but it's just another process that can contribute to jitter.

Back to the digital inputs. Threshold's DAC 1/e employs an active input designed to accelerate the risetime of incoming digital 'edges', thereby sharpening the transition point and (theoretically) reducing jitter. Nevertheless this is an extreme measure as its impedance rises from 33ohm at 500kHz to 77ohms at 2.2MHz (mauve, graph 2), a rapid increase that stimulates both overshoot and ringing with a CD transport like the Wadia whose line-driver output has a naturally fast risetime. So perhaps it's not surprising we got our best results with the Meridian 200, whose digital output has been designed to work into a climbing impedance. The dotted trace is a measure of the residual 'passive' impedance once the DAC is switched off, by the way.

This same explanation holds for the PS Audio Superlink (red, graph 2) and, particularly, the Proceed PDP2 (red, graph 1). PS Audio uses a trusty YM3623 interface chip to access incoming data though it's none too discriminating, the Superlink locking onto any RF signal in the 4-20MHz range while activating the copyguard LED from 1-16MHz! This is because the phase locked loop within the Yamaha interface chip will track almost any input up to 20MHz. Meanwhile PS Audio has connected its 'passive' 75ohm input resistor via an active Schmitt trigger to maintain the integrity of incoming digital transitions. Nevertheless interference caused by feedback between the input and output of the TTL device contributes to extra RF hash visible on the incoming data.

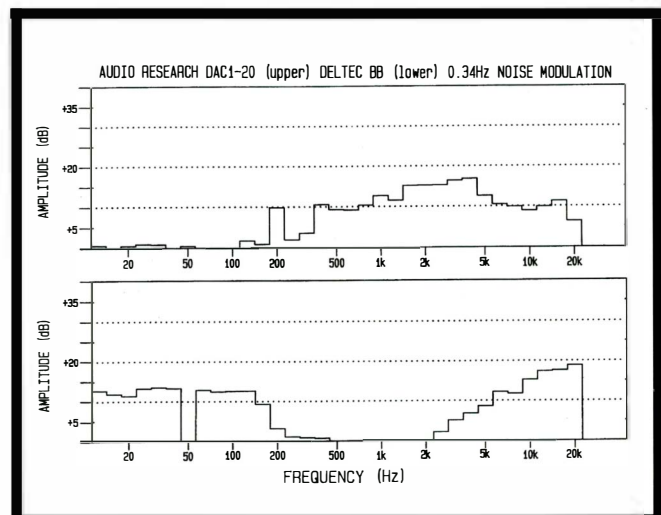
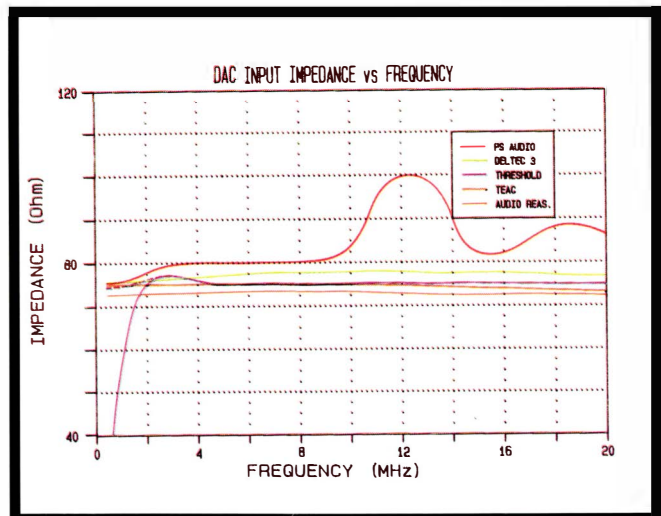
Madrigal also uses Schmitt triggers to clean up the data from its transformer-coupled digital inputs and, lo and behold, the Proceed PDP2 exhibited many of the problems of the Superlink. Transformer coupling will reduce incidences of static discharge failure but will also slow the risetime of digital edges (see CD transports in issue 96). Once more, the Proceed's digital input locks onto any RF signal between 500kHz-8MHz, identifying a nominal 44kHz sampling rate,

while RF inputs above 17MHz are identified as 32kHz sampling.

The various resonances that contribute to the deviating impedance of both Proceed and PS Audio DACs and, to an extent, the Forte Model 50 (mauve, graph 1) are readily observed on the waveshape of the incoming data; once again, see our report on CD transports (issue 96).

Teac's D-500 (brown, graph 2) adheres most closely to the 75ohm standard, followed by the Audiolab 8000DAC (brown, graph 1), the two Deltec convertors (green, graphs 1&2) and the Audio Research DAC1-20 (orange, graph 2). These are the DACs that should give the most consistent and reliable performance with an arbitrary choice of digital output. Nevertheless even the 8000DAC was compromised by low-level RF interference on the digital input (which locked at 1MHz and 5MHz), possibly a through-put from the hordes of TTL devices lurking within.

Consequently even if two digital outputs both have the same characteristic impedance (75ohm), the same voltage level (500mV) and the same risetime they may still react differently with these 'reliable' DACs depending on the amount of jitter caught in between. As I've said before, even when dealing with 1s and 0s, nothing can ever be taken for granted.



Choice Offers

Our Mail Order Section this month features, amongst the old favourites such as Furakawa interconnects, some great new accessories to help improve the performance of your system. We've been reviewing some new and interesting products and have selected some that we thought you should know about.

Goldring Magic Record Cleaner

This is a kit consisting of a double sided velvet brush and spray on Goldring Magic record rejuvenating fluid. Unlike some other record cleaning potions this one makes old grubby records sound smoother and less gritty, reducing surface noise quite significantly. For best results use with the mk10 brush.

£11.95 ref: **A13**

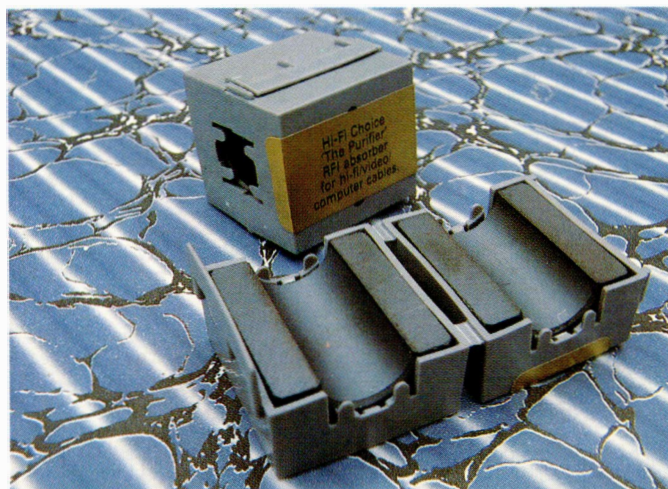
The Purifier

The Purifier is a ferrite cable clamp designed to reduce RF induced noise in audio, video and computer systems. The clamps will accept single or multiple cables of up to half an inch in diameter and can be used on both signal and mains cables. The main benefit is a general cleansing of a system's sound allowing finer resolution of low level detail. They can be particularly beneficial for digital interconnections.

Price £16.90 per pair ref: **A14**

Nagaoka Anti-Static Record Sleeves no.102

Packs of 50 plastic record sleeves that can be used on their own or inserted into an existing card or paper sleeve. They keep records dust free and eliminate static, but are of course hampered if the record isn't cleaned before it's stored. No great



sound quality claims but in these days of disappearing vinyl it pays to take care of what precious vinyl you've got, after all there may never be a format to beat it!

£6.99 ref: **A15**

Mk 10 Carbon Fibre Brush with Velvet Pad

The carbon fibres efficiently remove dirt from the record grooves, which is then collected by an integral felt pad. This can be easily cleaned with the supplied tool after use.

£9.99 ref: **A8**

Monotrack Support Cones

Supplied in packs of four, these

turned steel support cones are ideal for supporting just about any item of hi-fi, from subwoofers through to amplifiers. The cones provide effective isolation and de-coupling at a bargain price.

£8.00 ref: **A12**

System Cleaning Kit 1

Everything needed for maintaining a hi-fi system, all contained in one handsome wallet pack. Stylus cleaner, auto reverse wet tape head cleaner and cleaning fluid, manual CD cleaner and cleaning fluid and a carbon fibre record cleaning brush.

£15.99 ref: **A9**



Interconnects

We have a variety of interconnects on offer, all sourced from the respected Japanese specialist Furakawa.

The FA21 Series balanced analogue interconnect cables

The *FA21 Series* of analogue interconnects is supplied in matched pairs employing the Furakawa all PCOCC RCA plug with a flying earth or ground lead which is designed to be terminated to the ground tag of the source component for the purpose of transmitting a balanced signal with a totally separate ground path.

These interconnect cables are recommended for the connection of analogue devices where RCA sockets are provided, such as power amplifier to preamp and tape deck, turntable, step-up transformer etc to a preamp or integrated amplifier. They can introduce a wide stereo image with good depth and height.

Furakawa FA11S Series balanced analogue interconnect cables

The *FA11S Series* of analogue interconnects is supplied in matched pairs employing the Furakawa hermetically sealed all PCOCC RCA phono plug with a flying earth or ground lead.

These interconnect cables are recommended for the connection of high quality analogue devices.

The cable's ability to transmit a vast amount of information has the effect of creating an awe inspiring bass, transparent mid range and simply superb unfettered treble.

Improve the sound of your system for a mere £15

Ever wondered why some people get taken seriously in hi-fi shops while others are given the run around? Wonder no more. The answer to all your hi-fi problems is the *Hi-Fi Choice* sweatshirt. Tastefully printed in red and black on grey, as well as being this year's most crucial fashion accessory, it will also readily identify you as a reader of Britain's fastest growing hi-fi magazine. You'll almost certainly be taken more seriously and end up with a better system – and all for a mere £15. We can supply the shirts in two different sizes – Large and Extra Large.



Order Form

Speaker Cables

Furukawa FS-2T14 PCOCC speaker cable

FS-2T14 PCOCC speaker cable is Furukawa's entry level speaker cable consisting of two 1.4mm square drawn PCOCC concentric strands.

Furukawa FS-2F09 PCOCC speaker cable

Two 0.09mm square drawn PCOCC strands are contained in a neat, flat, flexible PVC insulation.

The FS-2F09 is highly regarded by audiophiles around the world.

Furukawa FS-2T30F Evencap speaker cable

PCOCC speaker cable consisting of two 3mm square drawn PCOCC rope lay strands. FS-2T30F speaker cable, by virtue of its low resistance and 3mm section, increases the audible bandwidth, most particularly in the low frequencies.

FS-2T20P PCOCC speaker cable

PCOCC cable consisting of two twisted 2mm² drawn PCOCC strands laid in a concentric pattern.

The two conductors are insulated in polypropylene and contained in a circular outer sleeve of soft PVC.



Furukawa FS-2T35P PCOCC speaker cable

Produced from six concentric laid conductors in a rope lay this large cable has a low DC resistance and a larger occupation area for the skin effect, therefore bass is larger and treble is even sweeter.

Furukawa FS2T55F Evencap speaker cable

FS2T55F is a 5.5mm 2 rope lay cable of similar construction to the FS2T30F.

Furukawa Price Table

Please circle the cables you require.

Interconnects

	0.5m	1.0m	1.5m	2.0m
FV11 (each) RCA-RCA	42.50	45.50	52.50	57.50
FD11 (pair) RCA - RCA	75.00	85.00	95.00	NA
FA21 (pair) RCA-RCA	NA	95.00	105.00	NA
FD11S (pair) RCA-RCA	NA	220.00	NA	NA

Fibre optics

FO11 (each) TOSLINK	NA	37.50	42.50	NA
FO12 (each) TOSLINK	NA	90.00	100.00	NA
FO13 (each) TOSLINK	NA	105.00	120.00	NA

Speaker cables

Please state termination required, solderless, gold plated banana plugs, spades or pins or any combination. All prices are per pair.

	FS2T14	FS2F09	FS2T20P	FS2T30F	FS2T35P	FS2T55P	FS2T15
1.0m	38.00	37.00	44.00	53.00	56.00	74.00	129.00
1.5m	42.50	41.00	51.50	65.00	69.50	96.50	179.00
2.0m	47.00	45.00	59.00	77.00	83.00	119.00	229.00
2.5m	51.50	49.00	66.50	89.00	96.50	141.50	279.00
3.0m	56.00	53.00	74.00	101.00	110.00	164.00	329.00
3.5m	60.50	57.00	81.50	113.00	123.50	186.50	379.00
4.0m	65.00	61.00	89.00	125.00	137.00	209.00	429.00
4.5m	69.50	65.00	96.50	137.00	150.50	231.50	479.00
5.0m	74.00	69.00	104.00	149.00	164.00	254.00	529.00
6.0m	83.00	77.00	119.00	173.00	191.00	299.00	629.00
7.0m	92.00	85.00	134.00	197.00	218.00	344.00	729.00
8.0m	101.00	93.00	149.00	221.00	245.00	389.00	829.00
9.0m	110.00	101.00	164.00	245.00	272.00	434.00	929.00
10.0m	119.00	109.00	179.00	269.00	299.00	479.00	1029.00

Cleaning Accessories

Please indicate which items you require by ticking the appropriate box.

- | | |
|--|---|
| <input type="checkbox"/> A8 Mk 10 Carbon Fibre Brush with Velvet Pad £9.99 | <input type="checkbox"/> A13 Goldring Magic Record Cleaner £11.95 |
| <input type="checkbox"/> A9 System Hi-Fi Cleaning Kit 1 £15.99 | <input type="checkbox"/> A14 The Purifier £16.90 |
| <input type="checkbox"/> A12 Monotrac Support Cones £8.00 | <input type="checkbox"/> A15 Anti-Static Record Sleeves £6.99 |

- Yes! Please send me Hi-Fi Choice sweatshirts at a mere £14.99 each. Please tick size required** Large XLarge

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Audiophile Recordings

We are pleased to be able to offer a selection of records from the world famous Reference label. Guaranteed to get the very best from your system these recordings have been selected for the merits of the performance as well as their outstanding sound quality.

Prof Johnson's Astounding

Sound Show: Sampler. Orchestral Fanfare - Red Norvo Quintet - Cal Arts Ensemble - Richard Morris - Organ - Susan Mc Donald, Harp - Kronos Quartet - David Rosenthal, Tubulong.

A perennial audiophile favourite, this sampler of Prof Johnson's early work shows what Reference can do with a wide variety of musical and sonic experiences.

Includes the only known recording of an unusual tuned mallet instrument, the Tubulong. Guaranteed to give your playback system a royal wringing out!

Kronos Quartet: In Formation. *The funky chicken - Remember - Blues - When - Enantiadromia - Joan's Blue - Wind on my back - The Junk food blues - Dark razz*

Ever heard a quartet play the blues? Kronos, celebrated exponents of 20th Century masterpieces have another side, represented by this collection of lighthearted tuneful scores, all written specially for the group.

Recorded in St Mary's Cathedral, San Francisco, for an unusual, highly effective soundstage.

Copland: Appalachian Spring Suite, Eight poems by Emily Dickinson. Keith Clark/Pacific Symphony Orchestra, Marni Nixon, Soprano (in the poems).

Music by America's best loved composer, *The Appalachian Spring Suite* is presented in its original version for 13 instruments. Also included is the world premiere recording of Copland's orchestration of eight of his Emily Dickinson songs.

This recording was a Grammy Award nominee in 1987. The CD version also contains *An Outdoor Overture*.

Walker & Garson: Reflections. *Portrait of a friend - Love - First song - Ethereal - Yearnings - Pied piper - The park - Magic spell - You're one of a kind - Reflections - Reason.*

Jim Walker on flute and Mike Garson on piano from the jazz group 'Free Flight' offer something peaceful and soothing for those quiet moments. Surpassingly natural sound.

Helicon Ensemble: Vivaldi/Bach Vivaldi: Sinfonia in C-Trio Sonata in G minor - Double Concerto in E-Flat. Bach: Trio Sonata in C - Double Concerto in D minor. (Compact Disc also contains *Prelude in C*)

Albert Fuller conducts from the harpsichord a varied original instrument ensemble in works featuring two solo violins, including the great *Double Concerto* by Bach and three rare, ingratiating works by Vivaldi.

Featured solo artists are Japp Schroeder, Stanley Richie and Linda Quan.

Recorded at the John Harmes Centre for the Performing Arts in Englewood, New Jersey. CD also has Bach's *Prelude in C*.

Walton: Facade Suite. Walton: Facade Suite - Strauss/Hasnohrl: Till Eulenspiegel - Scriabin/Elliott: Waltz in A-Flat - Nielsen: Serenata in Vano. Chicago Pro Musica.

An instrumental from Walton's whimsical *Facade* in the composer's original scoring makes a perfect vehicle for these brilliant musicians. A chamber version of *Till Eulenspiegel* and the seldom heard pieces of Scriabin and Nielsen complete this engaging programme.

Tafel Music: Popular Masterworks of the Baroque. Pachelbel: Canon & Gigue. Handel: suite from 'Water Music' Purcell: air from Suite no. 3 in D and Suite from 'The Moor's Revenge'. Vivaldi: Concerto op. 10-2, 'La Notte'.

Canada's finest original-instrument Baroque ensemble plays familiar favourites with outstanding scholarship and musical panache. Note the Pachelbel *Canon* with its seldom-heard companion piece, both to the composer's instrumentation. Strings, oboes, recorder and harpsichord offer delightful music recorded in a vaulted ceiling stone church.

Stravinsky: L'Histoire. Stravinsky: L'Histoire du soldat suite. Blackwood: Capriccio Espagnol. Chicago Pro Musica.

Stravinsky's landmark composition for a mixed ensemble of seven. Grammy winning performances.

Catingub & Rivers: Your Friendly Neighbourhood Big Band. Don't be that way - Honeysuckle rose - Bloozball - Work song - Easy living - You leave me breathless.

Current concert jazz with vocalist Mavis Rivers and her son Matt Catingub's cooking 20 piece ensemble.

Dancehall ambience, realistic balances, and Prof Johnson's patented punch give big band lovers the thrill of the real thing. CD contains two extra tracks.

Respighi: Church Windows. Keith Clark, Pacific Symphony Orchestra.

This grandiose work, scored for full symphony orchestra, pipe organ and tam-tam, has at last been given its due, musically and sonically, in this celebrated recording. *Church Windows* quite literally pushes to the theoretical limit the dynamic range it is possible to reproduce at home.

The CD also contains Respighi's rare mini concerto *Poema Autunnale* with the violinist Ruggiero Ricci.

Marni Nixon: Marni Nixon sings Gershwin. Summertime - Let's call the whole thing off - Someone to watch over me - I've got a crush on you - But not for me - The real American folk song - Nice work if you can get it - Embraceable you.

Marni Nixon's impeccable intonation and diction bring a welcome elegance to these songs which are perhaps too often jazzed up. By beautifully singing what Gershwin wrote, stylishly accompanied by 'Lincoln Mayorga' piano, Miss Nixon brings new insights to these immortal songs.

Eileen Farrell: Torch Songs. Stormy weather - Round Midnight - The end of a love affair - Black coffee - When your lover has gone - Don't explain - Something Cool - and more.

The album Farrell fans have been waiting for. America's great blues diva makes these songs of lost love her own.

Smoky night club arrangements set the stage for some unforgettable singing.

Dick Hyam: Dick Hyam Plays Fats Waller. Ain't misbehavin' - Keepin' out of mischief now - African ripples - Honeysuckle rose - Willow tree - Stealin' apples - I've got a feeling I'm falling - Handful of keys - My fate is in your hands - Jitterbug waltz - Squeeze me.

The world's first direct-to-CD on RR-33DCD. A technological and musical triumph, a true landmark in recording history. RR-33DCD (listed as Ref CD87 on the order form) is available as a deluxe numbered limited edition.

Encoded on the highly sophisticated, computerised Boesendorfer reproducing piano, Hyman's performances were played back for Prof Johnson's microphones, and the digitised signal was transmitted via microwave to the compact disc master as the music was being played.

No recording tape of any kind was used, nor was the digital bitstream corrupted at any stage by copying manipulation or editing.

The digits generated at the recording session are the very digits on the finished compact disc.

Also on ordinary CD and LP.

Michael Garson: Serendipity. Lady - Autumn leaves - I should care - Spirit of play - Trio blues - My romance

With illustrious sidemen Stanley Clarke (bass), Gary Herbig (sax), Peter Sparague (guitar) and fellow Free Flight members Jim Walker and Jim Lacey, Michael Garson has put together a tasty program of exciting mainstream acoustic jazz. Recorded by Prof Johnson in a real concert space, *Serendipity* represents an alternative, non-studio approach to jazz recording. A long standing favourite for audio demo, the CD contains two extra tracks.

Star of Wonder. Silent night - Nativity carol - We three kings - We'll Dress the house - Come all ye faithful - Deck the hall -

Festive music for the holiday season by an outstanding professional chorus, recorded in San Francisco's St Ignatius Church.

The spine tingling acoustics are ideal for this program and *Star of Wonder* contains the full range of Christmas music: imaginative arrangements of traditional carols, renaissance motets and dramatic 20th century compositions.

The CD contains three extra tracks.

Berlioz: *Fantastique. Symphonie Fantastique.* Varujan Kojian, The Utah Symphony Orchestra.

This is widely considered to be the recording of this magical work. The Utah Symphony Orchestra, playing in Salt Lake City's Symphonic Hall, gives world class performance, and the excellent recording captures it in its entirety.

The CD contains two versions of the explosive finale, one with standard orchestral bells, and another with digitally recorded church bells.

The 2-disc 45RPM LP set contains two copies of *March To The Scaffold* and *Dreams Of A Witches Sabbath*.

Nojima: *Nojima plays Liszt. Sonata in B minor - Mephisto Waltz - La Campanella - Harmonies du Soir - Feux Follets.*

The recipient of more rave reviews than any piano recording in recent memory, this is truly one for the history books.

Japan's most celebrated concert pianist won the Silver Medal at the Van Cliburn competition.

Connoisseurs of great piano playing will treasure this recording, which has also been acclaimed for its outstanding sonic realism.

Blazing Redheads: *Paradise drive - Sea Level - February song - Get down (and stay down) - Final segment - My Picasso - Santa Fe - Mozambo.*

The Blazing Redheads play their own special blend of Latin flavoured jazz - 'funky with a dash of salsa'. The seven woman combo plays alto and tenor sax, flute, harmonica, keyboards, bass drums and a lot of percussion.

The Blazing Redheads perform live in packed clubs on tour and in San Francisco.

This vivid live-to-two-track studio job was engineered by Paul Stubblebine and Prof Johnson. The CD contains two extra tracks.

Chicago Pro Musica: *Weill, Varese, Bowles and Martinu. Threepenny Opera suite - Octandre - Music for a farce - La Revue de Cuisine.*

Chicago Pro Musica gives brilliant performances of four magnificent 20th Century works. Kurt Weill's pungent suite for wind, brass and percussion is the centrepiece.

Featuring the first stereo recording of a rare piece by Paul Bowles, best known as the author of *The Sheltering Sky* but also a distinguished composer for the stage.

Martinu's Parisian ballet from the 1920s contains the steamiest of tangos and a mad Charleston.

Eileen Farrell: *Rogers & Hart. I could write a book - I wish I were in love again - Wait till I see him - I didn't know what time it was - Love me tonight - Nobody's heart - It never entered my mind - Mountain greenery - Sing for your supper - Can't you*

do a friend a favour - Lover - My heart stood still - Little girl blue - You're nearer.

A wide ranging survey including many great standards and more than a few rarities. Farrell's affinity for the songs of this era is undisputed.

Beautifully sung as her earlier pop recordings were, these new performances reveal an added dimension to the Farrell art - total involvement with the lyrics. And what lyrics! A must for admirers of Lorenz Hart.

Nojima: *Nojima Plays Ravel.*

Miroirs: Noctuelles - Oiseaux tristes - Une baroque sur l'océan - Alborada del gracioso - La valse des cloches - Gaspard de la Nuit: Odine - Le gibet - Scarbo.

Here is the eagerly awaited sequel to Nojima's first American recording, featuring some of his most renowned specialities.

Gaspard de la Nuit is the pianist's Everest, attempted by only a few. *The Miroirs* are a distillation of Ravel's impressionist style, requiring a totally different technique.

The Nojima performances are incandescent.

Order Form

Record and CD Price Table

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Star of wonder:

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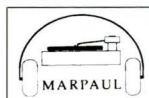
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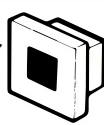


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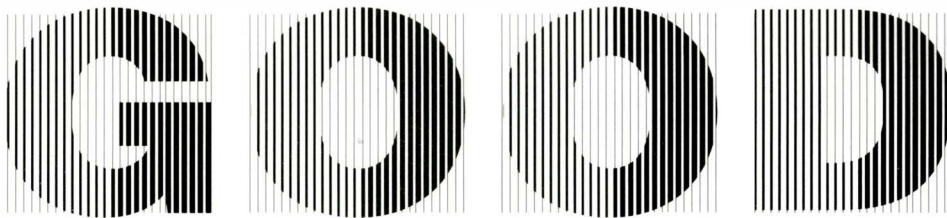
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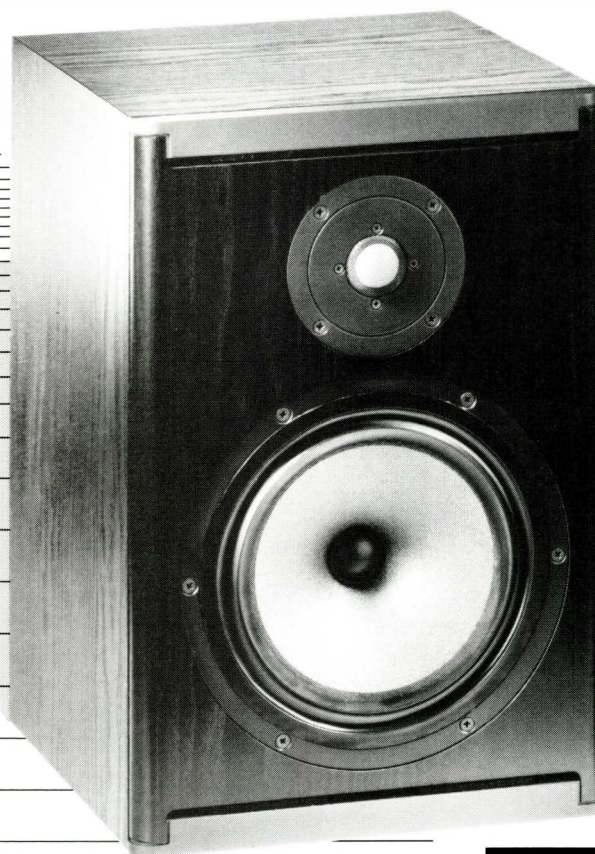




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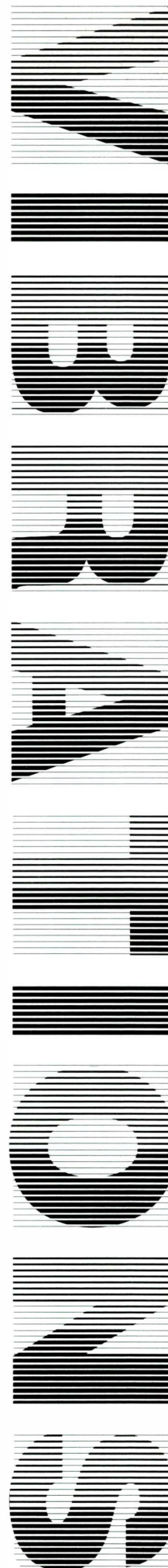


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WHARFEDALE



Glossary

The Hi-Fi Choice dictionary of audio terminology, explaining all the weird and wonderful adjectives used by our reviewers, as well as technical abbreviations.

AM: Amplitude modulated — see 'Medium Wave'.

Acoustic breakthrough: Sound that gets into the turntable and hence the cartridge from the air and thereby creates a risk of acoustic feedback.

Acoustic feedback: If any sound in the room can find its way through the body of the record deck to the cartridge stylus, then that sound will be reproduced from the loudspeakers, along with the desired programme material. If too much of this sound from the loudspeakers is picked up by the cartridge in this way then a vicious circle of acoustic feedback will be created.

Active: Speaker systems which contain electronic crossovers and where the drive units are connected directly to power amplifiers.

Alignment protractor: A device used to minimise the lateral tracking error of a cartridge/arm combination.

Amplitude: Size or magnitude; hence the amplitude/frequency response, known normally simply as the frequency response, which describes the relative loudness of the system at different frequencies with a constant input voltage.

Anechoic: Without echo — a special room or 'chamber' with thick sound absorbing materials on all surfaces to prevent reflections.

Arm mass: More accurately called effective arm mass, because it is not the weight of the arm on a pair of scales. It is the mass of the arm and cartridge combination that appears to be concentrated at, and thus felt by, the stylus tip which is tracking a record groove. There is nothing inherently good or bad about arms with light or heavy effective mass; what matters is the manner and choice of their combination with cartridges of different compliance and the low frequency resonance produced by such combination.

Azimuth: With reference to tape and cassette recorders, the alignment of head gap to tape path.

Balance: 1) The overall relative loudness perceived at different frequencies (eg bass treble); 2) the accuracy of the match between the two channels of a stereo transducer (eg cartridge or pair of loudspeakers).

Bandwidth: A range of frequencies with presumed defined upper and lower limits.

Bass: Lower part of the frequency spectrum.

Belt drive: The turntable motor has its rotational speed geared down to the required platter speed (33 1/3rpm for

LP discs) by a rubber or similar resilient belt which runs round a small pulley on the motor shaft and a large pulley attached to or part of the platter.

Bias: (turntable/arms) Because the cartridge on a pivotal arm is being drawn across the record surface by the stylus tracking at an angle offset from the pivot, groove friction produces an imbalance of lateral force. Bias is the application of a compensatory lateral force acting in the opposite direction.

Bias: (tape) This refers to a high frequency current passing through the record head which allows the audio current also passing through the head to produce reasonably linear magnetisation of the tape at all levels permitted by the combination of each machine with the tape. The lowest level of bias is required for ferric cassettes, a slightly higher one for ferrichrome, an even higher one for chrome or pseudochrome, and the highest for metal.

Bit Stream: the use of single Sign Bits controlling a switched-capacitor DAC to generate a Pulse Density Modulated output. This is achieved via oversampling, truncation of each 16 bit word into 1 bit 'chunks' and the redistribution of errors (noise) via noise-shaping.

Bitstream: a generic term given to those DACs utilising a Pulse Width Modulated output but whose noise-shapers may not operate over the full 16-bit dynamic range.

Cantilever: The thin rod or tube that connects the stylus to the armature and hence the cartridge body.

Capacitance: An element of electrical impedance that is particularly important when matching pickup cartridge, arm leads and amplifier input characteristics to achieve a flat frequency response from discs.

Chipset: a handy euphemism for the decoder, oversampling filter and DAC that comprise the CD player.

Clipping: This is reached when a circuit is overloaded and overdriven, resulting in bad waveform distortion and audibly unpleasant effects.

CLV or Constant Linear Velocity: the rotational velocity of a CD is constantly adjusted so that data passes over the laser at a fixed rate, ie, at a constant 'linear' velocity. The exact velocity differs from disc to disc but usually lies between 1.2-1.4m/sec. The frequency of the recovered data is compared with a crystal reference and the difference is used to speed up or slow

down the rotation of the disc.

Coloration: A general term used to describe the audible effects of distortions, particularly in loudspeakers and record players. These are usually caused by frequency response irregularities and/or resonances.

Compatibility: The selection of interdependent components to achieve optimum system performance; notably arm/cartridge mass/compliance matching, cartridge electrical loading, or loudspeaker compatibility with amplifiers.

Compliance: A measure of the springiness of the cantilever/armature seen from the stylus, expressed in compliance units (Cu), where 1 cu = 10 to the power of -6 cm/dyne

Crossover: An electrical circuit which uses combinations of inductors, capacitors and resistors to divide the signal from the power amp into the required frequency bands and with any necessary equalisation for feeding to the individual drive-units of the speaker system.

Crosstalk: The leakage from one channel to the other in a two channel stereo system.

Cutter: Mechanism used to cut recorded signal onto lacquer master; consists of turntable, lathe, cutting head, cutting and servo amps

Damping: A technique for controlling resonances by means of a resistive medium (electrical, mechanical, or acoustic depending on situation).

Decibel (dB): A logarithmic unit that is convenient for expressing ratios that span a wide range on a linear scale. For simplicity it can be regarded as a measure of relative loudness.

De-emphasis: an emphasis or boost is occasionally applied upon recording (max +9dB at 16kHz) to reduce hiss and noise upon de-emphasis within the CD player.

Digital: the use of a binary code (ie, 1's and 0's) to represent, store and transmit an analogue audio waveform.

Digital Output: a datastream adhering to S/PDIF and transmitted in biphasic-mark code, allowing the CD player to be upgraded with an external DAC. The digital output on a player may be coaxial or optical in design but the coding is identical.

DIN: German standards body, responsible amongst other things for a popular range of standard plugs and socket specifications.

Distortion: Literally this can mean any deviation from the original, but usually refers to harmonic rather than intermodulation distortions.

Dither: a low level triangular-distribution noise that is added to convert harsh-sounding granulation distortions into an innocuous background hiss. The S/N ratio may deteriorate slightly but distortion is much reduced.

Dolby: Covers various signal processing/ deprocessing systems, but normally refers to the B and C noise reduction systems used in cassette record/replay, and the B system used for music cassette replay. Also Dolby S Type, the latest form of noise reduction.

Doping: A technique involving the application of damping to a loudspeaker driver cone in order to assist in controlling resonances.

Downforce: The weight, measured at the stylus, which holds it down in the groove.

Drive unit (driver): The term used to distinguish the loudspeaker unit itself, be it bass, midrange, treble or fullrange in application, from the complete loudspeaker system which combines drive units, cabinet and crossover into a total design.

Dropouts: Momentary reductions of programme level due to inadequate head/tape contact caused by oxide particles shedding off the tape onto the head gap, or inadequacies in tape transport or tape.

Dynamic range: The ratio in dBs between the quietest sound that can be successfully recorded and the loudest which can be accepted without serious distortion on an average programme.

Effective mass: The inertia, or mass-controlled resistance to movement, of a device. Particularly important with regard to tonearms.

Efficiency: The amount of acoustic power delivered for a given electrical input power.

Electrostatic: A principle employed in some loudspeaker transducers using static electricity effects to set up a polarising field within which the modulated transducer medium moves.

Equalisation: (general) The deliberate modification of frequency response, usually in response to some engineering limitation or deficiency.

Equalisation: (tape) This refers to the necessary change in frequency response required of an amplifier so that overall flat frequency response is obtained from a tape medium. Equalisation is required both on record and replay. Any tape recorded on a good cassette recorder should have the same inherent response when played back on another correctly set up machine, since all playback

equalisations should have been standardised. These standards are normally specified by the time constants of the circuits involved, eg 70µs or 120µs (microseconds).

Farad: Measure of capacitance.

FM: Frequency modulated, often used to describe radio transmissions of high fidelity potential on the VHF band.

Ferrite rod: A short rod type aerial used for AM reception; may be fitted internally or externally to a tuner or receiver.

Ferro-fluid: A magnetic fluid which is introduced into the voice-coil gap to provide damping and/or improved cooling.

Filter: A circuit (normally) used to restrict the bandwidth of a system, may be fixed or switchable.

Frequency response: The variation in output over a frequency range, particularly of a transducer; can be expressed as a range with decibel limits, or depicted graphically.

Hz (Hertz): One Hz equals one cycle per second and is a measure of frequency which corresponds to musical pitch (the higher the frequency the higher the pitch).

HF: High frequency

Harmonic: Harmonics are the whole number multiples of a base frequency called the fundamental.

Harmonic distortion: The addition of unwanted harmonics to the required signal.

Hum: A low frequency interfering sound produced by breakthrough or interference from mains wiring or circuitry.

IEC: An international standards body.

Impedance: Measure of resistance (and reactance) in alternating (ie, audio) signals. This is important in the compatibility of both cartridges and headphones with amplifiers. For convenience sake it's measured in ohms.

Integration: Used to describe the success with which the output from two drive units combine to give smooth output through the crossover region.

Intermodulation (IM): A form of distortion arising from two or more signals producing nonharmonic signals that correspond to the sum or difference of the two frequencies

Jitter: an uncertainty in the position or timing of digital transitions (or edges) caused by interference or poor clock recovery. Digital jitter gives rise to unpleasant distortions after D/A conversion.

Kilo (k): Prefix meaning one thousand.

Lateral friction: The resistance to movement of an arm and cartridge combination in the horizontal plane (ie across a record), caused by friction in its bearings

LED: Light Emitting Diode; an indicator light.

LF: Low frequency

Load or Loading: The impedance (including resistive and reactive components, ie, ohms, mH pF) seen by one component looking back to its inter-connected component.

'Loudness': An equalisation circuit fre-

quency switchable on amplifiers which is designed to compensate for presumed hearing characteristics at low listening levels by boosting bass and treble.

LSB: or Least Significant Bit, the difference in amplitude between one quantisation level and the next. This is the final bit on the far right of each 16-bit digital word.

MASH: or Multi-stAge noise-SHaping. A two-stage process developed by NTT and utilised by Technics (among others) to redistribute the quantisation noise caused by truncation in the bitstream process

Medium wave: An AM transmission band incapable of high fidelity signals.

Micro- (µ): Prefix for units, meaning 'one millionth of'

Midrange, Midband: The central part of the audible frequency range where the ear is most sensitive.

Milli- (m): Prefix for units meaning one thousandth of.

Modulation: The audio signal is 'stored' by means of modulations within a medium, eg the 'wiggles' in the groove of a plastic disc, or the magnetic coding on a tape.

MOL: Maximum operating level of tape normally referring to 5 per cent distortion of 315Hz or 3.15kHz.

Moving coil: A transducer (eg cartridge or headphone) where the signal is generated by the movement of a coil within a magnetic field.

Moving magnet: The most common form of cartridge transduction, where the magnet moves while the coils are held relatively stationary.

MSB: or Most Significant Bit. Equivalent to 32768 LSBs in amplitude. This is the sign bit on the far left of each 16-bit digital word.

Multibit: an older style converter that uses 16 or more sequential current sources to build up the audio waveform in response to each 16-bit (or greater) digital word. These DACs suffer from glitches as each current source turns on and off while low-level accuracy is dependent on the precise matching of individual resistive elements. Bitstream DACs overcome these limitations.

Multiplex filter (MPX): A circuit which introduces severe attenuation at supersonic frequencies to decrease interference encountered with the output from some stereo FM tuners.

Nano (n): Prefix meaning a thousandth of a millionth of.

Noise: Random unwanted low level signals.

Noise modulation: An unwelcome breathing effect that can be heard on some programme material, produced by poor noise reduction systems, or circuits.

Noise-shaping: a form of digital feedback used to redistribute unwanted quantisation noise towards higher frequencies.

Octave: Two-to-one ratio of pitch or frequency.

Offset angle: The angle measured between the centre line of the pickup cartridge and the line which joins stylus

and arm pivot point.

Ohm: Unit of electrical impedance (including reactance) or resistance; also kohm, where one kohm = 1,000 ohms.

Overhang: The extent to which the cartridge stylus extends beyond the centre of the platter is critical, and controlled by fore and aft adjustment of the cartridge on the arm.

Oversampling: the mathematical generation of intermediate sample values to effectively double and re-double (etc) the original 44.1kHz sample rate.

PDM: or Pulse Density Modulation represents the audio waveform as the variation in density (or number) of analogue pulses per sample period. More pulses increase the average level of the audio signal at that point in time and vice-versa.

Peak recording level: A level above which distortion becomes apparent. This distortion is introduced when the oxide particles almost reach magnetic saturation, and thus will accept no more level.

PEM: or Pulse Edge Modulation. A bitstream variant developed by JVC that employs two PWM datastreams which are combined to effectively lower the required clock rate.

PFM: or Pulse Flow Modulation. Pioneer's interpretation of true PDM operation.

Phono: The most commonly used plug/socket combination in audio components.

Pico (p): Prefix meaning one millionth of a millionth of.

PLM: or Pulse Length Modulation. Sony's version of bitstream where just seven binary values are used to control a PWM DAC.

Port: An opening in a cabinet which is tuned to characteristics of the bass driver and the enclosure volume to provide reflex type bass-loading.

Power amplifier: The part of an amplifier that provides power to drive the loudspeakers. Usually integrated, it is sometimes a separate component.

Preamplifier: The part of an amplifier that accepts the input signals, sorts them, applies any necessary equalisation, and then passes the signal to the (normally integral) power amplifiers.

Presence: A quality of forwardness or immediacy in a sound balance, generally related to an upper-middle frequency response boost.

Print-through: A pre- or post-echo of a loud signal created by magnetisation occurring from one layer to an adjacent layer after the tape has spooled or been recorded.

PWM: or Pulse Width Modulation. The correct term first coined by Technics who truncate from 16- to 3.5-bits, producing 11 binary values which generate any one of 11 Pulse Widths from the bitstream digital to analogue converter.

Q: A measure of the magnitude and shape of a resonance; the higher the Q, the sharper and more severe in amplitude the resonance.

Quantisation: with CDs' 16-bit code there are two to the power of 16 or

65,536 different quantisation levels available to describe the audio waveform once per 44.1kHz sample period. Errors in the allocation of each quantisation level result in quantisation noise and distortion. Truncation in the bitstream process produces huge amounts of quantisation noise.

Reflex: A system of bass loading (using port or ABR) which offers improved efficiency and bass power handling at the expense of subsonic control compared to a sealed box.

Rumble: The low or medium frequency sound produced mechanically by any moving parts in a turntable, mainly the motor and platter bearings.

Sensitivity: The volume of sound output for a specific electrical voltage input.

Separation: As between the two channels of a stereo pickup; see Crosstalk.

Shibata: A special stylus extending the elliptical to a 'line-contact' type of profile.

Signal to noise, Signal/noise, S/N: The difference in total output when an applied signal is removed.

Stylus: The specially shaped piece of diamond in contact with the groove and connected to the cantilever.

Subsonic: Below the audible range; ie, below 20Hz.

Square wave: A signal which consists of a fundamental plus a (theoretically infinite) series of odd (3rd, 5th etc) harmonics in a precise phase and amplitude relationship.

SSN: or Single Stage Noise-shaping as developed by Philips uses either two or three feedback loops together with a unocoder to redistribute quantisation noise in one step.

Stop-band Noise: signals outside the audio or passband related to the 44.1kHz sample frequency and its multiples.

THD: Total harmonic distortion.

Tracking error: The discrepancy between the truly tangential angle at which a record is cut and the slightly off-tangential angle at which it is tracked by a stylus on a pivoted arm during some parts of the arm's travel.

Transient: Signal of very short duration.

Treble: Upper part of frequency spectrum, typically above about 3kHz.

Tweeter: A small drive unit designed to operate over the high frequency range.

Ultrasonic: Frequencies above audibility, ie greater than 20kHz; also supersonic.

Vertical tracking angle (VTA): The angle at which the plane of motivation of the stylus is set with respect to the vertical when viewed from a side elevation of the cartridge. Should match the 20° cutter standard.

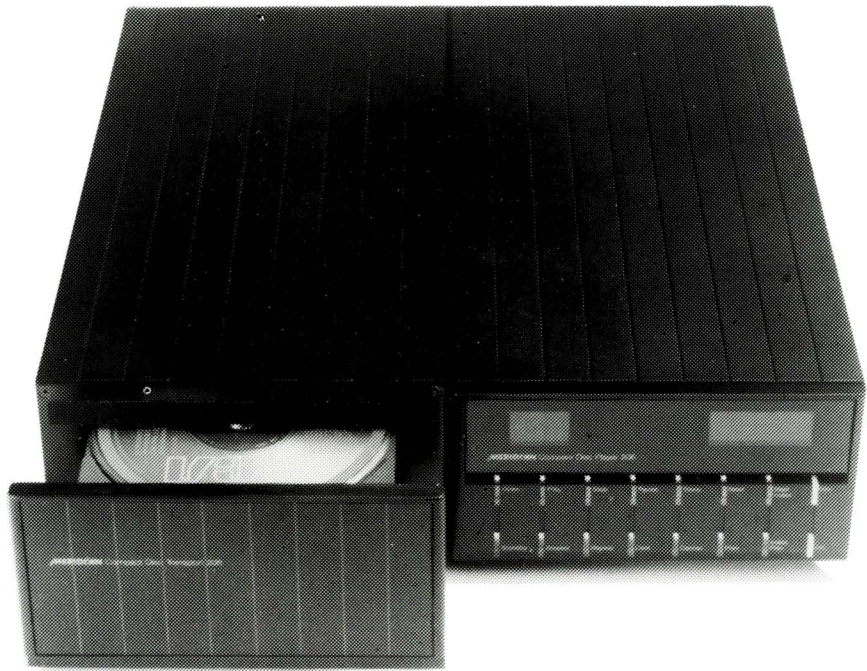
Weighting: A factor or function that is applied to a measurement to increase its relevance and usefulness, often seen as A or B Wtd.

Woofers: A drive unit that operates over the bass portion of the audio range.

Wow and flutter: Low and high frequency pitch variations (from poor tape transport or turntable platters with speed drift).

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The Directory

The *Hi-Fi Choice Directory* was conceived as a reference guide to all the audio products reviewed by *Choice* that are currently available. The products are split into suitable categories, each with its own introduction containing information about the product type and its applications. They are particularly relevant to the uninitiated first time buyer and help sort out the order of priorities when buying a piece of equipment.

Each product along with its retail price is placed in its respective category in alphabetical order. For instance, the Acoustic Research *EB101* is presently at the beginning of the Turntables and Tonearms section; however, the Ariston *Superior* heads the Motor Units section as it is solid and was reviewed as a separate component - requiring a separate arm. Where there are several products with the same name but different model numbers these are in price ascending order.

Then come the ratings for the standard achieved in laboratory and listening tests, with the exception of certain product groups where lab tests were not carried out. One important point to remember is

that they cannot be used to compare products from different categories - for example a cassette deck rated 'excellent' in sound quality will not usually offer the same standard of fidelity as a similarly rated turntable or CD player (unless you can get hold of first generation copies of the master tape!)

The Comments column contains a potted summary based on the original review, emphasising the salient points of a product's character and sonic performance. The space available doesn't allow for great detail but in the 20 or so words we have attempted to put across the essence of the review, in some cases using quotes from the review itself. Obviously, important information on compatibility or auxiliary equipment used in the test cannot be included, and we would advise you to refer to the original review for this, of which more later.

The next column varies from category to category but is usually either features or specifications, the former being facilities available on a cassette deck or amplifier or the type of drive system on a turntable.

Specifications vary with product type

but usually relate to suitability or capability, for instance in the case of arm matching, figures are given with the cartridges, which tie in with the mass figures for the tonearms themselves, making it easier to avoid compliance/mass mismatches.

Perhaps the most influential letters in the *Directory* are those found in the Value column, the Rs and Bbs denoting the Recommended and Best Buy ratings that are appended to products we consider meritorious. The Best Buy tag means that a product not only offers good sound quality but is reasonably priced as well. With source components a price limit of approximately £300 is usually used as a guide. Recommended means that either the performance of a product is particularly good irrespective of price or, alternatively that a good value standard is achieved but overall attainment falls short of Best Buy classification. An ideal situation would be to choose suitably priced Best Buy or Recommended products from relevant categories and create a Best Buy system, but, due to the variety in tonal balance that exists in much audio equipment

(especially the electromagnetical elements - that is to say the cartridge and the speakers), system building is unfortunately not quite that simple. These ratings make a useful guideline for shortlisting components, but only experiencing the actual combination will tell you whether it works for you.

The final column contains a reference to the issue of *Hi-Fi Choice* which featured the complete review. If you wish to get a better idea of a product by reading the complete review it is possible to order a copy (if still in print) through our back issues department. Every *Choice* issue contains a Back Issues page for this purpose.

The *Hi-Fi Choice Directory* is constantly updated with the latest reviews and price changes as well as having any discontinued products removed. If a listed product is updated to a 'mark two' form and the alterations are purely cosmetic or not too extensive, we sometimes leave the product in with its current model number, together with an asterisk in order to denote that it has changed since our original review was published.

SYSTEM BUILDING

Pre-packaged one-make systems have been commercially very successful, with advantages like cosmetic consistency, competitive pricing, and (assumed) technical compatibility. However, despite the mass market clout of the consumer electronics giants, the hi-fi tradition of specialised separate components seems to be as strong as ever, and certainly represents the route taken by those who place sound quality first.

Yet those who choose the separates route still have lingering doubts - usually completely unjustified - over the compatibility of components from different manufacturers. Gross incompatibilities are very rare nowadays, only likely to rear their heads amongst the most exotic components. Here the delicate art of 'supercompatibility' really takes over the major role and might be regarded as the key to 'real' hi-fi.

There are now three different prerecorded music media competing for the attention of the hi-fi user, and to go for all three will either cost a lot of money or involve substantial compromises in the sound quality of each. For this reason many separates purchasers may start with just one source, adding others or a tuner when funds permit.

There will always be controversy over the relative qualities of LP, CD and cassette. LP is still the choice for ultimate sound quality - particularly for those prepared to spend a substantial sum on a good quality turntable system.

Cassette has never really challenged vinyl's superior quality, but it is a multiple role format, offering 'go anywhere'

flexibility, a uniquely useful recording capability, plus a broad catalogue of prerecorded music cassette material. As a hi-fi medium cassette suffers from prerecorded material which has been improving but is still patchy in quality, and can usually be bettered by a home recording. There is also the worry that a tape made on a specific machine usually plays best on that machine, which may cause aggravation when upgrading a few years hence.

CD is the latest challenger to these two established media, using a digital instead of analogue storage format. The sound quality remains controversial, hailed as near perfect by its fans but derided by vinyl freaks, so it is probably fairest to say that CD is fine for most listeners, but may not suit everyone; certainly the lack of background noise, defects and deterioration are major strengths.

While there will always be arguments about the different music storage and transmission formats available to the hi-fi listener, there is also controversy over the relative importance of the different components which make up the system chain - by which is meant the source, the amplification, and the loudspeakers (and for the pedantic the room itself, though there's often little that can be done here).

For many years the 'weakest link' theory proposed that the loudspeakers needed the most attention, that amplifiers merely had to have sufficient power, and that turntables were pretty well perfect. However, this perspective has become steadily discredited by an alternative 'theory of precedence', which stresses that

no subsequent component can make up for the inadequacies of its predecessors - all it can do is supply its own additional degradations. In such a context it is not uncommon to find more than half the system budget allocated to the record player, with scrimping and saving made on amplifiers and loudspeakers.

Choosing the components of a system is only part of the task of getting the system as a whole working as well as possible. Good turntables and loudspeakers both benefit to a surprising degree from proper support - from stands that enable them to give their best performance, whether floor-standing or wall mounted.

Siting of components within a room can play a significant role, as can the room itself. Some people may prefer an acoustically more 'live' room than others, but most will agree that the larger it is the better, because this tends to provide smoother and better extended bass reproduction. All rooms create reflections and standing waves, and the effects of these are more severe if all opposing walls are parallel, similar distances apart, and with hard reflective surfaces. Provided that the loudspeakers can be placed fairly symmetrically, slight asymmetry elsewhere in the room is usually helpful.

The loudspeakers are most critical of placement, because it is their job to create the stereo image, and it will be impossible to do this if the sound from each is not roughly similar at the listening position. Each loudspeaker should operate in a similar immediate acoustic environment, unencumbered by other furnishings and

structure, and a similar distance from each listener, nearby walls, and corners. Some loudspeakers are designed to operate close to a rear wall, others a metre or so out into the room, but all loudspeakers benefit from being closely mechanically coupled via proper stands to the floor.

Mixing and matching the components of a record player to get optimum results can be something of a black art, over and beyond the fairly simple business of choosing a cartridge of roughly the right compliance to suit the arm effective mass. Certainly the combining of turntables and tonearms is not a simple matter, and this is where a good specialist dealer will come into his own, both in terms of recommending good combinations from the models he holds in stock, and then in correctly carrying out the sometimes tricky set up procedures which are often required to get the best results.

The key to getting the best results from a separates system lies in finding an experienced and skilled dealer in the first place, one who takes the trouble to find out what you really want and then demonstrates some likely alternatives.

The *Directory* has been compiled so that it can be used by *Choice* readers as a buying guide. A guide in the sense that that you should use the information in it to make a shortlist of equipment suited to your needs and budget, and then audition it at a dealers' before taking the plunge. Because tastes inevitably differ it would be unwise to buy purely on the basis of our recommendation and dealers are the most experienced people around when it comes to making systems work as a whole.

AMPLIFIERS

The amplifier sits at the heart of the system, processing the outputs from all the various music sources as necessary and then driving the loudspeakers. These two (quite separate) functions are integrated into a single box at the low-to-middle price points; separated pre- and power amplifiers become increasingly common as one moves upmarket. At the upper end of the specialist market, valve amplifiers provide a popular alternative to the transistor types amongst enthusiasts.

There is a substantial difference between specialist (sound quality oriented) amplifiers and the consumer electronics style models. The

former are bleakly simple, avoiding all unnecessary features to provide the most direct signal path in the interests of best sound quality. The latter range from models with just basic tone controls and tape recorder switching, to those with elaborate facilities such as graphic equalisers, remote control (including volume), surround sound options etc. etc.

Lab measurement provides some useful data, particularly in regard to an amplifier's ability to drive a wide range of different types of loudspeakers, but this is only obliquely related to sound quality. We also include our measured power output (RMS, 8ohm load, 1 channel

driven) – but again, paradoxically, this doesn't necessarily correspond to the loudness capability of the amplifier, which has as much to do with the elegance of the overload characteristics within a given system (valve amplifiers invariably sound more powerful than their rating would suggest). The listing of features provides some indication to the complexity of an amplifier: many users prefer to retain the option of tone controls to 'shape' the overall sound according to taste; many others have found living without tone controls surprisingly easy, with additional benefits in terms of transparency.

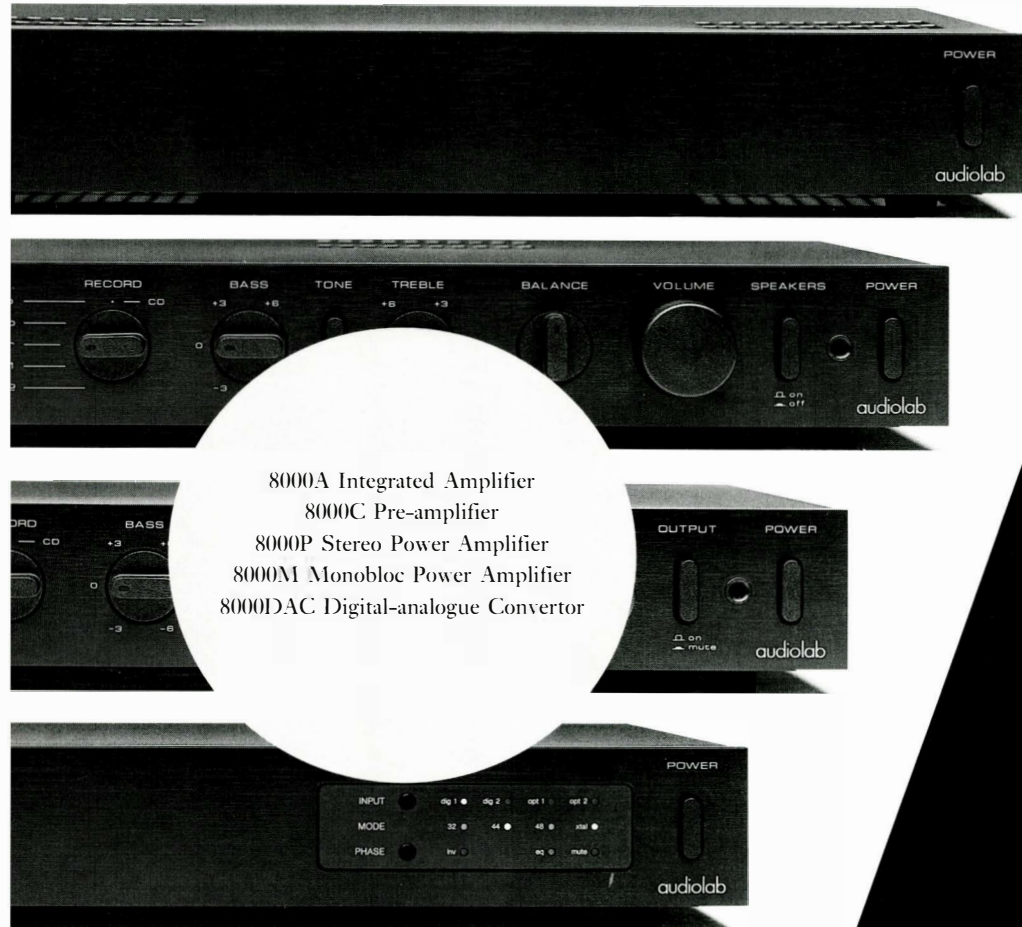
MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Acoustic Research A03 £170	Average + Average	New slimmed down version of the A04 with less power and facilities but also a slightly 'fuzzy' sound	38W, MM disc, CD direct and 3 aux inputs		74
Acoustic Research A05 £200	Good + Good +	Capitalises on the strengths of the A-03 and A-07 but escapes the ignominy of their deficiencies. The amp for all AR-based systems	67W, 2 tape, 3 line and both MM/MC inputs. Tone defeat	R	97
Acoustic Research A07 £300	Very Good Average +	Relatively smooth but ineffectual sound quality that lacks some weight and impetus at very low frequencies	75W, 4 line, 2AV and MM/MC inputs		68
Aiwa XA-006 £135	Good Average	Competent enough performer with plenty of facilities. A gutsy sound though one that's rougher via CD than MM.	67W, MM and 5 line i/p's plus independent rec out.		92
Akai AM-52 £230	Average + Average -	Basically equipped, this amplifier offers a comfortable but hardly over-detailed sound	95W, MM/MC disc, 5 line inputs, loudness		74
Akai AM-65B £299	Good Average	On-board 18-Bit DAC's actually give better sound than standard CD inputs! Punchy via MM disc	101W, MM, 6 line, digital inputs		80
Akai AM-93 £550	Average Average -	Unfortunately Akai's on-board D/A convertors were less successful than its conventional analogue CD input.	112W, coax and optical dig inputs. MM/MC		68
Alphason Apollo £300	Average- Average+	Our early production sample was beset with a variety of niggling problems. Laid-back though not unmusical sound.	54W, 5 line, tape and MM/MC inputs. Solid wood fascia		92
Amadeus Gold £360	Average - Good	There is some indication of instability but otherwise sounds very rich, warm and musical. High-ish IMD	56W, MM/MC plug-in cards, 3 line R inputs		74
Amadeus Silver £270	Average - Good	Limited headroom via disc but still offers a sweet, lush sound. Limited current delivery	37W, MM/MC, 3 line inputs	R	80
Aragon 4004 £1795	Good Good	Despite its imposing bulk, the Aragon is something of a softy at heart. It can deliver oodles of power but its musical presentation is more laid-back	231W power amp		72
Arcam Alpha 2 £195	Good Good +	Very confident, convincingly musical and punchy sound that sets the standard for other budget amps	41W, 4 line and MM inputs	BB	68
Arcam Delta 110/120 £720/£520	Good+ Good	Overall performance is limited by the power amp - in isolation the PDM-preamp offers a remarkably open and detailed sound, particularly in 'digital' mode.	112W power amp, MM/MC + four line inputs + coax/opt digital input.	R/-	92
Arcam Delta 60 £300	Good Good +	Very refined and highly detailed sound via MM and CD without any of the hardness noted via the MC stage	59W, 4 line, MM/MC inputs, no tone controls	R	68
Arcam Delta 90.2 £410	Average + Average +	Dark but slightly dead or conservative sounding version of the original Delta 90. Improved disc stage	73W, MM/MC, 4 line inputs, tone bypass, bi-wire	R	74
Art Audio Quintet £725	Average Very Good	Switchable triode/ultralinear output stage. There's 15W and 15W, but in triode mode these are 15 of the sweetest watts around. Surprisingly gutsy	15/25W, variable feedback	R	100
Audio Innovations Series 1000 2nd Audio Amplifier £1499/2950	Poor Excellent	This valve combination offers awesome dynamic range with superb transparency and power to match. Compatibility with other brands is unpredictable	15W, MM, 6 inputs, monoblocks	R	63
Audio Innovations Series 200 £449	Poor Very Good	Like most Innovations valve power amps, compatibility with other brands is unpredictable. Hardly a powerhouse, but nicely 'open', transparent and dynamic sound in small(ish) systems	12W	R	77
Audio Innovations Series 300II £500	Poor Good +	Under-powered and over-distorted yet capable of realising an open and captivatingly expressive sound. Sensitive speakers are a must	9W(!) integrated valve amp with tape, 3 line and MM disc inputs	R	97
Audio Innovations Series 400 £669	Poor Very Good	Superior styling and better build quality than the Series 300 make for a very attractive integrated valve amp. Capable of fine results in the right system, but can sound too 'thin' and lacking in welly with inefficient speakers	12W, MM and 4 line inputs	R	77
Audio Note Ongaku £34,000	n/a Excellent	An out and out audiophile product, a single ended, zero negative feedback, triode, line level integrated amp. Probably the best amplifier in the world!	6 line inputs, 27W	R	Coll '90
Audiolab 8000A £410	Very Good Very Good	Recent mods have cured the slightly glassy treble, replacing it with a smoother but richer and more solid style of music making	81W, 3 tape, 4 line and both MM/MC inputs. Tone defeat	R	97
Audiolab 8000C/8000P £375/£545	Very Good Good	Audiolab has revamped its pre/power combo though the very distinctive almost stark neutrality that results will not appeal to all listeners. Good value engineering, nevertheless	157W pow amp + bi-wire outputs. 3 Tape, 4 line + MM/MC on preamp		97
Audion CD-1 £399	Average + Very Good	Nicely presented valve (line-only) preamplifier with fine bandwidth and enjoyable, musical sound. Great - if you can justify the cost. Well worth hearing	5 line inputs		77
Aura VA-40 £190	Average Average +	Based on ITL's earlier MA80, this amp sounded slightly withdrawn or 'dead' if inoffensive	55W, MM 4 line inputs, MOSFET output		80
Aura VA-50 £200	Good Very Good	Superficially similar to the cheaper VA-40 but with much more of the old MA-80's magic! Great sound from a slimline package	65W, one tape, 4 line and MM only. New tape monitor switch	BB	97
Beard 506 £1195	Good + Good +	A versatile valve preamp - the bass sounded lively if a touch softened, while the treble was detailed but lacked a little sparkle and air.	4 inputs MM/MC		50
Beard Audio CA35/P35mkII £695/£895	Average + Very Good	Good build quality and a very smart finish combine with a characteristic valve sound to make a first class amplifier capable of giving hours of musical enjoyment	35W, MM/MC, 4 inputs	R	63
Beard M70 £1995 pair	Good Good +	A substantial British monoblok power amplifier, but not a great deal more impressive than the P35 at half the price	70W		50
Bryston 0.5B/2B £695/£695	Very Good Good	Very rugged Canadian pre/power combo that sounds cool, confident and punchy. Headamp available to suit MC cartridges	65W, MM and 4 line sources, overload LEDs on power amp	R	74
Bryston 12B/4B £1295/£1395	Good + Good	Bryston's massive 4B power amp stood out as the backbone of this combo, the preamp sounding a trifle unbalanced between MM and MC inputs	272W, bridgeable to 800W. 6 line, 2 disc inputs, subsonic filter		68
Cambridge P25 £180	Good+ Average	Despite clocking-up a solid set of measurements the sound of the P25 proved to be as grey as its appearance.	37W, 4 line and MM/MC inputs + tone defeat.		92

The Directory

AMPLIFIERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Cambridge P50 £200	Good	A pleasant enough sound with full bass yet with a slightly mechanical quality that reduced its sense of 'naturalness'	56W, 4 line inputs + MM/MC + tone	R	85
Carver CM-1090 £495	Average	Looks very professional with its meters and handles but suffers from a loose and dirty sound that shies away from busy tracks	141W, 2 tape, 4 line and MM disc. Sonic Holography feature	R	97
Cello Audio Suite £1200	Excellent	Cello's preamp represents a whole new ball game in flexibility and sound quality (or war of attrition on your wallet)	Optional inputs MC etc	R	50
Chord SPM-900 £1850	Average + Good +	Technically very interesting, this mini-powerhouse uses a switched-mode supply to deliver a crisp and refined sound	236W with protection into lower loads	R	85
Concordant Excelsior £856	Very Good	Cottage industry styling might not inspire confidence, but sonically this preamp is tremendously vivid and detailed. Real high-end performance. We loved it!	MM plus 3 line inputs. External power supply	R	77
Concordant Exultant £700	Average+ Very Good	Individual appearance of this valve pre contrasts with sonic invisibility. An extremely dynamic performer. Recommendation withheld pending more appropriate p.s. plug	3 line, MM, variable gain	R	100
Conrad-Johnson Premier 7A £8995	n/a	Price has increased since we tested it - but at this price who cares? The 'Seven' is designed without compromise, and it's clearly one of the finest (valve) preamplifiers money can buy	MM, 4 line inputs, sep. Rec Out, versatile cartridge matching	R	Coll.'90
Conrad-Johnson PV-10 £1100	Excellent	Pricey, yes, but a fabulous preamplifier which confirms C-J's high reputation in the States. Beautiful imaging, superb detail, plenty of gain on the phono stage - classy build quality too.	MM plus 4 line inputs	R	78
Creek CAS 4040s3 £200	Good	Now in mk3 guise the '4040 offers a dry but tidy sound via disc and one that's slightly leaner and better focussed on CD.	41W, 3 line and one MM disc i/p. Tone controls.	R	92
Creek CAS 4140s2 £230	Average Good	Disc headroom still poor but the open and detailed, if slightly bright, sound wins through	40W, MM/MC, 3 line inputs, mono R and mute	R	80
Croft Series 4S £850	Good Good	The original IV is still available now supplemented by the higher price and power (S); both are fine performers	40(60)W channel	R	57
Croft Series 4SA £1000	Good Very Good	Featuring tuned components chosen for their sound quality, the 'A' variant is an impressive example of Croft's technique in valve design	60W special supply regulation	R	57
Croft Super Micro A £549	Average + Very Good	The looks are somewhat improved, while this 'hot rod' version with tuned components performed very well indeed. There is still no gain on the line inputs. Now in mk.II form	4 inputs, MM, straight line	R	57
Croft Super Micro A 0T/Series V £689/£555	Average+ Good	Micro is still unashamedly "cottage" but offers good performance. Combo is let down by the very low powered Series V	15W, valve, dual vol.control, 2 line, MM, tape out	R	100
Cyclone Catalyst £1995	Good + Very Good	Exceptionally load tolerant and very refined in delivery. Extra options available in future	74W, external MM or MC stages, 3 R line inputs	R	80
Cyrus I £230	Very Good	Crisp, meaty and exquisitely detailed, this latest Cyrus amp had us enthralled via CD. MM/MC enjoyed a lesser clarity	34W, 4 line + MM/MC i/p's with dual-conc vol.	R	85
Cyrus II £350	Very Good	Recently updated this popular favourite captured our attention, once again, with its robust and very convincing sound	60W, 4 line and both MM/MC disc. No tone controls	R	92
Cyrus PSX £250	Very Good	The PSX does make the Cyrus Two sound better; and also improves the PCM II CD player giving more wallop and clarity	Auxiliary power supply	R	62
Deltec DPA 100S £2200	Very Good	A top-quality transistor power amp, sounding fast, articulate and well controlled, though maybe a touch clinical for some tastes	80W	R	50
Deltec DSP-50S DPA-50S £725/£925	Excellent	Remarkable pre/power combo based around the highly linear DH-OA32 hybrid op-amp. Unmatched detail resolution, control and transparency	63W, external feedback wiring, 3 line, MM/MC no tone controls	R	68
Denon DAP-2500/POA-4400A £550/£600 pr.	Very Good	Denon's fully-fledged preamp also incorporates D/A converters that did not improve the sound of our £299 CD player. The power amps are brilliant!	172W, monoblocks Opt/Coax dig + 2 tape, 4 line and MM/MC inputs	R	68
Denon PMA-250II £130	Good Good +	Spacious yet tactile and gutsy sound via all inputs. Worthwhile upgrade over original PMA-250	53W, MM 3 line inputs, source-direct	R	80
Denon PMA-350 £160	Average+ Good	Bold claims were made at its launch but the sweet and inoffensive sound, though very pleasant, is not mould-breaking at the price.	88W, 5 line and MM disc inputs + source direct.	R	92
Denon POA-6600 £1000 pr.	Excellent	Delivers abundant high quality sound, solid engineering expertise and content clearly compensating for any compromising of purist audiophile principles - now in revised A form	250W monoblok, remote power	R	60
DNM 3A From £1000	Good + Very Good	The DNM3 in its acrylic case is a remarkably revealing and neutral state of the art preamp	5 inputs MM/MC twin vol controls	R	44
Dual CV-5670 £250	Very Good	Magnificent build and prodigious output to its credit, the CV-5670 still fails to capture the delicacy and enthusiasm of its cheaper companion	128W, 5 line, 2 tape and MM/MC inputs + loudness and CD Direct	R	97
Dual CV5600 £160	Good+ Very Good	Made by Rotel and possessing the highly articulate vocal/string quality of their best budget amps. Very communicative, especially with a good CD player	57W, 3 line, 2 tape and one MM input. CD direct	BB	92
E.A.R. 549 £3628 pr	Very Good	A valve monoblok that measures like a solid state amp is itself an achievement, but exceptional power delivery and bass 'slam' is not fully matched by delicacy and transparency elsewhere	200W monoblok, bias setting	R	60
E.A.R. 802/509mkII £1098/£1868	Average Very Good	Extremely well made and combining the sonic strengths of both transistors and valves this EAR combo warrants attention	100W, MM, 6 inputs, monoblocks	R	63
Entire Sound EX50 £500	Average- Average+	A new and fairly costly Mostet power amp of limited output. Resolution of detail is pretty good but sound is cold-hearted.	40W Power amp. Internal P/S included for ES preamp	R	92
Exposure VI/VII*/VIII £320/£500	Good Very Good	An established company like Exposure could do more to improve the 'look' of these amps which, nevertheless, sounded confident, dry and musical. Dual version no longer available	63W, Super mod. 4 line and 2 disc inputs with full rec-out switching	R	68
Exposure VII/VIII £430/£470	Very Good	Supplied as a combination without the separate preamp power supply, this pre power combination performed satisfactorily especially on the moving coil input	50W, MM/MC, 3 inputs, straight line	R	62
Exposure XI/XII/VIII Super £1600	Good Very Good	New preamp and improved power amp led to a smooth and refined sound, MM/MC less transparent than CD	61W, MM/MC, 5 line inputs	R	80
Goodmans GSA-600 £140	Good Poor	Designed to form the heart of a Goodmans separates system, the wishy-washy and faceless sound of this amp fails to stack up	76W, tape, 3 line and MM inputs. Remote control	R	97
Grant G60AMS £948 pr.	Good Very Good	This neat and compact 60W valve monoblok gave good sound on the 8ohm tap, better still on 4ohms. The midrange was particularly natural	60W monoblocks 8ohms	R	57
Hafner DH120 assembled £360	Very Good	Sound quality results were decent enough, but this power amp won't set the world on fire at this price	60W	R	44
Hafner DH120 kit form £295	n/a	Er, we didn't build one; see assembled version above	60W	R	44
Hafner SE-100/SE-120 £365-375/£375	Good + Good +	The smallest of Hafner's pre/power range but still imbued with the open, sparkling quality of their bigger models. Preamp sounds significantly better via CD than MM or MC	96W, bridging option, 2 Tape, 3 line + Aux or MM/MC	R	97
Hafner XL-600 £1145	Very Good Very Good	Sounds remarkably open, transparent and inherently 'musical'. XL-600 is tremendously powerful and very compatible	426W in stereo mode, 1.5kW in bridge	R	74
Harman Kardon Citation 25/22 £699/£899	Good Average +	Not as outrageous as previous Citation amplifiers but neither as punchy nor exciting in the sonic stakes. A good all-rounder but lacks sparkle	138W, MM/MC full range of input and record out	R	74
Harman Kardon HK6100 £170	Good Good	Re-packaged version of the popular PM635. Still offers very up-beat and exciting sound	47W, MM, 5 line inputs, tone controls	R	80

H i - F i t h a t s p e a k s f o r i t s e l f :



8000A Integrated Amplifier
8000C Pre-amplifier
8000P Stereo Power Amplifier
8000M Monobloc Power Amplifier
8000DAC Digital-analogue Converter

AUDIOLAB

The Directory

AMPLIFIERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Harman Kardon HK6200 £250	Good Good	Supposedly a beefier version of the HK6100 but in practice there's little to distinguish the two amps	50W, 5 line inputs + MM, tone controls		97
Harman Kardon HK6500 £380	Good+ Good+	The best of HK's current range. A firm sound that enjoys an impressive grip on the most complex music. Great bass!	74W, 3 line, 2 tape and MM/MC. Tone controls + loudness	R	92
Harman Kardon HK6600 £500	Good + Average +	This amp comes as a real disappointment after the HK6500. Differences in design yield a flat and uninspiring sound	87W, 2 tape, 4 line and MM/MC inputs. Tone defeat		97
Harman Kardon HK6800 £700	Good + Good	Smoother and more evenly paced than previous H/K superamps, this model sounded both confident and nimble. A fine result	115W, 4 line + 2 tape i/p's + MM/MC	R	85
Heybrook C3/P3 £479/£660	Average + Average -	There's a chance our power amp was a dud for the combo sounded very disappointing on the whole - glassy and uncouth	138W with plenty of current Passive line inputs		85
Jadis JP30/JA30 £4145/£4200	Average Excellent	Two-box preamp plus monoblok power amps, classic valve design gives stereotype valve sound. Beautiful build, nostalgic styling and delightful sounding midrange transcend limitations at frequency extremes, in lab, and re cartridge matching	30W 2-box pre-, monoblok power, MM-only, 4 line inputs	R	60
Jeff Rowland Coherence One/Model 7 £3950/£9900	Very Good Very Good	The technical design of these amps is very elaborate but ensures they achieve an extraordinarily transparent and potent sound. However, the CD i/p is clearly superior to the disc inputs	448W monoblok MM/MC with loading options. Balanced topology	R	72
JVC AX-A3TN £140	Very Good Good	A true minimalist amp from the masters of mass-production! Offers a very comfortable, accessible sound yet with some loss of deep bass and extreme treble.	50W, 3 line, 1 tape and MM i/p's. CD DiRt and 'Bass Compensator'	R	92
Kelvin Digital Integrated £550	Good + Very Good	Not so Class A as before but now fitted with a PDM DAC which offers a smooth, detailed and naturally 'musical' sound	34W, digital, line and MM i/p's only	R	85
Kelvin Integrated £449	Good Good	Recent mods have reversed the Integrated's previous good fortune, this unit was just too syrupy	21W with 10-12W in Class A. Four line + MM/MC		92
Kelvin Labs Absolute Zero/M30 £395 + £295/£595pr.	Good + Average +	Latest versions of the M30 offers a true 30W Class A and a slightly muddled but very comfortable sound. MC preamp is a very linear design	33W monoblok MC only + 4 line inputs. Separate L/R balance	R	74
Kenwood KA-3020 £140	Good + Good +	An unassuming little amplifier that turns in a remarkably balanced and entertaining sound. Lively, detailed and engaging	66W, 2 tape, 3 line + MM disc. Source direct	BB	97
Kenwood KA-4020 £170	Good + Average +	On paper this is a beefier version of the '3020 yet our listeners thought it sounded weaker, lacking richness and detail	103W, 2 tape, 3 line + MM/MC. Source direct		97
Kenwood KA-5020 £220	Very Good Good+	Something of a powerhouse on the cheap this amp can keep pace with the most challenging of dynamics. Its sound is vibrant but some fine detail is lost.	115W, 3 line, 3 tape and MM/MC. Source direct.	R	92
Klyne SK5a £2590	Very Good Very Good	Beautifully made and presented, this American thoroughbred has a good lab performance, but although versatile, is rather expensive for the quality of sound offered	Balanced output, versatile cartridge loading		72
Lecson Quattra £350	Average+ Good	Underpowered but with the flexibility of four independent power amps. Very deep, captivating sound with 3D soundstaging.	19W via all 4 channels. 5 line and MM/MC inputs.	R	92
Lectron JH50 £2300	Average Very Good	Sexily presented valve power amplifier from France. Lovely valve sound too, with delicate and airy top end. Not especially powerful and rather expensive - but very desirable!	50W		78
Linn LK1/LK280 £598/£763	Good Good -	A very modern, logic-controlled amp with distinctive and inoffensive sound quality. Its restrained sound could do with extra insight and zip.	84W, compact amp CMOS sw. for 2 tape, 2 line and MM/MC. xlr sockets.		68
Linx Nebula £500	Average + Average +	Ambitious both in style and design this amp was less impressive in the sonic arena — positive but two-dimensional	88W, logic-controlled i/p switching		85
Magnum MP150/MF150 £320/£320	Average + Good	This is no technical masterpiece but the strain-free, fluid sound augers well for CD-based systems. Excellent value	89W, 3 line + MM/MC i/p's. No tone cont.	R	85
Marantz PM-30SE £150	Very Good Good+	The breathe-on version of Marantz' PM-30 offers an engagingly detailed and spacious sound though one that's warmer via MM disc than CD.	50W, 3 line, 2 tape and MM disc. Source direct	R	92
Marantz PM-40SE £240	Very Good Good +	The improved version of their basic PM-40 model has itself been updated to provide a bigger and more exciting sound. A good 'un	61W, tape, 3 line + MM/MC disc. Source Direct	R	97
Marantz PM-50 £260	Good + Average +	One of Marantz's new breed, the PM-50 has a big and beefy sound yet one that lacks refinement	92W, MM/MC, 4 line inputs, source- direct		80
Marantz PM-75 £500	Good Average	More successful than most amps with on-board DACs but still not as balanced as other Marantz products	136W, opt/coax dig inputs, 6 line + MM/MC		68
Marantz PM-80 £400	Very Good Good +	Technically robust with an equally beefy and tactile sound. Great sense of power and control but spatially a little flat	133W, 3 tape, 4 line + MM/MC. Class A option	R	85
Meridian 201/205 £760/£525 each	Very Good Good +	A fine preamp with additional luxury option of full system remote, plus competent and attractive monoblok power amplifiers with generally good performance	100W MM/MC 6 line inputs remote capable straight line	R/-	62
MFA Magus £1147	Good Very Good	Versatile valve preamp from USA, genuine MC compatibility and high class construction make the Magus a bargain	3 line, MC, tape out, variable gain	R	100
Musical Fidelity A1 £299	Average + Average +	Just scraping a recommendation, this current A1 sounded lush but sleepy — lacking the bite and sparkle of old	26W with 9W of Class A. 4 line + MM/MC inputs	R	85
Musical Fidelity A100 £499	Good + Very Good	This is another one recommended for fine sound with which you could keep your Chinese carry-outs warm	50W MM/mc 5 inputs straight line	R	62
Musical Fidelity B1 £200	Average + Good +	The subject of much controversy, this 50W wonder offers a very deep, solid and powerful sound	50W, MM/MC, 5 line inputs, tape monitor	R	80
Musical Fidelity B200 £349	Very Good Good +	Running cooler than other MFs, the B200 delivered fine musical and dynamic sounds with plenty of power	80W MM/mc 4 line inputs straight line	BB	62
Musical Fidelity MA50 £875 pair	Good Excellent	An audiophile bargain. One of the best sounding power amplifiers made	50W, monoblok	R	62
NAD 3020i £150	Very Good Good +	The most balanced and communicative of NAD's 3020 series. Great at revealing subtle musical clues without aggression	31W with tone controls, 3 line + MM inputs	BB	85
NAD 3225PE £160	Average + Average +	Light and detailed if not as rich or weighty sounding as others. MM input sounds warmer than CD	42W + 70W dyn. headroom; soft-clipping, MM only	R	68
Naim Separates £750 plus	Very Good Good	A consistent and coherent series of 'building blocks' for conventional passive or active operation. Sound quality ignores conventional audiophile standards of presentation, but achieves fine musical communication	40-70W, MM/MC etc	R	60
NVA P70MC/A60 £830	Average Average +	NVA's speaker cables are a must, the amp offering well-integrated but not particularly crisp sound	68W, MC, 3 passive line inputs		80
Onix OA-21s/SOAP £350/£180	Average + Good -	Via MM disc this amp comes alive with a fresh and vibrant sound though its CD input sounds utterly dead by comparison	60W, 1 tape, 3 line and either MM or MC. Outboard PSU option		97
Orell SA-040 £359	Good Good +	This promising newcomer from a brand new company sounded pretty good and should improve as production settles	45W MM/MC, 4 line inputs, straight line	R	56
Orell SA-040SE £400	Average Average +	Very natural, relaxing if not overly exciting via CD, the sound closed-in to become 'pinched' or fettered via disc	64W, 5 line + MM/MC i/p's Tweaky components.		71
Philips DFA-888 £300	Good Average	As above but including a modified disc input and onboard DAC. Sounds tight but also slightly thin	107W, as above + opt and coax digital inputs		74

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AMPLIFIERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Philips FA-880 £200	Good Average	A new and cheaper design from Philips that sounds best via MM disc. Can appear soft and unbalanced via CD	108W, MM/MC source-direct tone		74
Philips FA890 £230	Good + Good -	Based on their FA880 model but tarted-up with a remote control facility. Inoffensive, civilised but unexciting sound is retained	120W, 6 line + MM/MC logic-controlled input switching		97
Philips FA960 MkII £300	Good + Average	The MkII '960 still failed to grasp our listeners' attention, but it remains a competent amp nonetheless	122W, 6 line & 2 disc inputs + tone controls		68
Pioneer A-300 £160	Very Good Good	The cheapest of Pioneer's dynamic duo gives off its best with CD rather than MM disc which failed to shine quite so brightly.	55W, 3 line, 2 tape and MM. Independent rec out facility.	R	92
Pioneer A-400 £240	Very Good Very Good	Pioneer's design concept snaps into focus with the A-400, an amp that seems to bubble with musical detail. A bench-mark that other manufacturers should strive for.	71W, 3 line, 2 tape, MM/MC Independent R-out switching.	BB	92
Proton 520 £115	Average Average	Very well equipped budget amp with a slightly flat and undynamic sound - acceptable at the price though	31W, MM/MC with variable MC gain, 4 line inputs	R	74
Proton AP-1000/AA-1150 £250/£395	Good + Average +	Bags of headroom available from this pre/power combo, but can seem bloated or unrefined via MM	67W, MM/MC, adjustable MC gain, 5 line inputs		80
QED A240 CD II £249	Good + Good	Latest 240CD is fine value for CD and has competent MM disc input as well	45W MM 5 line inputs straight line	BB	62
QED A270CD/PA £369/£429	Good Good +	Recent updates have bolstered the output of the A270 without adding to its colourations. The PA option is a touch expensive	61W, 2 tape, 3 line + MM or MM/MC from PA board	R/-	97
QED C300/P300 £329/£370	Good Good	A cost-effective combo, limited in its resolution but no less beguiling as a result. Disc stage is sweeter but samey	58W, 2 tape, 3 line, MM/MC + mono/biamp opt.	R	85
Quad 34 £366	Very Good Average	This well-built durable preamp has useful filtering and above average tone controls but was found lacking in sound quality (viz: detail/dynamics)	4 inputs MM/MC tone controls		44
Rational Audio £175	Average- Average+	This wacky newcomer from Czechoslovakia offers a very open and fluid sound via CD but its performance via MM depends very much on the cartridge's load impedance.	129W, caters for line and MM disc sources but has no i/p selector.		92
Ray Lumley Model 75 £1995 pr	Average Good +	Monstrous valve monobloks which represent good value. What they lack in musical subtlety they make up for in sheer muscle. And these are Lumley's small monobloks!	75W monoblok		78
Revox B150 £1047	Very Good Average +	Beautifully constructed but hampered by Revox's convoluted logic control. Open and smooth sound. Still costly.	117W, CMOS sw. for 3 line, 2 tape and MM		68
Revox B250 £1467	Very Good Good	With much improved sound over its predecessors plus amazing remote control facilities, this could form the heart of a round-the-dream-house system	150W MM/MC system/house remote tone controls		56
Rose RV-23 £395	Good Very Good	Beautifully built classy British 'hybrid' preamplifier. You can spend more to get a more transparent sound - but it's hard to criticise the Rose given the competitive price	MM plus 3 line inputs	R	77
SAE P102/A202 £499/£599	Average + Average +	Microprocessor-controlled pre and power amp that sounds much better at low rather than high volume levels. Pro-oriented aesthetics	151W, MM/MC + 2 liner and 2 tape, tone memory, spk switching		74
Sansui AU-X111 £100	Good Average	Sansui has engineered an amp that's both solid and flexible for the price, but its sound is rather bland compared to competition in the £110 sector	5 line inputs, MM, 52W		92
Sansui AU-X911DG £700	Very Good Good +	At its best when used with the on-board MASH/PWM DAC where it sounds technically neutral but still emotionally charged	112W, 4 dig, 3 line and MM/MC i/p's. Rec-out	R	85
Sony TA-F630ESD £350	Good Average	Based on the '530 but equipped with PDM D/A converter. Amp is competent but DAC sounds truly magnificent!	130W, as above + opt. and coax digital inputs	R	74
Sony TA-F730ES £450	Very Good Good	A very stable and coherent amp but one that lacks a crucial sense of involvement	133W, MM/MC, 3 tape, 2 line, full rec-out		80
Sound Audio VP3a/HBP60a £599/£599	Good Average ++	Hybrid power amp and valve line stage. Big 'n' beefy power amp is the stronger partner	4 line, 1tape 60W	R	100
Sugden A21a £395	Average+ Good	The modern-day relative of Sugden's original Class A amp and one that offers a smooth, easy-going sound. Best partnered with sensitive speakers	25W power amp with a good 16W inPure Class A.		92
Teac A-X400 £115	Average Average	Sibilance and a lack of crisp vitality hamper the performance of this amp, as does the stringent protection circuitry	59W, 4 line + MM + tone + mic i/p level control		85
TEAC A-X5000 £229	Good Average -	This amplifier is compromised by a grey and muddled sound that taxed the concentration of our listeners. Better via MM disc	107W, 3 tape, 3 line + MM/MC. Source Direct		97
Technics SU-810 £130	Average + Average	Our sample started off sounding fast, taut and well-integrated yet eventually failed on the MM disc input	66W, 2 tape + 3 line + MM. Tone + loudness		85
Threshold FET 10e system/Stasis SA-4 £5824/£6028	n/a Very Good	Almost valve-like limpidity and excellent soundstaging are star qualities of the Threshold amps. Line input resistive loading is too low	Component FET phono stage, line pre, FET power amp 100w		Coll. '90
Woodside SC26/STA35 Renaissance £1931/£1323	Good Good+	Synergistic pairing with a cool, controlled sound, good focus and transparency. More about poise than grunt	35W, valve, 3 line, optional MM or MC, 2 tape outs		100
Yamaha AX-330e £100	Average + Average +	An improvement on earlier efforts but still a little bland or lack-lustre. Very compatible though	48W, MM, 3 line inputs, source-direct option		80
Yamaha AX-550 £240	Very Good Good	Beautifully built and offering the flexibility of remote control, the AX-550 sounds tidy and neutral yet lacks the ability to involve on an emotional level	131W, 5 line + MM/MC. Pure Direct + remote control		97
YBA 1 power amp £2995	Good Excellent	This equally well finished power amp offers front rank stereo staging and transparency, and is capable of driving the most difficult loads	85W	R	62
YBA 1 preamp £2895	Very Good Excellent	A front line French audiophile product. Great stereo and a fine Krell style finish	MM/MC, 3 inputs, straight line	R	62
YBA 2 pre & pwr £1395/£1695	Very Good Very Good	Superbly finished French separates, with very good space and transparency, slightly softened bass. Needs extra transformer (£300) for MC cartridges	70W MM (MC extra) straight line	R	56
YBA Model 3 £995/£995	Good Good	Suited to highish sens. loudspeakers this duo produced see-through, ethereal stereo images that were more convincing towards the centre of the soundstage than at the edges	56W stereo amp MM only with 3 line i/ p's.		72

Watch out for loads more amplifier reviews
in the next issue of Hi-Fi Choice.
On sale February 14th.

The Directory

CABLES AND CONNECTIONS

Although cables and connections are sometimes thought to be the least important items in an audio system there has been a growing awareness in recent years that they have a significant effect on sound quality. To this end there is now a vast array of exotic cables and interconnects available to those interested in experimentation.

The key observation on cables is that they are much more than mere accessories. Carrying the audio signal, just as any amplifier does, it's really not too surprising that they can influence sound quality.

The characteristics of any cable are determined by the materials and topologies utilised in its construction. The purity of the conductor, nature of the insulator dielectric, mechanical construction, physical geometry, RF characteristics, efficiency of screening and finally the connectors themselves, all play vital roles in the sonic character. These factors tend to vary more with interconnect cables which are used to carry the signal between active components like pre and power amplifiers. The interconnects summarised here were tested in 1m terminated lengths and therefore the results and prices relate

to that length - some cables may well perform differently when used in longer lengths.

What's more, most cables are significantly cheaper if you are prepared to fit the plugs yourself.

The features column contains information on the material makeup of the different cables with the following abbreviations: OFC - oxygen free copper, OFHC - oxygen free high conductivity (Audionote defines HC as high crystal), PC-OCC - pure copper by ohno continuous casting, LC-OFC - linear crystal oxygen free copper.

CABLES - INTERCONNECT

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Audio Note Copper ANA £44	Average Good	ANC sounded punchy with a faintly lean but tightly-focused bass character. This crystalline precision waned slightly at higher frequencies	OFC copper twin-axial	R	59
Audio Note Flexible Silver ANS £99	Average Very Good	ANS scored a hit with its transparent midband and revealing but quite unforced treble quality. Bass transients were slightly softened	Silver signal & Copper screen	R	59
Audio Note Silver ANV £154	Poor Excellent	Far weightier-sounding than the flexible ANS, ANV interconnect also possesses a fair degree of treble clarity and sparkle	21 strand silver Litz		59
Audio-Technica AT-6115 £40	Very Good Average	This cable sounds somewhat 'quieter' than the original LC-OFC interconnect, but is also less transparent and three dimensional	PC-OCC copper coaxial		59
Audioquest Livewire Ruby £49	Average Good	Smoother sounding than the Topaz, the extended crystal Ruby is less grainy and coarse, better able to resolve complex passages	FCL copper twin axial	R	59
Audioquest Livewire Topaz £35	Good Average	Sounding 'bigger' and faintly richer than Reference 2, Topaz was also slightly grainy at the top end	Gold-plated plugs, OFHC copper		59
Budget OFC Circa £7	Average Average	Subjectively, this cable did lift much of the aural fog experienced with scrawny standard hook-up leads.	OFC		59
Budget Patch Cords (see text)	Average Poor	As thrown in gratis with cassette decks and the like - frequency extremes were restricted and performances were veiled	Thin coaxial		59
Chord Mono-t £27/1.2m	Average + Average +	Offers a slightly rolled-off treble but its rich sound is an upgrade from patch-cords	Unsymmetrical 4-conductor cable	R	83 Supp
Deltec Gortex Black Slink £152	Very Good Excellent	A true reference quality cable providing an exceptionally detailed and transparent sound	Symmetrical, 8-conductors, Gore-tex ins.	R	83 Supp.
Deltec Slink £32	Good Very Good	Ideally used in lengths of under 4 metres, it errs on the lean side of neutral but has an uncommon transparency in the midrange	4 silver plated OFC strands PTFE dielectric	BB	59
DNM Solid-core £23	Average Good	Transparent in the midband and full of sparkling detail in the treble, low bass was slightly curtailed (undermined price £2.30 per m.)	Single strand nickel-plated copper. Unshielded	R	59
Kimber Kable KC-1 £65.55	Very Good Average	Tonally faintly leaner and brighter than the more open-weave PSB, KC-1's treble detail was just too sharp and grainy	Multi-gauge PTFE dielectric		59
Kimber Kable PSB £41.40	Very Good Very Good	An exceedingly transparent midband but slightly 'clanky' treble. It always managed to sound remarkably uncluttered and open	OFC, PTFE dielectric	BB	59
Monster Interlink 300 £30	Average + Average	A big, larger-than-life sound but with some emphasis of midband detail and loss of bass	Screened, symmetrical cable		83 Supp
Monster Interlink 400 £50	Good Good	Bass is solid and punchy, counterpointed by a slightly overblown midband which tends to make vocalists sound larger-than-life	Multi-gauge	R	59
Origin Live Soli-Core Super £60	Good Average	Improves over previous Soli-core samples in stereo depth and bass weight, but a 'loud' treble presentation remains	Solid-core gold-plated AT plugs		59
QED Incon Graphite P1G Gold £19.95	Average Average	A shielded version of Incon P1, it sounded thicker at the frequency extremes, the top end being coarser and more out of focus. Good for long runs though	OFC Graphite shielding	R	59
QED Incon P1-Gold £16.95	Good Good	A lively open presentation that just borders on the lean side of neutral, the quick and lucid delivery affording considerable musical insight	OFC, gold plated Deltron plugs	BB	59
Sterling £250	Average Good	Possessing a neutral if faintly rich overall balance, it supplies a pleasantly open and transparent perspective. (Reviewed in pre-production form.)	2 silver strands per conductor		59
Supra EFF-1 £60/0.75m	Average Average	A new, costly and mildly disappointing addition to the range. Edgy, smeared sound	Screeded, symmetrical dir. cable		83 Supp.
van den Hul D300 II £44	Poor Good	It tended to highlight some upper mid detail, but a generally open and spacious acoustic proved its saving grace. Slightly soft at LF	Silver plated single strand VdH plugs	R	59
van den Hul MC-Gold £230	Average Good	It possesses a rich and beguiling treble balance that matches a weighty, slightly warm bass character. Seductive balance may prove worthwhile in some circumstances	Silver & gold plated copper		59
van den Hul MC-Silver £750	Good Good	Although remarkably transparent for an asymmetric design this costly cable was not considered to be of 'state-of-the-art' standard, and is bettered by cheaper models	19 silver plated copper strands		59
van den Hul MCD-102 III £61.50	Good Good	Possessing the same endearing qualities as the D300, it presented open and transparent soundstages and improved timbral resolution	Twin axial silver plated copper	R	59
van den Hul Thunderline £92	Good Average	Thunderline essentially parallels the sonic performance of the cheaper D102. HF is occasionally tainted by a 'tizzy' coarseness, bass is tight and dry	Silver plated 'matched copper'		59
Yfere LC-OFC Quad £85	Very Good Very Good	New cable with a very refined sound. Very transparent with good sense of focus and space	Symmetrical, star-quad with screening	R	83 Supp.

CABLES - LOUDSPEAKER

Absolute Wire Force 4 £4.75 per metre	Good Average +	By current standards there was a loss of fine, sharp detail at the frequency extremes, but it has a big, friendly sound	744 OFC strands, PVC dielectric		64
Audio Innovations OR-200 £16 per metre	Average + Average +	Open and detailed throughout the midband but a grainy coloration tended to corrupt subtle timbral information at very high frequencies	200 LC strands, polyurethane and cotton dielectric		64
Audio Note AN-SP £100 per metre	Average - Excellent	A clean and open sounding cable that offered a deep and pleasantly detailed perspective. Bass was slightly restricted, but seemed tight and coherent	15 silver strands, polyethylene dielectric		64
Audio-Technica AT-6120 £10 per metre	Average + Average	Compared to earlier LC-OFC cables, this PC-OCC derivative sounded smoother and less aggressive	PC-OCC, PVC dielectric		64
Audioquest Livewire Black £15 per metre	Good Good	It proved clear and punchy but with some grain across the treble. Nevertheless Black remains an interesting concept and proved better than Livewire Green	OFC, surface only - foam core construction	R	64

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CABLES - LOUDSPEAKER

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Bellwire 12p per metre	Poor Average -	Broadly speaking it delivered a bright and tizzy sounding treble with a fairly open and detailed mid with little or no bass resolution	0.5mm single strand, PVC dielectric		64
Cyrus £2.50 per metre	Average + Good	Because of its impedance characteristic this cable will deliver a smooth and unfatiguing treble balance with loudspeakers offering an easy load	0.8mm single strand, PVC dielectric	BB	64
Deltac 8S £144 - 5m pair	Good Good +	The unerring transparency and detail resolution of 8S throughout the midband makes it a cleaner and more spacious sounding cable than others at the price	4 silver plated OF copper strands, PTFE	R	64
Deltac Gortex Black 16 £528 - 4.5m pair	Very Good Excellent	Improvements in bass resolution, transparency and treble poise maintains status of this cable	Silver-plated OF copper with Gore-tex ins	R	83 Supp.
DNM Solid core £3 per metre	Average Average	A good general-purpose solid-core, though too bandwidth limited for high-end applications. Sounds great in some systems	0.65mm single strand, webbed PVC dielectric		64
Exposure £2.50 per metre	Good Good	It could sound a trifle matter of fact but this emotive flattening was also somewhat dependent on the music program. It is also highly suited to long runs	56 OFC strands, webbed PVC dielectric	R	64
Furukawa FS-2F09 £3.50 per metre	Good Average +	Some loss of bass weight but otherwise offers a fresh and open sound. Good value	Multi PC-OCC stranding, PVC dielectric	R	83 Supp.
Furukawa FS-2T15S £50 per metre	Good + Very Good	An advanced solid-core cable with a highly fluid, detailed and inherently musical sound	Single 1.5mm Super PC-OCC	R	83 Supp.
Kimber 4VS £7.15 per metre	Average + Average	Similar construction to 4TC but dissimilar materials infer a slightly tizzy sound	Open-weave, multistrand, PVC ins.		83 Supp.
Kimber Kable 4PR £54 - 5m pair	Average Average +	This directionally marked cable benefited from an open and airy treble quality but seemed notably leaner than 4TC. Bass was well round and satisfyingly taut	4 x 7 copper strands per conductor, PVC diel		64
Kimber Kable 4TC £17.65 per metre	Good Good +	4TC made a great impression in the listening tests with an open midband, a smooth and unfatiguing treble with slightly rich but suitably weighty bass	OF copper, PTFE dielectric	R	64
Linn K20 £2.95 per metre	Good Average	Subjectively, it erred on the forward and bright side of neutral but enjoyed an essentially clear and punchy delivery	56 OFC strands, webbed PVC dielectric		64
Monitor PC Silverline PC4 £5.75 per metre	Good Average	Sonically, it laboured under a heavy and claustrophobic balance, lacking the see through transparency and lucidity of the better solid core cables	2072 x 0.07mm silver plated copper strands		64
Monster Original £3.49 per metre	Good Average +	Original sounded relatively congested and murky at higher frequencies but possessed weight and conviction in the bass	Multistrand		64
Monster SCI 16-4 £3 per metre	Average Average	Not as thick-sounding as early Monster cables but still slightly unbalanced. Versatile construction	4 x 16-gauge conductors, OFC strands		83 Supp.
NVA LS1 £6 per metre	Average + Good	A light and breezy sounding cable best suited to short lengths, NVA benefited from a clear and transparent outlook	7 x 0.25mm silver alloy strands, PTFE	R	64
QED 79-Strand £1 per metre	Good Average	For much of the last decade QED 79-Strand has been the first port of call for enthusiasts on the upgrading ladder, a tradition that should still hold true today	79 strand, PVC dielectric	R	64
QED Fiat 200 £2.20 per metre	Good Good	I detected a degree of confusion at low frequencies but this did not stifle the acoustic atmosphere which remained open and positive	200 strands, flat webbed PVC dielectric	R	64
QED Incon Graphite £2 per metre	Average + Average +	This graphite version of Incon sounded cruder and generally more heavy handed than the cheaper unshielded type. Overall presentation was mildly restricted and cloaked in a faint aural fog	OFHC, polymeric screen		64
Rotel Supra 10 £8.95 per metre	Good + Good	Supra 10 provided a very free and open sound that was unhindered by any excess at low frequencies. Worth its weight in scrap copper!	2,562 OFC strands, webbed PVC dielectric	R	64
Rotel Supra 4 £3 per metre	Good + Good	Ideal for both long and short runs, it furnishes a big sound that benefits further from a smooth, unfatiguing treble	1,036 OFC strands, webbed PVC dielectric	R	64
Solid core lighting cable 36p per metre	Average + Good	It enjoys much of the smooth treble and articulate midrange usually associated with the better solid core derivatives. Lean but taut and rhythmically coherent	1.5mm square, 3 cores, PVC dielectric	BB	64
Townshend Isolda £400 - 5m pair	Average + Good	Isolda possessed a truly dark background out of which rose a very solid and extended bass together with an excellent sense of transparency through the upper octaves	8 coax cables per conductor - very thick	R	64
van den Hul CS-122 £6.50 per metre	Average + Good -	Characterised by a driving and powerful bass, CS-122 is a heavy sounding cable. Mid treble detail was refreshingly clear but there was a slightly muted air about the extreme treble	19 x 0.45mm silver plated strands, rubberised dielectric	R	64
van den Hul D-352 £12 per metre	Good Average +	Subjectively it sounded like CS-122 only more so, the deep rumbling bass tending to overwhelm subtle musical details. It also appeared a trifle peaky in the treble	7 x 0.76mm + 168 x 0.125mm silver plated strands, rubberised diel.		64
van den Hul SCS-12 £10 per linear metre	Good + Good +	SCS-12 set a high standard with a tight and well focused soundstage populated with tactile stereo images. Bass wasn't as extended or resolved as some other cables	19 silver plated strands of 12 different gauges, PTFE dielectric	R	64
van den Hul SCS-2 £99.95 per linear metre	Good + Good +	Overall it was commendably neutral and transparent but nothing less would be acceptable bearing in mind the tremendous cost of a stereo pair	665 silver plated matched crystal copper strands, PTFE dielectric	R	64
Vecteur R-CV30 £5.40 per metre	Average Good	Subjectively the better of Vecteur's cable line-up offering a neutral overall perspective but slight loss of detail resolution at both frequency extremes	4 x 0.8mm LC-OFC PTFE insulated strands	BB	64

CASSETTE DECKS

The bad odour of copyright theft hangs around the compact cassette, but there is no doubt it is the world's most versatile and ubiquitous music storage medium. Hi-fi buffs may wrinkle their noses pointedly, but are still happy to use cassette decks to make up tapes for the car or personal - at the same time complaining loudly about the quality of pre-recorded material. (In fact the very best decks can do a surprisingly good job with musicassettes.)

There is no problem in connecting a cassette deck to any normal amplifier, but some care needs to be taken in choosing the best tapes for a

specific machine. (Trial and error is one effective technique, but many decks have manual bias adjustment and some match up to the tape automatically.)

Lab performance and sound quality often go hand in hand, and are frequently somewhat dependent upon factory alignment. The mechanical integrity of the mechanism itself is another crucial factor, that is often reflected in the asking price.

All modern hi-fi decks have Dolby B and the majority have Dolby C besides, the very worthwhile HX Pro system is becoming steadily

more widespread. Remote control remains rare, though sometimes it is available as a system option.

Three-head recorders allow simultaneous checking of the recording being made. Auto-reverse is a useful convenience feature, but usually with some mechanical compromise, while double-mechanism 'dubbing' decks of dubious quality are fashionable at the bottom end of the market. The welter of different 'music search' systems available is some indication of their frequent ineffectiveness.

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Acoustic Research R0-06 £300	Average Average	Acceptable middle market player with very simple facilities and cramped control section, but unusually good looks	Dolby B/C/HX Pro, fine bias, counter memory, repeat		69
Aiwa AD-F410 £100	Average Average	Comparable to AD-F500 but cheaper: Good all round performance, well adjusted, useful basic and not so basic features	2 head, Dolby B/C/HX Pro, bias adjust	BB	99
Aiwa AD-F500 £160	Average Good	Noise levels are a little higher than usual, but sound quality is otherwise very good - open, explicit and very neutral tonally.	Dolby B/C/HX Pro, cue/review, fine bias, record sensitivity adjust	R	93
Aiwa AD-F810 £200	Good Good	First class budget 3-head machine with a dual capstan transport that really works at reducing the 'fudge' factor	Dolby B, C, HX Pro, bias adjust, track search, variable hdp	BB	99

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CASSETTE DECKS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Aiwa AD-WX616 £160	Poor	Sonically sub-standard twin transport deck which has sensible range of well implemented features, yet which sounds compressed and uneven	Twin full logic, 1 records, Dolby B/C track search	R	93
Aiwa AD-WX777 £190	Very Good	Excellent, middle price dual deck with quick side change and a living, breathing sound - though prerecorded tapes sound bright	Twin auto-reverse, one records. Dolby B/C, fine bias	BB	75
Aiwa AD-WX888 £260	Good	Inaccurate set-up spoils metal tape operation, but with other tapes the deck works well. This deck offers fine engineering, facilities and sound	Dual auto-reverse twin deck, Dolby B, C and HX Pro	R	75
Akai GX-32 £170	Average	Constrained and smeared sum up this deck well. It has poor bass and treble definition alike, though it proved well aligned for prerecorded cassettes	Dolby B/C, variable bias, headphone out, track search		69
Akai GX-52 £250	Very Good	Well finished and a pleasure to use, this well specified deck sounds clean and defined with all tape groups, with or without Dolby	Dolby B, C, HX Pro, track locate features	BB	57
Akai GX-65 £300	Average	Fine ungimmicky middle ranking deck with simple, purposeful controls, works best with metal tapes. Performance standards fair to good	3-head, dual capstan, Dolby C/HX Pro		87
Akai GX-95 £400	Good	Well designed and finished cassette deck with features well judged to please the audiophile. The calibration system is simple and effective, and the deck sounds great	Dolby B/C/HX Pro, 3 head, manual tape set-up	R	69
Akai GX-95II £400	Good	Sharp, clear and articulate sounding deck, with superb performance extending to frequency extremes	3 heads, dual capstans, tape calibration, Dolby B/C/HX Pro	R	99
Akai GX-R35 £200	Average	Middling sound quality at best with Dolby B; deteriorates with Dolby C and unsatisfactory anyway with testing material due to loss of low level information	Auto-reverse (optically triggered), Dolby B/C/HX Pro, bias adjust		99
Denon DR-750A £250	Average	Workmanlike and simply equipped dual deck which is more appealing on audio grounds than most of its type	Dual transport, Dolby B, C & HX Pro	R	99
Denon DRM-510 £140	Good	An amnesic Dolby switch and lack of timer standby detract from an otherwise strikingly successful deck with a consistently good performance	2 heads, Dolby B/C/HX Pro	R	99
Denon DRM-700A £230	Very Good	Simple but adequate features, lacks only timer standby. Musically this deck equals the best at this price level despite some clouding of transients with Dolby B.	Dolby B/C/HX Pro, fine bias, 3 heads, record return	BB	93
Denon DRW-650 £200	Average	This simply equipped model is a little fiddly to operate at time, partly because of the way the single set of transport keys is assigned. But sound quality is generally workmanlike - good value	Twin transport, Dolby B/C/HX Pro	R	93
Dual 5850RC £230	Poor	Average-to-middling deck which does most things well and skates over the more subtle things. Control system is uninspired but easy to master. Overpriced	Dolby C/HX Pro, bias adjust		87
JVC TD-R431 £170	Poor	Modestly specified auto-reverse cassette deck which suffers the usual problems of the breed, to wit unstable, homogenised sound quality	2-head, Dolby B/C/HX Pro, auto reverse		99
JVC TD-V531 £260	Average	A simple but potentially Good deck with an excellent transport, let down by poor setting up. With all tapes, sound quality was thin and lacking in both substance and colour	3 heads, dual capstans, Dolby B/C/HX Pro, var bias		99
Kenwood KX-5030 £200	Good	confusing mishmash of listening impressions caused by poor set-up afflicting metal tapes and Dolby C in particular. Promising otherwise	2 head, Dolby B/C/HX Pro, auto-bias, track search		99
Kenwood KX-7030 £260	Good	Fine, articulate middle price cassette deck whose only (mild) failing with some programme material is a just perceptibly synthetic glaze	3 heads, dual capstans, Dolby B/C/HX Pro, auto bias	R	99
Marantz CP230 £330	Average	This is a competitively priced portable recorder though not suited to replay of musicassettes	Dolby B, bias adjust	R	52
Marantz CP430 £400	Average	Uniquely flexible and compact package for outside work which at a pinch can double as a domestic cassette deck. dbx is useful for location work; results with Dolby B are acceptable	Portable 3 head, dbx, fine bias, charger/adaptor	R	87
Marantz SD315 £180	Average	Sound quality is promising, but somewhat offset by 'shut in' top end. Pitch integrity suspect	Dolby B/C/HX Pro, twin transports, one rec/play, one play only. Mic input		93
Marantz SD40 £150	Average	Obstructive aesthetics are offset by apparently good build and sensible features, but sound quality is uneven or worse.	Dolby B/C/HX Pro, fine bias	R	93
Marantz SD50 £230	Good	Fine, exacting all-rounder offering good stereo, precision and focus. Good with prerecorded tapes too.	Dolby B/C/HX Pro, track & intro search, variable bias etc	R	81
Marantz SD515 £350	Poor	Good electronic design is let down by mediocre alignment and poor transport stability. Disappointing at the price	Twin auto-reverse, both transports record, HX Pro, parallel recording		93
Marantz SD60 £350	Good	A first rate, highly capable deck offering energetic yet refined sound largely due to good electronic design	3-head, Dolby B/C/HX Pro, variable bias & sensitivity	R	81
Memorex SCT-5 £150	Poor	Poor example of a twin cassette deck where everything has been sacrificed on the altar of flexibility	1 rec/play, 1 play only transport, Dolby B/C		87
Nakamichi Cassette Deck 1 £700	Good	New modernised Nakamichi is still curiously old fashioned in many ways, but offers unusually articulate sound of great insight	Dolby B/C, 3 heads. dual capstans, var azimuth	R	99
Nakamichi Cassette Deck Two £350	Very Good	Not completely neutral, this deck is assured, dynamic and quick, with abundant detail and some coarseness. Stable transport but rudimentary features accompany fine under the skin engineering	Dolby B/C, manual tape type selection, bias adjust	R	93
Nakamichi RX-202E £600	Good	Fine, clear and articulate sounding player. Excellent with prerecorded material, but idiosyncratic and sometimes obstructive control	Auto reverse, Dolby B, C, 2 head	R	63
Philips FC870 £250	Average	Disappointing at the price, this is a well equipped deck with off-tape monitoring, but a somewhat listless, smeared musical style	Dolby B/C/HX Pro, 3-heads, track/intro search etc		81
Pioneer CT-676 £250	Average	Dull, compressed and hard sounding deck, which is hamstrung by high measured transport flutter. Good points include sophisticated (and accurate) tape alignment	Dolby B/C/HX Pro, auto tape alignment, 3 heads		99
Pioneer CT-900S £500	Good	High spec and well built derivative of CT-93, but disappointingly lacklustre sound	Dolby B/C/S/HX Pro, dual capstans, 3 heads, auto alignment		99
Pioneer CT-91a £550	Very Good	Superb, near state of the art recorder with an excellent dual capstan transport and very capable electronics. At the price, this one is a mould breaker	3-head, tape calibration, Dolby B/C/HX Pro	R	75
Pioneer CT-93 £800	Excellent	State of the art deck, built like something out of NASA's shuttle, with superb all round performance. Dolby S can muddle ambient information, but increases effective dynamic range	Dolby B/C/S/HX Pro, auto tape align, 3 heads, dual capstans	R	99
Revox B215 £1727	Very Good	Fine, consistent and solid sound quality, with excellent under the skin engineering and many useful features — but you're also paying for the same	Dolby C/HX Pro, 3 heads, dual capstans, auto tape align	R	87
Revox B215-S £1826	Very Good	This is a superbly engineered deck with a classically fine performance that almost transcends the stereotypes. Ergonomics are flawed but the user interface is both powerful and flexible	3-head, dual capstan, Dolby B/C/HX Pro, auto calibration	R	75
Revox H1 £1,145	Very good	Bare bones version of B215 is still a sophisticated piece of kit, and lacks for none of the 215's engineering prowess	3 heads, Dolby B/C, auto tape align, semi-auto record level set.		99
SAE C102 £549	Average	Looking most unlike a cassette deck designed in the States and proving competitive in its price group. Not sonically that outstanding, however	Real-time counter, track search, Dolby B & C		52
Sansui D-X211HXR £170	Good	Clean, stable and open sounding recording quality distinguishes this player, - and auto-reverse too. A great improvement on earlier mid price Sansui models, and excellent value.	Auto reverse, Dolby B/C/HX Pro, bias adjust	BB	93
Sansui D-X311WR £250	Poor	Not wholly successful auto-reverse deck which suffers because it has tried to be all things to all people. Lack of clarity is the main limitation	Twin optically triggered auto-reverse, Dolby B, C & HX Pro		99
Sherwood DS-1135C £100	Average	Excellent value. There is a low level constant background drone, and Dolby C recordings sound flat and coloured. Elsewhere sound quality exceeds expectations	Dolby B/C/HX Pro	R	87
Sherwood DS-7000R £230	Average	Rough and ready cassette deck in which sound engineering has been sacrificed on the altar of extra selling features, namely three heads for real time off-tape monitoring	3-head Dolby B/C/HX Pro		87

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CASSETTE DECKS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Sony (WMD6C) Pro Walkman £249	Good Very Good	One of the finest sounding cassette decks on the market today. A mandatory Best Buy, which also fits in your pocket	Dolby B, & C	BB	60
Sony K870ES £350	Average+ Average+	Good but not outstanding deck which proved slightly disappointing on audition. This model is no standard setter	3 heads, dual capstan transport, Dolby B/C/HX Pro, tape calibration		99
Sony TC-K520 £170	Average Good	Fine, assured and detailed performer with a very well designed and straightforward user interface	Dolby C/HX Pro, variable bias, display on/off	BB	87
Sony TC-K570 £200	Good Average+	Good if slightly untransparent sounding recorder, comfortable with all noise reduction circuits and all tape groups	3 heads, Dolby B/C/HX Pro, bias adjust	R	99
Teac V-5000 £300	Average+ Good-	Fine middle ranking heavyweight with blemish free overall performance, beaten only on subtleties by the best at the price	3 heads, dual capstans, bias/sensitivity adjust, Dolby B/C/HX Pro		99
Teac V-7000 £400	Good Good	Intrinsically sharp, clear and solid sound spoiled by exaggerated detail with prerecorded material and losses imposed by Dolby circuits	3 heads, quartz locked dual capstans, tape align, Dolby B/C/HX Pro		99
Technics RS-B965 £350	Very Good Very Good	Messy control layout, but ultra capable deck with clear electronics and excellent headroom, low noise, an ultra-stable transport - and first rate sound quality.	3 head, dual capstan, Dolby B/C/HX Pro, dbx, assisted tape alignment.	R	93
Yamaha KX-250 £150	Good Good	Excellent if somewhat fiddly deck with all mod cons. Play trim helps bring recalcitrant tapes back into line. Refined, expressive sound quality and stable transport	Dolby B/C/HX Pro, Intro Scan, Play Trim	BB	93
Yamaha KX-330 £180	Average Good	Cramped control panel but a strong, dynamic and comparatively stable performance distinguish this strong middle-price deck	Dolby C/HX Pro, optional remote control	R	87
Yamaha KX-530 £230	Good Good	Excellent all-rounder that does most things at least competently and many things well. One of the best middle price decks	Dolby C/HX Pro, 3 motors, optional remote control	BB	87
Yamaha KX-650 £300	Average+ Good	Fine audio manners, especially in the midband and treble, mark this high class deck out from the crowd	3 heads, dual capstans, Dolby B/C/HX Pro, play trim, bias adjust	R	99
Yamaha KX-930 £400	Good Average	Worthy but ultimately slightly disappointing mixture of fussy ergonomics and tidy but cluttered sonics	3 heads, dual capstans, Dolby C/HX Pro, remote control		87

CD PLAYERS

Now nearly a decade old, this all digital music source is well established despite high disc prices and the opposition of many hi-fi enthusiasts. Compact Disc's strengths over conventional vinyl are complete freedom from surface noise, ease of use, and more robust software. Remote control is just about standard on all new players.

However, many vinyl enthusiasts find CDs

sound less involving than top quality vinyl.

Prices average out at a little over £200, although entry level models are now available for little more than £100. Even the most basic models can sound very good indeed and employ state of the art decoding chips and the most useful play features. Extra money can buy remote volume control, audio 'tweaks', plus improved build and component quality control.

Digital outputs facilitate an easy upgrade path

Machines can be split into bitstream and multi-bit with each school having its adherents. Bitstream is the newer technology and will probably win in the end, although the development time spent on multi-bit systems means that excellent results can still be obtained

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Acoustic Research CD-06SE £450	Average- Average-	Basic Philips machine with beefed-up chassis and a revised analogue board. Distortion is higher than normal while the sound lacks both immediacy and clarity.	Remote control, programming but no direct track access, 16bit 4x		95
Acoustic Research CD-07 £300	Good Good	AR's first Bit Stream CD player relies heavily on Rotel know-how to produce a smooth, detailed but undemanding sound	Few features on player, remote, dig o/p. SAA7321 PDM DAC	R	100
Aiwa XC-700 £180	Good+ Very Good	Generously equipped player that harbours a top Philips' Bit Stream DAC. Offers a characteristically smooth and effortless 'bitstream sound'. Exceptional value	Remote control plus index skip, midship transport and 7350 PDM DAC	BB	95
Aiwa XC-900 £210	Good + Good -	The loss of transparency and general awkwardness of this player comes as a surprise after the XC-700. Extra features have taken their toll	Remote control with variable o/p, midship transport, 7350 PDM DAC	R	100
Akai CD-52 £249	Good Good	A nice surprise from Akai, genuinely good sound from this mid-priced model. Better linearity will help further	Remote, digital output, headphone socket	BB	64
Akai CD-55 £230	Good Average -	Budget model which fails to compare with the CD52	Remote, hdph, Good programming		83
Akai CD-62 £330	Average Very Good	Looks, build quality and the technical specification are right up to date. As it stands it sounds very good but if the indifferent lab performance is improved, it would probably sound even better	Remote, programme, hdph, comprehensive display etc	BB	70
Akai CD-73 £450	Good Average	A little uneven musically, the Akai tends to smother fine detail, but has first class dynamics and stereo imagery. Worth auditioning	Track entry keypad remote, menu display (switchable)		62
Akai CD-93 £700	Good Very Good	Undoubtedly a CD player of real class in build, presentation, lab performance and sound quality, but also a shade expensive for formal Recommendation - though that's not to dissuade lovers of black lacquer wood finish	Track entry remote, menu display etc.		58
Arcam Alpha £420	Very Good Very Good	Arcam's new star, its best CD player yet and great value	Remote, etc, coax dig. out	BB	83
Arcam Delta 70.3 £650	Good Good+	Latest in a line of Delta 70 CD players and one that offers a distinctly rugged, beefy sound. Plenty of power behind individual instruments but lacks a feeling of involvement	Remote control, display dimmer, variable and dig outputs. 7350 PDM		95
Ariston CD1 £400	Good Good	Easy on the ear compact disc for those who like their music Radio 2 flavoured. And it looks good	digital output, remote control	R	87
Ariston Maxim CD2 £550	Good+ Good+	Yet another re-worked Philips player with chunky alloy casework and sophisticated analogue stage. Narrowly escaped a recommendation with its dynamic and purposeful sound. Still a hint of graininess through the treble	Remote control, coax digital output. 16bit 4x chipset.		95
Cambridge Audio CD3 £649	Poor Good +	Unique internal configuration gives the CD3 a fluid and detailed sound falling off at the frequency extremes. The controls and displays are primitive	Optical/electrical digital out, remote control		87
Carver TL-3100 £340	Average Average -	The sound quality did not live up to the excellent fascia. Carver's DTL did not aid the indifferent sound	DTL sound shaping, usual facilities, remote, memory		76
Carver TL-3220 £495	Good Average	A lightweight player with primitive display. We thought it sounded rather sparse and dry, and though Carver's DTL feature certainly fleshed-out the bass it also softened the stereo focus	Remote control with volume keys, 'Digital Time Lens', 18bit 8x		95
Carver TL-3300 £595	Good + Poor	Carver needs to listen critically to CD sounds; in our opinion. DTL does not improve the recipe	DTL, remote, programming, digital output		83
CEC 880CD £230	Poor Average	The dynamic and spritely sound of this machine is gratifying in the light of its primitive design but is otherwise poor value	Remote control, direct track access, dig o/p, hybrid PWM DAC		100
Denon DCD-1460 £400	Good+ Average+	Here's a player that benefits from solid casework and decent features yet the overly complex electronics knock the stuffing from its sound	Remote control, volume, index search. 18+2-bit DACs		100
Denon DCD-2560 £550	Very Good Good	Beautifully built and, once again, generously equipped yet with a sound that's decidedly sluggish or reserved, particularly through the bass. Vocals are more forward but can sound a little glassy	Remote, pitch, tape edit features, opt/coax digital output, 20bit 16x.		95
Denon DCD-860 £250	Average+ Good+	This is a well designed and generously equipped budget player that offers a very spacious and appealing sound. There's a hint of treble emphasis but it still sounds great at high volumes!	Remote, pitch and full tape edit facilities. 18bit 8x.	R	95

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MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Denon DCD-960 £300	Good + Average	A fine feature package with good lab results, but unfortunately an unexceptional sound quality	Remote inc vol, hdph, keypad, well featured		88
Ferguson CDO07 £130	Good Average	The cheapest recommendation in the test group; don't expect the earth but the value is good	Manual, digital output, headphone R socket		64
Ferguson CDO08 £150	Average Average	Not as strong as its relatives, sample fault perhaps? Though performance is fair enough overall	Remote, midi digital output, 2x O/s, timeshare 16 bit		64
Goodmans GCD-435 £140	Poor Average -	Goodmans has the power to source with more care than this, music centre quality!	multibit, remote, basic facilities		88
Harman Kardon HD7450 £300	Good Average	A very stylish machine but one that is let down by its aggressive and 'dirty' treble quality which pierces through most types of music. Weak bass resolution undermines the 'roots' of the player	Remote control but no headphone socket. MASH/PWM bitstream		95
Harman Kardon HD7500II £350	Good+ Good+	An update of the original HD7500 but featuring superior analogue electronics to the HD7450. Tonal integration is much improved, packed with detail that's expressed with enthusiasm.	Remote, variable, digital and headphone outputs. MASH/PWM	R	95
Harman Kardon HD7600II £429	Good+ Average+	Based on the HD7500II but with a motorised volume control and extra-heavy casework. Either way it lacks the transparency and sparkle of the cheaper machine	Remote, variable and digital outputs. MASH/PWM DAC		100
Harman Kardon HK7300 £200	Average Average -	Budget low bit technology, does not deliver enough for a recommendation	No remote, no digital out; basic control features		83
JVC XL-V231 £149	Excellent Average -	Text book lab result but below par sound, nice and boring. Must be some potential here	Remote, hdph (fixed), JVC 1-bit PFM		88
JVC XL-V241 £160	Good Average	Even with its mkII PEM DAC this new machine sounds pleasant but not especially interesting. Stereo imaging is a trifle suspect	Remote control, slim centralised drawer, PEM bitstream DAC		100
JVC XL-Z1011 £520	Very Good Good+	JVC's current flagship combines old K2 technology with PEM bitstream to deliver a full, beely and engagingly dynamic sound	Remote control, variable and digital outputs, PEM bitstream	R	100
JVC XL-Z431 £200	Very Good Average-	This is a player that started life off the back of the successful XL-V231 but whose performance fails to come up to scratch. The sound is weak and uninspiring - poor use of JVC's PEM DAC.	Remote operation, motorised volume + tape edit. PEM bitstream		95
Kenwood DP-4030 £180	Good+ Good+	Kenwood's first and cheapest bitstream player enjoys a deceptively detailed and refined sound but one that is mildly veiled right across the spectrum. Excellent value nonetheless.	Remote, variable and opt digital outputs. NPC bitstream DAC	R	95
Kenwood DP-5030 £200	Good+ Good+	This looks like the DP-4030 but has more in common with the DP-7030 inside. Either way its neutral, uncluttered and intimately detailed sound is better than both	Remote control, motorised volume, R disc file. Sony PLM DAC.		100
Kenwood DP-7030 £300	Good+ Good+	By adapting established Sony bitstream technology Kenwood has moulded its own exceptionally smooth and polite sound. Very nicely built machine with midship transport mechanism.	Remote, index scan, variable and optical outputs. Sony PLM bitstream	R	95
Kenwood L-10000 £830	Very Good Good	A beautifully constructed and very stylish player that really only gives off its best when teamed-up in balanced-mode with Kenwood's matching pre/power combination	Remote control, balanced XLR's, 16-bit integrating DACs		100
Luxman D105u £699	Average Average	Visible valves are essentially for show in this rather ordinary player - both sound and lab	"valves", remote inc vol, hdph, well equipped		88
Marantz CD-52 £200	Average+ Good+	Hardly the most neutral player on the planet but its rich, full and very generous sound cannot fail but warm the coldest of hearts	Remote control, FTS and dig outputs. SAA7350 PDM DAC	BB	100
Marantz CD-62 £300	Good Good-	Basically this is a Philips CD850II with Signetics op-amps all plonked into an old CD-50 chassis. Something of a range-filler	Remote control, index, 8-step volume and FTS. SAA7350 PDM	R	100
Marantz CD-80 £560	Very Good Good	A dynamic and bold sound from a machine that is equally bold in appearance. It betrays no fear of the most thundering crescendos yet can sound a little hard or glassy with pop CD's.	Remote, motorised volume + FTS programming, 16bit 4x.		95

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CD PLAYERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Memorex CD1650 £200	Poor Poor	An overpriced music entre player. Surely the giant Tandy corp. can get a better standard than this?	remote, keypad, multi bit, midi		88
Meridian 206B £995	Excellent Excellent	What a stunner! Audiophile quality from the reference one box CD player, and at a most realistic price	Differential bitstream, keypad remote, prgming	R	88
Meridian 208 £1,550	Excellent Excellent	State of the art CD sound combined with a decent preamp and full remote control	Hdph + remote level. Programming, R phase invert, various outputs		83
Micro Seiki CD-M100 £541	Very Good Good	One of the hernia inducing bricks of hi-fi, the Micro is extravagantly styled, finished and built. The good lab performance led to an 'only good' sonic display when the price demanded excellent	Balanced output, remote, display blanking		72
Micromega Logic £500	Good- Good	A rather expensive version of Philips CD624 with new op-amps and CD tray. Still, it does sound rather meatier, better integrated and more purposeful	Remote control, no FTS but switchable digital output, SAA7321		100
NAD 5425 £200	Very Good Very Good	Not much in the way of facilities on offer but a sound that is both wonderfully open, detailed and appealing. This is a very communicative player that sounds positive without being brash	Worthless remote control, track skip/scan, MASH/PWM bitstream DAC	BB	95
NAD 5440 £300	Very Good Good+	The 'no compromise' version of NAD's 5425 but still rather lacking in facilities. Its sound is smoother and richer than the 5425, preferring to seduce with subtlety rather than have you perch on the edge of your seat	Remote with direct track access, variable output, MASH/PWM	R	95
Nakamichi CD Player 2 £625	Average+ Average+	This may look like a CD Player 4 but features a special transport able to store 7 CD's with one in play. Nevertheless its digital electronics are flawed and its sound powerful but blunt	Music bank, remote, volume control, digital o/p, 18 bit DACs		100
Nakamichi CD Player 4 £300	Average+ Good-	Attractively styled but suffers high-ish distortion for a modern CD player. Best suited to up-beat pop rather than complex classical works which seem to lack focus and secure soundstaging	Remote with track access, coax dig. output. 18bit 8x		95
Nakamichi DMS-5EII £1500	Good + Very Good	"... delivers near state of the art performance and build quality in a deliberately starkly functional package, but at a very high price..."	Skip and scan, simple track programming,l		51
Nakamichi DMS-7EII £2000	Good + Good	The only serious criticism here is of the price. And in our opinion you can get better sound quality for less elsewhere in Nakamichi's range	10 digit track entry programming, hdph		51
Philips CD618 £170	Good Good	Cheapest of Philips bitstreamers and quite possibly the best with its excellent definition, punch and sparkle	Remote control, shuffle play, variable headphone, SAA7321 PDM	R	100
Philips CD624 £200	Good Good-	Philips' cheapest Bit Stream machine is still equipped with a vast array of features. Sounds pretty civilised too but lacks the crispness and freedom necessary to set it apart.	Remote, FTS programming, digital output. SAA7321 Bit Stream DAC		95
Philips CD634 £250	Good Good-	The all-singing all-dancing version of Philips' budget Bit Stream player and one that seems better able to cope with the pizzaz and dynamics of a decent recording. Nevertheless it still lacks the lucidity and conviction of the best at this price.	Remote, FTS + Title + personal programming. SAA7321 Bit Stream		95
Philips CD850mkII £400	Very Good Good	This looks just like the original but sounds completely different, trading a little transparency and pizzaz for an altogether smoother but slightly less memorable performance	Remote control, 2 FTS, personal presets. SAA7350 Bit Stream DAC	R	100
Philips CDV185 £350	Average + Average	Hard to value with the video singles facility but it all works well enough for a recommendation	Video singles + CD scart + digital out etc	R	76
Pioneer PD-7700 £250	Good+ Good+	A busy-looking player with an upside-down transport yet one that offers a very tight, confident and dynamic sound. Bubbly and entertaining but still very refined	Remote control, turntable drive mechanism. 1-bit PDM DAC	R	100
Pioneer PD-8700 £300	Good+ Very Good	A pair of PDM DACs builds upon the sound of the '7700, crafting a generous soundstage populated with big-hearted and thoroughly captivating musical images	As 7700 plus index skip, display off and motorised volume. 1-bit	BB	100
Pioneer PD-91 £900	Excellent Excellent	Close to state of the art in nearly all areas - soundstaging, clarity and simple lack of artificiality. A well made and sophisticated player	Track entry remote, calendar display	R	64
Pioneer PD-93 £1430	Very Good Good+	The extremely civil, understated feel of its music contrasts markedly with the over-engineered construction of this unit. It will not offend anyone but then neither will it spark much excitement	Remote with fader and index facilities. Two dig o/p's. 20bit 8x		95
Proton AC-120 £180	Average Average -	Fine styling, low price but barely average performance	15 track memory, simple design, remote, hdph		76
Revox B126 £649	Very Good Good	Made in Switzerland so the build quality and technical performance is high, but then so is the price and the sound quality is only good	Programming, Revox system compatible		70
Revox B226S £840	Good Average	Top quality build and finish for the Revox system enthusiast. For high value sound look elsewhere	Remote vol, hdph, 19 track memory, digital op		76
Rotel RCD-965BX £300	Average+ Excellent	Two years on and the 865's replacement turns out to be an exceptionally refined bitstreamer: transparent, exquisitely detailed and powerfully emotive. A landmark player	Remote control, index skip, digital out. SAA7323 PDM DAC	BB	100
SAE D102 £700	Good Good	Considering the high price of this player, most of the innards seem fairly prosaic. Sound quality and lab performance are both respectable enough, but hardly justify the price premium involved	Remote (inc volume), skip, scan etc.		58
Sansui CD-X311mkII £250	Good+ Good	Sansui's mid-ranked player uses Technics' technology but provides a warm and cuddly sound that's atypical of the breed	Remote control, variable and digital out, MASH/PWM DAC	R	100
Sansui CD-X711 £600	Excellent Very Good	Luxury features, finish and sound from this classy Sansui; no excuses required here	Hdph + vol, remote full programming	R	83
Sharp DX150 £129	Average Average	This is one oversampled player which is rather outclassed for technical and sonic merit by the vast majority of the competition. Pretty enough but would you want to put discs in it?	Programmable, skip, search, repeat		70
Sharp DX750 £179	Average Average	It has a remote control but it's too like the 150 which is rather outclassed for technical and sonic merit by the vast majority of the competition	Remote, programmable, skip, search, repeat		70
Sony CDP-591 £160	Good+ Average+	Tons of features at a highly affordable price but let down by its lacklustre if inoffensive sound quality. The sound of these new Sony players lacks the grip and purpose of the last generation	Remote control, variable and optical digital out. PLM bitstream		100
Sony CDP-991 £230	Good+ Average+	Another well-equipped and well-specified machine and one that can sound very up-beat and detailed with simple material. Tends to loose its way with complex stuff, however	Remote control, Custom File programming, variable out. PLM DAC		100
Sony CDP-X333ES £400	Very Good Good-	This beautifully built player has a very tidy and well-ordered style of music-making, but in the long run it lacks the ability both to excite and involve	Remote control, Custom File programming. Complementary PLM		100
Sony CDP-X77ES £1000	Excellent Good+	Rather like Pioneer's PD-93 this flagship player is beautifully put together but simply lacks the thrill or conviction of cheaper and perhaps more ragged-sounding machines. Still, this sample was well-used from demonstration stock...	Remote, everything but Custom File titling. Complementary PLM DAC		95
Stax Quattro £2995	Very Good Very Good	Now in mkII guise this substantial player recreated exceptionally strong and convincing bass lines together with a beguilingly musical midband	18-bit DACs, 20-track memory, full IR remote, variable o/p	R	72
Technics SL-PG200A £160	Good+ Good+	This season's version of last season's favourite (the SL-P277A) offers extra features and a similarly punchy, dynamic and up-beat sound. All this plus an uncommon poise - Best Buy	Remote control, random play, variable out, MASH/PWM bitstream	BB	100
Technics SL-PS900 £350	Very Good Good-	Just about the quietest transport in existence and a sound that is equally unobtrusive, polite and refined. There's plenty of detail too but the overall result won't set your pulse racing	Huge remote control, function manager MASH/PWM DAC		100
Wadia WT-2000/Digimaster 2000 £5614/£6641	n/a Very Good	Very high grade player which provides state of the art in believable music making from CD, and promises a degree of upgradeability	Transport/multi bit DAC - 32, 44.1, 48kHz o/s	Coll.: '90	
Woodside WS2 £1095	Good Good+	Prompted a mixed reaction on audition, responding well to our jazz and classical selection but sounding bright and grainy with the pop CD's. RF emission is very high	Remote control, display defeat, variable and digital outputs, 16bit 4x		95
Yamaha CDX-450 £170	Average+ Good	A contentious player this and one that prompted a range of reactions from enthusiasm to disinterest among our listeners. It could prove too safe-sounding but worth a try at the price.	Remote control, track access, variable out. 18-bit hybrid DAC	R	100
Yamaha CDX-750 £250	Good Average+	A sleek machine that can sound rich and vibrant with simple material but seems to lack expressiveness and subtlety when dealing with busier, more complex passages	Remote control, variable and digital out, LC display. PDM DAC		100

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CD TRANSPORTS AND DACS

A CD player can be split into two basic components, the mechanism which reads the information from the disc, known as the transport, and the device which turns the digital numbers contained on the disc into the music that comes out of your speakers, this device being referred to as a digital to analogue converter or DAC. Although at the lower end of the market both of these are contained in a single box, at the top end of the market two box machines consisting of a CD transport and a separate DAC become more common.

Although many of these units will be purchased as two box machines, which are generally considered to sound better than a one box equivalent, a DAC can also be used to upgrade an existing CD player. A good example is where an early machine with a satisfactory drive unit but a rather dated DAC can be brought up to the latest spec by the addition of a new DAC.

When upgrading an existing player best results are usually obtained using the electrical digital output rather than optical, and obviously

to be upgradeable your CD player must have a digital output in the first place.

The choice of interconnect is crucial in linking drives and DACs and conventional interconnects used for analogue signals should be avoided, a dedicated 75ohm digital cable will give far better results

Mixing and matching transports and DACs from different manufacturers can be a bit of a lottery and readers are referred to the full reviews where this subject is discussed in more detail.

CD TRANSPORTS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Arcam Delta 170.2 £620	Very Good Good	An upgraded Delta transport, it sounds different but not really better. More research is required here	Transport only, display off, usual programming		88
Kenwood DP-X9010 £500	Average Average +	Compromised by jitter, RF noise and poor clock selection this transport generally encourages a dynamic but bright and edgy sound with most DACs	CD transport, optical + coax outputs, Class 2		96
Marantz CD-95DR £1500	Very Good Good	At its best with Philips-based DACs, this transport sounds confident if not totally pure, sparkling or fresh	CD transport, optical + coax digital, Class 1		96
Meridian 200 £895	Very Good Very Good	Broadly compatible with most DACs and offering a light, fresh and very bubbly sound that is both natural, engaging and unfatiguing	CD transport, optical + coax outputs, Class 1	R	96
Meridian 602 £1,750	Very Good Good	This dedicated CD transport teams-up most successfully with the 606 DAC. Otherwise it lacks the life and pizzaz of the 200	CD transport, optical + coax outputs, Class 1		96
Philips CDD882 £500	Good Good	A butchered CD880 CD player-cum-CD transport that pairs up well with most Philips-based DACs. Dynamic and lively but can also sound a little mechanical	CD transport, optical + coax outputs, Class 1		96
TEAC P-10 £1499	Good Very Good	A chunkier and altogether more successful transport than the P-500 with an especially beefy and compelling sound. TEAC's best	CD transport, coax + optical outputs, Class 1	R	96
TEAC P-2 £2849	Very Good Good	TEAC's flagship CD transport is beautifully styled and constructed but its sound is bleached and generally less inspiring than that of the P-10	CD transport, coax + optical outputs, Class 1		96
TEAC P-500 £649	Good Good +	Provides a smooth and very sympathetic sound with most DACs yet is also rather vague, lacking the crispness and resolution of its peers	CD transport, coaxial and optical outputs, Class 2	R	96
Technics SL-PA10 £470	Good + Good	Built to partner the SU-MA10 upmarket integrated amp/DAC, this transport has the unusual limitation of only optical output. Reassuringly solid and more immune to vibration than most other transports	CD transport, optical output only, remote		88
Wadia WT2000 £5614	Very Good Good +	Based on TEAC's P-2 with outboard mains transformers, active digital output and solid alloy casework. Its dynamic and crisp sound is best realised with Wadia DACs, otherwise it's less impressive	CD transport, AT&T opt + direct-coupled coax outputs, Class 1		96
Wadia WT3200 £1800	Excellent Very Good	Based on Marantz's CD-95DR with new casework, active digital output and revised grounding. Very clean, clear and authoritative sound with Wadia and Philips-based DACs	CD transport, AT&T opt + direct-coupled coax outputs, Class 1	R	96

DIGITAL TO ANALOGUE CONVERTORS (DACs)

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Arcam Black Box 2 £260	Very Good Very Good	An upgraded version of the old BB1 with more inputs and improved sound quality	Optical and wired inputs	BB	76
Arcam Black Box 3 £360	Good + Very Good	Top of a series of three decoders it can offer a high sonic standard with top class transports	Bitsream, auto input switching,	R	88
Audio Alchemy Digital Decoding Engine V1.0 £376	Good Very Good	A very sweet and seductive sounding unit that gives good results with a wide range of CD players/transports	Coaxial and optical inputs, phase invert, Bit Stream DAC	BB	101
Deltec Little Bit (Optical) £400	Very Good Good	Our sample suffered from radiated RF interference but new LB's are now cured. Works especially well with Meridian's 200 transport but does require the services of Deltec's 'Power' mains filter which add £100 to the price.	Coaxial and optical inputs, SAA7350 Bit Stream DAC		101
Deltec PDM1 £500	Average Very Good	A no frills audiophile bitstream converter at an affordable price	Coax-in, special cable and mains filter options	R	83
Deltec PDM2 £2000	Excellent Excellent	State-of-the-art technical performance with a pristine sound to match. Repertoire includes a solid, thunderous bass allied to a transparent midband and sparkling treble. The tops!	Coaxial and optical inputs, phase invert, two-box DAC7	R	101
Meridian 203 DAC7 £510	Good Very Good	This is another broadly compatible DAC that's free of fatiguing nasties yet remains bubbly and exciting. If you find the 606 too sober then the 203 will undoubtedly suit	Coaxial and optical inputs, single-box DAC7 Bit Stream	R	101
Meridian 606 DAC7 £1220	Very Good Good	Extra cash buys you a better standard of construction and finish over the 203 yet by refining its sound a stage further Meridian have also tempered its vibrancy and 'life'. Fickle reaction to different transports	Two coaxial and optical inputs, phase invert, DAC7 chipset		101
Micromega Duo BSII £500	Average Good	This DAC has a tendency to sound light, airy and 'fast' but it can also become a little hard or - fatiguing with some digital outputs. At its best with Meridian's 200	Coaxial and optical inputs, phase invert, SAA7321 Bit Stream		101
Stax DAC-Talent £1400	Excellent Good +	Natural, refined and never over-zealous, the DAC Talent is also capable of sounding very spicy and dynamic. A little expensive but capable of wielding a maturing influence over a light or bright-sounding system	Coaxial and optical inputs, phase invert, mute, 20-bit DACs		101
Wadia DigiMaster X-32 £2000	Average - Good -	Wadia's freaky input circuit gives unpredictable results with non-Wadia transports. Otherwise it can sound bold, dynamic and crisp but lacks the warmth to bind its music together	BNC and optical (Toslink and HP) inputs, 18-bit 32x		101
Wadia DigiMaster X-64.4 £5000	Average Good*	Our (demonstration) sample had not been thoroughly checked before dispatch, leaving us to identify various technical faults. Once redressed, the X-64.4 positively buzzed with vibrant, sharply-etched detail. An exciting sound	BNC + Toslink/AT&T optical inputs, phase invert, 18-bit 64x		101
Woodside DAC2 £510	Good Good +	Based on Woodside's earlier 16-bit CD player and offering a similarly sharp and dynamic sound, all the more captivating for its lack of graininess and 'tizz'. Should be a reliable and cost-effective upgrade	BNC coaxial input (no optical), 16-bit 4x	R	101
Woodside DAC 1 £895	Good Good	Fine but slightly dated and costly package in performance terms - but flexible, musical and t well built	2 electrical + optical i/p. tape out		87

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DIGITAL AUDIO TAPE

DAT, or digital audio tape, has been on the market for quite some time now but has never really 'made it' as a consumer medium, probably due to the fact that very little prerecorded software has been made available.

In the last year or so it has begun to carve itself a niche at the top end of the market replacing reel to reel tape recorders as the audiophile's tape based medium.

The DAT standard specifies a 48kHz sampling rate, which is higher than CD, so direct copying in the digital domain is only possible on those machines with dual sampling frequencies, ie 48kHz and 44.1kHz. Some machines also record at 32kHz to give a longer recording time for a given length of tape.

To try and get around the copying problem many machines incorporate SCMS, the Serial

Copy Management System, a device which enables you to record from a CD but not to 'clone' one digital tape from another.

Portable machines are now entering the market but make sure the price you are quoted includes an analogue to digital convertor, with some portables these have to be purchased separately and increase the price considerably.

DAT

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Aiwa XD-S1100 £550	Poor Average -	A muddled fascia detracts from the appeal of this inexpensive deck, but the real no no is a significant loss of the finer virtues: detail, imagery etc	SCMS, analogue, coaxial & optical in/outputs, full subcode editing	99	
Aiwa XD-S260 £500	Poor	Unlovely sounding deck lacks weight, clarity and presence. Low pricing and mini dimensions excuse many sins however	SCMS, optical/coaxial and analogue in, optical and analogue out	99	
Denon DTR-2000 £800	Good Very Good	Not cheap, but first rate DAT recorder, good to excellent fidelity in all modes, with a slightly cool detached quality when differences are detectable.	Digital LP/digital & analogue SP record/play, LP analogue play only, fade, fine cueing, remote control.	R	93
Kenwood DX-7 £500/£150	n/a Average	Sound quality is pretty fair, but a little rougher than the best of the breed. Controls are good, the display however is poor - and most users will require the accessory pack	AC powered recorder, no analogue LP mode. Optional accessory packs adds battery/ADC & case		94 Supp.
Kenwood DX-7030 £700	Average Average-	Bland sounding deck that lacks low level clarity and imaging. No analogue LP mode. Build quality is good however and ease of use ranks highly	SCMS Remote control, stand-alone DAC facility, analogue/optical/coaxial in/out		99
Luxman KD-117 £1499	Good Good	Slightly soggy, earth-bound sound quality, this model trails the other DAT decks tested so far	Two analogue inputs, remote twin address		63
Sony DTC-1000ES £1299	Very Good Very Good	Only available from professional outlets. Fine, consistent performer with accomplished tape handling and good build quality	Standard track ID and search, remote	R	63
Sony DTC-55ES £550	Very Good Good	Broadly comparable to a middle ranking CD player sonically, the Sony is particularly well equipped and well priced.	DAT with all record modes, inc LP (analogue) record	R	93
Sony DTC-M100 £799	Very Good Very Good	Only available from professional outlets. Clean clear sounding second generation model with most of the features and sound of the DTC-1000ES	Midi-width, alpha-numeric display, remote, optical interfaces	R	63
Sony TCD-D3 £500	n/a Very Good	Compact, well equipped, easy to use and excellent sound, it undercuts rivals by a clear £100. At the time of writing, this model represents the state of the art, and beats all comers.	DAT recorder, detachable rechargeable power pack, LP/SP	BB	94 Supp.

EQUIPMENT SUPPORTS

It's becoming more and more apparent that all the components in a hi-fi system benefit from being placed on the right kind of support. It is already acknowledged that performance of electro-mechanical transducers, such as turntables and loudspeakers, can be greatly improved by using highly rigid supports. This notion has been expanded to include electronics such as amplifiers and compact disc players, and inevitably a broad range of stands and supports have been produced to cater for this requirement.

With loudspeaker stands there seems to be two broad schools of design. The most common

is the open frame type which uses square section steel tubing (usually less than an inch square) made up to form a tripod or quadropod stand usually fitted with spikes top and bottom to ensure good coupling to both floor and cabinet. However, for reasons of domestic harmony this latter option is often not pursued as eagerly as perhaps it should be.

The alternative approach is to use mass. Larger section (approximately 3 inch x 2 inch) tubing is welded between square top and bottom plates and filled with sand and/or lead shot. Again, this type uses spikes at the base but Blu-

tack or the like for coupling with the cabinet.

Equipment supports generally place isolation quite high on the list of priorities and usually use a lightweight steel frame to support an MDF platform. Once again spikes are used to minimise contact with the platform and ensure good coupling to the floor. Minimising weight without compromising rigidity seems to be the aim with turntable supports but those designed for electronics often employ some form of damping to kill vibration, sometimes in the form of mass.

EQUIPMENT SUPPORTS - COMPONENTS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE (H x W x D)	VALUE	ISSUE
Alphason R444 £120	Rack Good	A heavyweight structure with stressed MDF shelves, ideally suited to the Sonata turntable	82 x 60 x 39.5cm	R	83
Audioquest Sorbothane Feet £40 for four	Feet Good	These large gumdrops are very useful for damping vibrations in amplifiers and especially CD players.	6.5 x 2.5cm (circular)	R	57
Cornflake TCS6 £60	Shelf Good	A squat and rigid frame supports a Medite top board with four adjustable spikes, better suited to suspended sub-chassis turntables.	43 x 23 x 33cm		83 Supp
Foundation Stable Table £100 (with Supe)	Table Good	Similar to Stand Design's table though less well finished and certainly less stable	64 x 46.5 x 36cm		58
Origin Live Skyline Super £100	Table Good	An asymmetric table that helps provide a quick, lucid and solid sound with most decks	41 x 50 x 40cm	R	83
Roksan Equipment Table £169	Rack Good	An upgradable/expandable system suited to Roksan's Xerxes if not other competing turntables	65 x 52 x 38cm		58
Sound Organisation Table £55	Table Very Good	A deceptively simple structure that just happens to be engineered in a thoughtful, and ultimately successful manner.	37 x 45 x 35cm	BB	57
Sound Organisation Wall Stand £40	Shelf Very Good	The first of its ilk and still amongst the best, this simple framework represents a vast improvement over standard furniture shelves.	27.5 x 43 x 35cm	BB	57
Sound Organisation 2022 £97	Table Excellent	A small but costly table made from thin steel tubing. Suited to the LP12 but not other decks	49 x 45.5 x 36cm		58
Stand Design Duplex £75	Table Very Good	Well made and nicely finished, this table is broadly compatible with most heavy turntables	63.5 x 46.5 x 36cm	R	83
Target TT2 £64	Table Very Good	Standing up to the best in most areas, the TT2's only real foible concerns a slight loss of bass 'slam'. Design was updated in 1990	52 x 46.5 x 35.5cm	BB	57

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EQUIPMENT SUPPORTS - LOUSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE (H x W x D)	VALUE	ISSUE
Appolo A10 £52.50	4 leg Average	A robust and lightweight model, it would make an ideal upgrade for those still happy with the big boxes of old.	19 x 19cm 44cm	R	58
Appolo A820 £44	4 leg Average	A light open-framed budget design slightly lacking in rigidity and subjectively superceded by other stands costing £10 more.	19 x 19cm 53cm		58
Audio Dimensions Classic 2 £110	4 leg Average	Built in the heavyweight tradition and damped with chalk. Solid, stable, tactile sound	20.3 x 20.3 x52cm	R	83 Supp.
Foundation Fred £70	2 leg Average	With sand filling the Freds made speakers sound tight and coherent with a more even balance.	19 x 19cm 36/43/59cm		58
Foundation Maggi £159 to order	Plinth Very Good	Made for Magneplanar and other similar panel speakers they seem to have a healthy effect on the sound quality thereof.	50 x 2cm 2cm	R	58
Foundation Pi £269 to order	2 leg Very Good	Overpriced in material terms the Pi nevertheless has a very positive effect on the low frequency performance of conventional speakers.	20 x 20cm 25/38/46/5	R	58
Foundation Sir Fred £80	2 leg Good	Upgraded 'Fred' with special in-fills. Sweet sound but one that also lacks bite and edge	19 x 19 x46.5cm		83 Supp.
Goldring Black Satin £65	1 leg Very Good	Screw together stand tastefully hewn from medite. Some loss of bass but still pleasantly rhythmic	18 x 20 46cm	R	83 Supp
Heybrook HBS1 £109	4 leg Very Good	With its new aluminium base frame the HBS1 fared very well in the listening tests. It allowed much of the speakers own 'sound' to remain intact.	23 x 21cm 47cm	R	58
Heybrook P5S £69	3 leg Very Good	An unusual triangulated open frame stand that can help certain speakers sound more transparent and fluent - a good value stand	23 x 21.5cm 47cm	BB	58
Linn Kan II £101	4 leg Very Good	Built to support Linn's Kan speaker this stand is well suited to the task, but is less successful with other loudspeakers.	19 x 16cm 59cm		58
Linn Sara £112	4 leg Very Good	The Sara exhibits some odd properties so its use other than with the Sara loudspeaker should be viewed with caution.	25 x 21cm 53cm		58
Monotrak Engineering M1 £58	1 leg Good	The M1 gave the mid and treble a commendably smooth and detailed presentation but bass sounded rather lacklustre and muddy.	19 x 18.5cm 48cm		58
Monotrak Engineering M4 £58	4 leg Very Good	Begging comparison with Heybrook's HBS1 the M4 maintained much of the openness and forthright detail of that model.	23 x 21.5cm 53cm	R	58
Monotrak Engineering M4S £58	4 leg Very Good	Its stature and stability would seem to mark it out as most suitable for smaller, lighter cabinets. The M4S possessed an open midband and clear treble.	20 x 17.5cm 53cm		58
Origin Live Advanced £145	3 leg Good	One of three related tripod-like stands. Stable sound with good sense of depth and power	22 x 20.6 44cm		58
Origin Live Three Leg £89	3 leg Good	An unusual tripod stand devoid of top plate and taking up more floor space than normal, subjective and technical performance was exemplary.	(support area) 22 x 17.5cm 52cm	R	58
Partington PP4 £60	1 leg Good	The PP4 offers a rather mixed performance, though when damped with sand infill it was less ready to embellish the overall sound and low frequencies became tauter and quicker.	18 x 16.5cm 48cm		83 Supp
QED TS22 Tristand £60	3 leg Very Good	Most tracks sounded uplifted or buoyant, never thick nor coloured. It worked well with most of the speakers tried and encouraged a fluid and revealing midband.	19 x 17cm 45/50/58cm	BB	58
Standesign Z20 £75	1 leg Excellent	Well built and finished with optional sand in-fill. Ideally suited to Wharfedale 505 2's	16.5 x 19 50cm	R	83 Supp.
Target HJ15/3 £107	3 leg Very Good	Sound quality was basically very good though without the sand infill some loudspeakers may sound a little unbalanced as both bass and treble regions are subjectively exaggerated.	28 x 28cm 40cm	R	58
Target HS20 £64	1 leg Excellent	This monopod stand can be used either filled or unfilled and encourages different characteristics in the speakers sound accordingly	19 x 16.5cm 53cm		58
Target T-40 £51	2 leg Very Good	Not very stable, tends to infer a slightly forward, ragged sound with diluted pitch	19 x 19 40cm		83 Supp.

HEADPHONES

There are a variety of different approaches to headphone design, and examples of each turn up in this group. Amongst the more expensive esoteric models, electrostatic drivers are used in square open-backed phones such as the Jecklin and Stax models

The majority of these come with some form of transformer which takes the signal initially from the speaker terminals on the amplifier. The actual speaker cables then travel from this unit

bypass switch to the loudspeakers

The more down to earth models feature dynamic drivers in circular open-backed designs. The advantage of open backs seems to be a correspondingly open sound and a less claustrophobic feel to the music.

One can also of course hear external noises, as well as irritating the hell out of people on public transport.

The third category are closed-back designs,

which are useful in situations where it is necessary to block out background noise. Another means of distinguishing different types is the way they sit on your head

There are three styles: circumaural models enclose the ear and rest on the side of the head; supra-aural designs press on the outer ear (pinna); and intra-aural types rest inside the ear and are popular amongst users of personal stereos.

MODEL PRICE	FIT SOUND	COMMENTS	TYPE	VALUE	ISSUE
Aiwa HP-X30 £31	Good Good -	A flashy personal stereo phone which alternatively could be used at home. A slight LF tonal preference slightly colours the response, but it ain't a bad can	Supra-aural, closed-back, dynamic		75
AKG K1000 £500	Very Good Excellent	One of the best moving coil headphones on the market, hooks directly to speaker outputs and makes much of the competition sound lame. Looks a tad weird	Extra-aural, open-back, dynamic	R	99
AKG K135 £33	Poor Average	Despite a very appealing design the K135s don't live up to the usual AKG standards, though they do have the ability to reproduce rhythm well	Supra-aural, semi-open, dynamic		63
AKG K145/S £60	Good + Good +	Electrostatic tweeters combine with a dynamic mid/bass unit to create very confident sounds in a comfortable headphone. Balance is on the bright side	Supra-aural, semi-open, electrostatic/ dynamic	R	75
AKG K240 Monitor £60	Very Good Good	Something of a classic, these AKGs are very user friendly in all respects; sonically on the warm side of neutral	Circumaural, semi-open, dynamic	R	63
AKG K280 Parabolic £90	Good Very Good	A very revealing and unusual twin driver design that uses the same principle as a satellite dish to beam sound into the ear	Circumaural, open-backed, dynamic	R	63
AKG K340 £140	Good Excellent	Heavyweight cans in most respects, the K340 with its electrostatic tweeter is a very revealing headphone. Gives the total electrostatics a good run for their money	Circumaural, closed-back, electrostatic/dynamic	R	75
AKG K44 £40	Good+ Average	Good quality personal oriented phone, could have a better sense of space but is musically quite communicative	Supra-aural, open-back, dynamic		99
Audio-Technica ATH-609 £31	Average Average-	Warm feeling and sounding with impressive physical substance for the price, could be more relaxed and open	Circumaural, open-back, dynamic	R	99
Audio-Technica ATH-611 £51	Average Good	Same basic design as 609 but bigger thinner diaphragm makes this a more relaxed and informative headphone	Circumaural, open-back, dynamic		99

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HEADPHONES

MODEL PRICE	FIT SOUND	COMMENTS	TYPE	VALUE	ISSUE
Audio-Technica ATH-909 £60	Average Average	Quite impressive in the treble though a bit bass shy, the 909s worked well at highish levels	Circumaural, semi-open, dynamic		55
Audio-Technica ATH-910 £70	Average Good	The closed-back 910s are an improvement on the 909s with a nice rhythmic quality rarely found with headphones	Circumaural, closed-back, dynamic	R	55
Audio-Technica ATH-911 £80	Very Good Very Good	Nicely finished dynamic headphones with all the trimmings, plus a very clean and subtle sound	Circumaural, open-backed, dynamic	R	63
Beyer DT 325 £32	Very Good Average	Lightweight in more ways than one, the 325s may be a little bright for some systems and tastes but will suit duller sources	Supra-aural, open-back, dynamic	R	63
Beyer DT330 Mk II £50	Good Poor	Not the most revealing 'phones encountered, the 330s were nevertheless enjoyable and rarely offended	Circumaural, semi-open, dynamic		55
Beyer DT550 £61	Good Good	On their own the 550s sound articulate with a slightly 'gritty' treble and 'keen' midrange; not suitable for headbangers!	Circumaural, semi-open, dynamic		55
Beyer DT880 £80	Good Good	Well made cans with a warmish sound but fairly solid midrange, though they're not that informative for the price	Circumaural, semi-open, dynamic		63
Beyer DT990 £102	Very Good Very Good	The 990s are definitely a significant pair of dynamic headphones; they have a smooth and yet revealing neutral sound that is hard to criticise	Circumaural, open-back, dynamic	R	55
Beyer IRS690 £203	Good + Very Good	High quality infra-red headphones with soft comfy earpads and mellow but informative sound quality which is hard to dislike	Circumaural, open-back, dynamic	R	75
Jecklin Float Electrostatic £399	Good Excellent	One version of the state-of-the-art, these electrostatics have an openness of sound rarely found in the breed, with good dynamic range to boot	Circumaural-ish, open-back, electrostatic	R	55
Jecklin Float Model One £79	Good Very Good	Whilst very unusual in appearance, the Floats give remarkable sound quality and openness at a reasonable price	Circumaural-ish, open-back, dynamic	BB	55
Jecklin Float Model Two £99	Good Very Good	Helmet shaped and pretty unflattering but open sounding and comfortable in the long term. Note lack of adjustment means you should try before you buy	Circumaural-ish, open-backed, dynamic	R	63
JVC HA-D990 £65	Good + Good +	Good looking well made cans that offer good sound quality for the money. Sonic nature is of the easy-going, laid-back variety	Supra-aural, closed-back, dynamic	R	75
Koss K/6X Plus £30	Average Poor	'Sixties-style' 'phones from the good ole US of A, their sonic style is unique and can make a system sound quite different	Supra-aural, closed-backed, dynamic		63
Koss TD/60 £20	Good Average	Although they're devoid of channel identification and have a decidedly Stateside approach to sound, these are very listenable phones for the price	Supra-aural, closed-back, dynamic		75
Pioneer SE-72 £30	Good + Average -	Neat, very nicely made personal stereo phones along the lines of Sony V3s. Sound is on the veiled side, good for aggressive sources	Supra-aural, closed-back dynamic		75
Quart Phone 30 X £40	Good Average	Slightly dark character makes these more suitable for some sources/material than others, specifically music that needs bass weight	Supra-aural, open-back, dynamic		99
Quart Phone 70 £70	Good Good	Competent performers that were hard to criticise but lacked the life and sparkle of which some of the competition are capable	Circumaural, closed-back, dynamic		63
Quart Phone 95 X £100	Good+ Good+	Can sound even handed, relaxed and open with a good drive system but may be a bit too transparent for lesser headphone outputs	Circumaural, open back, dynamic	R	99
Realistic Pro-X £25	Poor Average -	Robust, unanimously uncomfortable and heavily veiled in sonic terms - not a great success	Supra-aural, closed-back, dynamic		75
Ross RE2530 CD £20	Average Average	Rather an 'average' £20 phone that some found uncomfortable due to high pressure on the ears. Sonic balance is on the bright side	Supra-aural, closed-back, dynamic		75
Ross RE2560 CD £25	Good Average +	If you're not too fussy about quality of finish and don't have an elfin head then these British phones warrant attention. Sound could be smoother	Supra-aural, semi-open, dynamic		75
Sennheiser HD40 £20	Very Good Good -	Very light and comfortable headphones with an even sonic balance that will suit most sources, but jack is 6.3mm and not suited to personals	Supra-aural, semi-open, dynamic	BB	75
Sennheiser HD450II £40	Good+ Good-	A neat looking supra that makes quite acceptable noises with a variety of outputs, could sound more spacious but is pleasantly relaxed	Supra-aural, open-back, dynamic		99
Sennheiser HD480 Classic II £60	Good+ Good	The same basic design as the 450 but improved sound quality as a result of aluminium coil and extra damping, natural with good bass	Supra-aural, open-back, dynamic	R	99
Sennheiser HD520 £65	Good + Good +	A very comfortable and musically capable headphone. If you've got this sort of bread to blow on cans, give 'em a blast	Circumaural, semi-open, dynamic	R	75
Sennheiser HD530 £75	Very Good Good +	One of the better dynamics in its group, the 530s create a sense of space that eludes most sub £100 cans, and they're dead comfy to boot	Circumaural, semi-open, dynamic	R	75
Sennheiser HD540 Ref Gold £160	Good Very Good	The 540 Golds prove that dynamic headphones can be subtle, informative and capable of creating a remarkable sense of space	Circumaural, open-back, dynamic	R	55
Sennheiser HD560 Ovation II £120	Very Good Good+	A comfortable and nicely styled headphone that could be more natural sounding at HF, but is detailed and open with good power	Circumaural, open-back, dynamic		99
Sony A21EX £20	Good - Good -	Forward facing in-ear drivers on a folding plastic band provide exceptional clarity for such an inexpensive phone. However, no bass, and fit isn't to everyone's taste	Intra-aural, semi-open, dynamic	BB	75
Sony MDR-CD3000 £300	Very Good Very Good	Better than most of the headphone outputs around so hard to make the most of, potentially up there with the electrostatics	Circumaural, closed-back, dynamic	R	99
Sony MDR-CD350 £32	Good+ Good	Very impressive for the price the 350 is possibly the most open sounding cheap closed back can around, lightweight in balance but transparent	Circumaural, closed-back, dynamic	BB	99
Sony MDR-CD550 £50	Good+ Good+	A very competent headphone for the price, creates a remarkable sense of space for a closed back design and sounds natural to boot	Circumaural, closed-back, dynamic	BB	99
Sony MDR-R10 £2500	Excellent Excellent	Costly state of the art sealed moving coil design built to the highest standards using the finest materials. Sound quality reflects this care, being big, clear, sweet and refined	Circumaural, closed-back, dynamic	R	72
Stax Gamma pro/SRD-X pro £296/£230	Very Good Excellent	The Gamma pros are like a stethoscope for your hi-fi, revealing subtleties that many loudspeakers fail to resolve	Circumaural, open-backed, electrostatic	R	63
Stax Lambda Signature/SRM-T1 £470/£895	Very Good Excellent	The Signature when combined with the SRM-T1 valve driver must be the most transparent headphone available	Circumaural, open-backed, electrostatic	R	72
Stax SR Gamma £299 (inc. SRD-6 Adaptor £100)	Very Good Very Good	The next model down the Stax range from the Lambda, the Gamma is an excellent headphone with little to criticise but the price	Circumaural, open back, electrostatic	R	55
Stax SR Lambda Pro/SRD-7SB Mk 2 Adaptor £360/£185	Very Good Very Good	A bit of an industry reference, the Pros are frighteningly revealing, bringing across more information than loudspeakers costing twice as much	Circumaural, open-back, electrostatic	R	55
Stax SR Lambda Pro/SRM-1 Energiser £360/£635	Very Good Excellent	This combination extracts layers of information that other headphones only hint at. The SRM-1 has more edge than the SRM-T1, but it's good	Circumaural, open-back, electrostatic	R	75
Stax SR34 £140	Average Very Good	The least expensive Stax headphones around, the SR34s are lively and rhythmic with good tight bass and a sweet midrange	Supra-aural, open-back, electret		55
Stax SR84 £210	Very Good Very Good	The stepping stone between dynamics and full electrostatics, these electret phones are revealing, open and highly enjoyable	Supra-aural, open-backed, electret	R	63
Yamaha YHL-006 £30	Average Average	Unusual personal stereo oriented phones that curl up when not in use. Earphones are like golf balls and balance is well suited to Walkmans	Supra-aural, open-back, dynamic		75

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LOUDSPEAKERS

Last item in the hi-fi chain, to some extent the loudspeaker is merely the slave of what has gone before, capable only of reproducing a signal as good as it is fed. Nevertheless the distortions (colorations and stereo effects) introduced by loudspeakers (and rooms) tend to be more immediately obvious than those anywhere else in the chain, so careful choosing according to taste is very important.

The average loudspeaker consists of a smallish enclosure, much of which may have begun life as part of a tree, plus a couple of drive

units hidden behind a removable grille. Inside the box lurks a simple electrical circuit known as a crossover, which divides the incoming (full range) signal into the right bits for the drivers to handle. Variations on the above formula are specifically identified in the entries. The designer's primary task is to balance the sensitivity of the loudspeaker (how loud it goes for a given electrical input) against the bass extension (how low does it go) for the given box size. After that such subtleties as coloration and dispersion come into the equation.

Careful placement of the loudspeakers within the room is as important as the initial choice of model.

For good stereo they need to be more or less the same distance from nearby walls, and preferably on rigid stands. The listener should be about the same distance from and listening angle to each loudspeaker. The ideal placement depends on the way a particular model has been balanced (not to mention a number of other factors), and our recommendation is given in the entries.

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
Acoustic Energy AE1 £767	Good Good	Amongst the best miniatures around, this metal driver pioneer shows exceptional mid focus and coherence, but is pricey and could be faster and more agile.	29.5x18x25cm stands clear of walls	84dB 48Hz (in room)		102
Acoustic Energy AE2 £916	Good Very Good	Dynamic, solid and lively, a great allrounder if a bit small considering the price. AE proves that metal cone/dome drivers really work	39 x 23.5 x 29.5cm heavy stands, free	88.5dB/w 45Hz	R	66
Acoustic Energy AE3 £1650	Very Good Very Good	Solid, authoritative and impressively accurate – if a shade ponderous and slow – AE's latest 'big one' is a much better bet than the earlier '4, combining	63 x 26.5 x 37cm low stands in free space	85dB/w 23Hz (in room)	R	86
Acoustic Research AR-112 £125	Average Average -	Nicely presented and engineered, but sounds a bit small and boxy without true coherence	36 x 19 x 18.5cm stands near rear wall	87dB/w 75Hz		66
Acoustic Research AR-122 £150	Average Average	Despite a promising enough list of ingredients, the 122 failed to excite real enthusiasm amongst the listening panel	38.5 x 19 x 22cm stands near rear wall	87dB/w 68Hz		68
Acoustic Research AR-132 £200	Average + Average -	Good presentation and detail engineering was not sufficient to counter bass heavy balance problems on auditioning	44.5 x 23 x 25.5cm stands 1ft from rear	87dB/w 50Hz		66
Acoustic Research AR-152 £373	Good Good-	Large bookshelf size model with luxury finish has a slightly thin overall balance, but fine coherence and agility makes it well worth considering	44 x 23.5 x 28cm stand 1-2ft wall	87dB 25Hz in room		98
Acoustic Research Red Box £100	Average Average	Lively and balanced if a bit crude and uneven, this econobox succeeds partly because of its simplicity, and works well with some rear wall assistance	32 x 19.5 x 17cm close to rear wall	87dB/w 85Hz	R	74
Alexander SE11 £299 (stands £69)	Good Good	Clearly better than its cheaper stablemates, the metal jacket delivers a different – and in some respects superior – sound than the wood-based	52 x 14 x 17.5cm stands close to wall	86dB/w 25Hz (in room)	R	82
Alexander SE5 £199	Average Average	Particularly well suited to surround sound A/V applications, the SE5 can give any miniature a run for its money on bass performance; hardness and coloration	40.5 x 12 x 15cm ALS stands near wall	82dB/w 50Hz (in room)		78
Allison AL100 £120	Average- Average	Loud and lively budget wall-mount is bigger and beefier than most of the competition, if lacking some subtlety and refinement	33.5 x 24 x 21.5cm stands against wall	87dB/w 30Hz (in room)	BB	94
Allison AL105 £150	Average Average -	Pretty enough in appearance, sonically the AL105 doesn't really make the grade at the £150 asking price	37 x 24 x 21cm high stands against wall	87dB/w 45Hz (in room)		78
Allison AL110 £220	Good+ Good-	Compact bookshelf model is a little dry and mid forward, but bass is extended and solid. Free space balance is good, though build quality could be improved.	40x24.5x22.5cm stands 1-2ft from wall	86dB 28Hz (in room)	R	102
Allison AL120 £429	Good Average	Cleverly engineered compact floorstander is pretty well balanced if slightly mid forward, but sound quality is a little disappointing for the price	63 x 28 x 27cm floor, clear of walls	88dB 30Hz (in room)		98
Allison CD6 £290	Average Good -	An unusual cube-shaped model designed for wall mounting gives exceptional bass extension from a small box, though it's also a bit heavy, coloured and slow	28.5 x 28.5 x 28.5cm stands against rear	88dB/w 45Hz	R	71
Alphason Amphion £680	Good Good	This fine-sounding, nicely finished compact wall-mount is just a little too expensive for formal Recommendation, but is a good performer for all that	44 x 23 x 27.5cm high stands against wall	88dB/w 47Hz (in room)		78
Alphason Artemis £299	Average Average+	Pretty little miniature sounds nicely inobnoxious but is also a bit short of punch and balanced rather too bright.	27 x 17.5 x 22cm stands 1ft from wall	86dB/w 50Hz (in room)		94
Alphason Orpheus £1000	Good Good +	Large hi-tech two-way features unusual, sweet-sounding isodynamic tweeter; well engineered and balanced if a shade odd in appearance	65.5 x 28 x 34cm stands near rear wall	87dB/w 43Hz	R	71
Apogee Caliper Signature £3350	Good + Very Good	Pretty but power hungry full range panels have remarkable transparency and delicacy, though loudness and bass 'grunt' are both a bit lacking	122 x 59-70 x 6.5-28cm floor, free space	81dB/w 30Hz (in room)	R	81
Arcam Alpha £200	Good Good	It has its own colorations to be sure, but delivers a fine room balance with unusually good dynamics, timing and 'life', and is fine material value	46 x 26.5 x 26cm stands close to wall	89dB/w 30Hz (in room)	BB	82
Arcam Delta Two £340	Average+ Good	Pretty luxury compact sounds a shade forward and coloured but has dynamic and lively bass for its size	37.5 x 22.5 x 27.5cm stands 1-2ft from wall	87dB/w 40Hz (in room)	R	94
Ariston Image £180	Average - Average -	Despite a sweet treble character, the Image fails to impress with a 'lumpy' over-rich balance that has room integration problems	42 x 22 x 27.5cm stands in free space	89dB/w 28Hz (in room)		82
Ariston Q £395	Average + Average	The prettily shaped Q delivers a good impression of scale from a small box, but a rather laid back, ponderous and over-rich overall sound	35 x 16.5-25 x 20-27cm high stands in free	85dB/w 30Hz (in room)		86
ATC SCM20 £1320	Very Good Good +	Massively built to no-compromise Pro monitoring standards, the SCM20 is invariably informative but the rather forward presentation can be uncomfortable	44 x 24 x 31cm stands close to rear wall	82dB/w 28Hz (in room)		86
Audio Electronics TC10 II £599	Good - Good +	Oddball appearance is rescued by a respectable technical performance, interesting and impressive engineering and fine sound quality	70 x 33.5 x 33.5cm low stands in free space	87.5dB/w 40Hz	R	68
Audioplan Kontrapunkt £799	Good Good +	Cute little German miniature sounds as sweet as it looks, dressed expensively in real wood with matching stands. Not for bass or loudness freaks	31 x 24 x 13cm free space, matching stands	83dB/w 48Hz (in room)	R	86
B&W 610 £200	Good Average	Fine presentation and good perceived value, with good in-room bass extension and impressive loudness credentials too, but rather indifferent integration and coherence.	49x23.5x30cm stands clear of walls	89dB/w 25Hz (in room)		102
B&W 620 £299	Good Good	Good value floorstander has well balanced, laid back and slightly lazy sound that is pleasantly easy on the ears; could do with its own spikes	74 x 23.5 x 30cm floor, free space	89dB/w 25Hz (in room)	BB	94
B&W CM1 £400	Good Average	Cleverly thought out luxury design package is also fundamentally well engineered, if a shade pricey on 'sound for pound' basis	24.5 x 16 x 22cm close to rear wall	84dB/w 90Hz		74
B&W DM550 £149	Good + Average -	Beautifully presented, well engineered near-miniature with precise sound but a distinct lack of 'wellie'. Ideal for considerate flat dwellers	35 x 20.5 x 22.5cm stands in free space	86dB/w 70Hz		71
B&W DM560 £199	Average + Average -	Fine cosmetic presentation and good engineering for the price; overload protection may be handy but listening panel was underwhelmed	49 x 23.5 x 30cm stands in free space	88dB/w 55Hz		66
B&W DM600 £150	Good+ Average+	Attractive hi-tech appearance and clever engineering makes for an impressively smooth overall balance, but sound is a touch bland with it	35 x 20.5 x 25cm stands 1-2ft from wall	85dB 30Hz (in room)	R	98
B&W Matrix 801 £3295	Good + Good +	Lacks the transparency of the best panels, and the drama of the best dynamics, but is something of an acoustic tour de force, with low coloration and fine imaging	77/99 x 56 x 43cm floor or stands, free	86dB/w <20Hz (in room)	R	81
B&W Matrix 805 £915	Very Good Good	A genuine compact monitor, stylish, with remarkable imaging properties, good balance and low coloration, though less successful at communicating musical	42(max) x 26 x 22.5cm Slate stands in free	87dB 30Hz (in room)		98

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LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
B&W Vision DS1 £120	Average Average -	Although significantly hampered by upper bass cabinet coloration, the DS1 cleverly combines high sensitivity with a rich and generous soundstage	36 x 21 x 19cm stands quite close to wall	91dB/w 40Hz (in room)	R	82
B&W Vision DS2 £180	Average Average -	Although the box is generous for the price, the DS2 is a rather uneven performer, both on the measurement and listening.	50 x 24 x 25cm stands in free space	89dB/w 43Hz (in room)		86
Bose 305 £350	Average Good -	A bit of an oddball, fine dynamic liveliness and a good room match more than make up for the strange stereo imaging and treble	28 x 45 x 23cm high stands near wall	88dB/w 40Hz (in room)	R	78
Bose 901 MK6 £1600	Good Average	Still controversial after all these years, the pre-equalised multi-driver 901 is cleverly engineered to deliver exceptional loudness.	33 x 54 x 32cm rigid stands in free space	(92dB/w midband) 28Hz (in room)		86
Bose Interaudio 3000XL £150	Average Average -	Lots of perceived value and well enough balanced, but low cost cabinet and driver engineering results in a crude and unsubtle sound	46.5 x 29 x 23cm stands in free space	89dB/w 45Hz		71
Boston A120 £349	Average + Good -	Ugly but cleverly engineered, the 120 combines a tiny main driver with much larger ABR to give a generous, bighearted and lively sound despite little bass	62.5 x 31.5 x 25cm stands in free space	89dB/w 48Hz	R	86
Boston A40II £120	Average Average -	Competent performance for size and price but below average relative to the UK competition	34 X 21 x 20cm on stands near wall	88.5dB/w 63Hz		41
Boston Acoustics T830 £399	Good Good	A lot of speaker for the money, the T830 is a smooth and accomplished performer with a big and easy - or alternatively a lazy and laid back - sound	82.5 x 25.5 x 24cm floor, away from walls	87dB/w 30Hz (in room)	R	82
Cambridge SoundWorks Ambiance £179 (mail order only)	Average Poor	Attractively styled sub-miniature sacrifices sensitivity in the interests of bass extension, but manages to lose dynamics along the way too	28 x 18 x 14cm close to wall	83dB/W 45Hz (in room)		94
Canon S-50 £349	Average Average+	Though only a small cone miniature at heart, the fascinating styling and extended stereo listening area feature make it utterly original and unique.	30x24(diam)cm stands in free space	84dB 48Hz (in room)	R	102
Castle SG Trent £129	Average Average	The grey paint finish looks much more modern than black vinyl woodprint, and this miniature wall-mount sounds lively and engaging, if a bit rough at the top	33.5x18x20cm stands close to wall	88dB 50Hz (in room)	R	102
Castle Chester £599	Good Very Good	A brilliant throwback, using horn-type approach to provide startling midrange dynamics and coherence.	94 x 23 x 27cm floor, experiment	87dB 45Hz	BB	98
Castle Durham £259	Average + Average	Listening results were encouraging, well engineered and finished, but lean on treble and a bit weak on bass; still recommended	41 x 21.5 x 25cm near rear wall	89dB/w 67Hz	R	46
Castle Pembroke £379	Good Average +	Comfortably recommended, a sweet smooth sound with good overall balance of engineering-based performance	55 x 37.5 x 30.5cm open space on stands	88dB/w 46Hz	R	31
Castle Warwick £229	Good Average -	Excellent presentation and fine engineering with overload protection, but a sonic disappointment in bass and dynamic qualities	46.5 x 25 x 23cm stands 1ft from rear	88dB/w 50Hz		66
Castle Winchester £1400	Very Good Very Good	This unconventional and beautifully crafted model is physically large for its bass extension but is engagingly agile and sounds attractively open and airy	114 x 24 x 47cm in free space	87dB/w 25Hz	R	90
Celef CF2 Nimbus £230	Good - Good -	Nicely balanced overall but a little uneven with it, this lively and dynamic largebookshelf model came close recommendation	46 x 25.5 x 24cm stands in free space	88dB/w 55Hz		71
Celef Cirrus £180	Average Good	It's nice to see Celef back in the UK, with this decent sounding small reflex box that seems unusually tolerant of siting	39 x 20.5 x 23cm stands in free space	84dB/w 60Hz	R	66
Celestion 3 £109	Average + Average	This attractive little wall-mount gives good balance and stereo imagery, with a character which leans more towards inoffensiveness than excitement	31 x 18.5 x 21cm high stands against wall	86dB/w 55Hz (in room)	R	78
Celestion 5 £149	Good Average	Cunningly conceived and balanced, the 5 may be a little slow for some tastes, but is well suited to CD-oriented budget systems	35 x 20.5 x 26cm heavy stands close to wall	89dB/w 30Hz		90
Celestion 6000 £1470	Very Good Very Good	A genuine fullrange audiophile quality speaker system - with Star Wars styling to suit a high tech environment	Complex, on floor in free space	82.5dB/w	R	60
Celestion 7 £200	Average Average+	Good value, good looking large bookshelf size wall-mount has lively up front presentation. Can sound a bit coarse and stand selection is critical.	45 x 24.5 x 32cm heavy stands close to wall	87dB 30Hz (in room)	R	98
Celestion 9 £249	Good Average	Nicely presented and fair material value, with impressively flat bass-to-mid balance, the 9 doesn't really make a convincing case for the return of the three-way.	49.5x20.5x24cm stands clear of walls	89dB 30Hz (in room)		102
Celestion DL6 Series II £179	Good Average	Good tonal colouring and plenty of bass for the enclosure size; the metal dome tweeter is excellent, but bass and mid lack clarity and 'bite'	45.4 x 24.5 x 26.2cm near wall, on stands	87dB/w 65Hz		59
Celestion DL8 Series II £199	Very Good Good	A refined middle market speaker has a smooth but slightly dull quality, with good definition and deep, if slightly boxy bass	50 x 27.5 x 27.8cm open, stands	87.5dB/w 60Hz	R	59
Celestion SL12Si £599	Average Average	Careful setting up does reveal elements of fine sound quality, but this 'grown up' SL6 variation has a lumpy response alongside its improved power handling	53 x 20 x 27cm matching stands clear	85dB/w 50Hz		66
Celestion SL600Si £799	Good + Good	This Aerolam high tech miniature has certain remarkable qualities that some will find irresistible, but needs careful system and room matching	27 x 20 x 23cm free air on tall stands	82dB/w 52Hz		68
Celestion SL6Si £399	Average+ Average+	This stereotype luxury compact can sound a bit dull and congested, but really opens up on Slate Audio stands; favours CD	37.5 x 20 x 25cm stands 1-2ft from wall	86dB/W 30Hz (in room)		94
Creek CLS20 £200	Good Average -	Looks good material value, but sound is distinctly over-rich and thick in the mid-bass region; maybe the box is a little too large.	49 x 24.5 x 24cm open frame stands, free	88dB/W 30Hz		90
Dali 700 £600	Very Good Average	Good material value and fine bass extension for size and price, but overall sound is disappointing, perhaps due to complexity of driver array	110 x 28 x 35cm clear of walls	88dB/w 20Hz		90
DCM Timeframe TF250 £350	Average + Average	Neat and unusual floorstanding presentation, marred by indifferent build and cuddly but rather coloured sound, especially on spoken word	86 x 32 x 16cm close to rear wall	88dB/w 45Hz		90
Duntech PCL1000 Crown Prince £6120	n/a Excellent	Immensely 'listenable', refined sounding speaker capable of creating lifesize musical images. Not overly transparent to source, but very civilised	180 x 30.5 x 43.5 free standing away from	90dB/w 42Hz	R	72
Duntech PCL500 Marquis £3998	n/a Very Good	Better value for money than the Crown Prince - and arguably more dynamic, with real bass 'slam' but a little less refined in the higher registers	147.5 x 27 x 40cm free standing away from	92dB/w 48Hz	R	65
Eltax Linear Response 8 £399	Average- Average+	Good material value Danish floorstander suffers from 'loudness contour' balance due to twin main drivers, but nevertheless has pleasing coherence	97 x 21 x 33cm floor, free space	88dB 22Hz		98
Epos ES11 £300	Good Good+	Pretty luxury compact uses integral baffle/driver to give a remarkable combination of low coloration, transparency and speed, bass is a bit shy	37.5 x 20 x 25cm stands 1ft from wall	86dB/W 45Hz (in room)	BB	94
Epos ES14 £449	Good Very Good	Substantial stand mount model delivers delightful midrange focus and delicacy with good bass control. Tends to be system sensitive	49 x 22.5 x 29cm own stands 1-2ft from wall	85dB 25Hz (in room)	R	98
Equation 0 £1290	Average + Very Good	Expensive but most attractive floorstanding miniature. Bass is limited and mid tends to shout but sound is fast and lively with fine dynamics and timing	85 x 20 x 35.5cm floor, c1ft from wall	85dB/w 45Hz	R	90
Faraday Siren £330 (direct sale)	Average- Average-	Interesting if ugly high mass concrete cabinet is let down by imbalance of ageing driver combination	46 x 27 x 27cm stands, free space	87dB/W 48Hz (in room)		94
Faraday FS5 £589	Good Good	Pricey and ugly, but with its own sonic charm nonetheless, thanks to the substantial (largely positive) influence of the concrete enclosure has upon the sound	46x27x26cm stands in free space	90dB 28Hz (in room)		102
Goodmans B-Max/Maxim 2 £100/£90	Poor Average -	Stick with the Maxims on their own until you can afford some real grown up loudspeakers	60 x 21 x 26 see above, suck and see	89dB/w 55Hz (in room)		78
Goodmans HIM 440 £350	Good Average -	Amazing perceived value, sensitivity and good bass extension, marred by serious cabinet coloration, a nasty tweeter and a difficult amplifier load	87 x 38 x 40cm low stands clear of walls	94dB/w 24Hz		90
Goodmans M100 £80	Average + Average -	Effectively a Maxim on the cheap, the M100 measures more smoothly but sounds somehow less involving than its more famous stablemate.	20 x 17 x 26cm close to rear wall	85dB/w 50Hz (in room)	R	86

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LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
Goodmans M300 £100	Average Average -	Conveying much of the charm and life which has made the Maxim 2 so popular, the M300 is sensitive, but hampered by upper bass cabinet coloration	38.5 x 21.5 x 17cm stands close to rear	89dB/w 50Hz (in room)	R	82
Goodmans M500 £130	Average Average-	Large 'bookshelf' size means plenty of speaker for the money plus good sensitivity, let down by unruly mid/bass performance and indifferent build	47 x 24.5 x 21.5cm stands, free space	89dB/W 50Hz (in room)		94
Harbeth HL Compact From £539	Very Good Average	The clean and neutral sound lacks resolution and gives rather unsubtle though well differentiated stereo. Can be bi-wired to advantage	52 x 27.2 x 28.1cm open space, on high	87.5dB/w 65Hz		59
Harbeth LS3/5A £343	Good Average	Still a classic miniature, though not to every taste, and none the better for the recent update under our listening conditions. Limited dynamic range	30.5 x 19 x 16cm stands in free space	81dB/w 60Hz		66
Heco Interior 120 £169	Good Average	Drab appearance belies a lively enough character, though the balance is altogether a bit bright for UK tastes	32 x 23 x 23cm high stands against wall	88dB/w 50Hz (in room)		78
Heco Interior 430 £429	Good Good -	This tall floorstanding enclosure delivers an impressively even sound balance with good bass extension, if not the lively dynamics to satisfy enthusiasts	85 x 24 x 27.5cm free space	88dB/W 43Hz	R	71
Heco Interior 90 £159	Good Average -	Neatly finished and engineered miniature, but the disappointingly 'lifeless' sound left the listening panel decidedly underwhelmed	27 x 18 x 16cm on high stands	87.5dB/w 90Hz		74
Heco Interior Plus 404 £400	Average+ Average+	Odd shape and size; twin main driver arrangement creates a slight 'boom'n'tizz' effect, but mid focuses well and bass extension is impressive	58 x 26 x 31cm low stands free space	88dB/W 25Hz (in room)		94
Heco Reflex 10 £160	Average+ Average	This nicely balanced and well mannered small bookshelf wall-mount is a competent rather than exceptional package for the price, thanks to indifferent build.	32x21x23cm stands up to 1ft from wall	90dB 30Hz (in room)		102
Heco Superior 740 £599	Good Good -	A similar sonic package to the cheaper Interior 530, these Superior clothes are very pretty indeed, though spikes are still awaited	84.5 x 22 x 25cm on floor in free space	88dB/w 30Hz (in room)		78
Heco Superior 940 £999	Good Good	This large and beautifully finished floorstander has an impressively smooth and transparent midband. Bass is well extended but follows rather than drives the music	110 x 26 x 31.5cm free space	88dB/w 20Hz		86
Heybrook HB1 S3 £250	Average+ Good	Latest version of long established favourite delivers good liveliness and fine coherence for the price, even though the shape looks a bit dated	47 x 29 x 24cm HBS1 stands close(ish) to	88dB 30Hz (in room)	BB	98
Heybrook HB100 £279	Average + Good	Well matched for wall siting, the HB100 is a lively and informative performer in the tradition of the popular HB1	47 x 26 x 28cm stands near rear wall	86dB/w 50Hz	BB	66
Heybrook HB150 £369	Average Good	Convincingly communicative but a bit coloured and congested, this lively compact wall-mount is nicely finished but a little costly for the content	40.5 x 23 x 22cm stands close to rear	89dB/w 42Hz (in room)		82
Heybrook HB200 £429	Average Average	This luxury successor to the HB2 is lively and informative, but sounded insufficiently balanced to convince our listening panel	46 x 23 x 26cm stands against rear wall	87dB/w 55Hz		66
Heybrook Point 5 S2 £179	Good Good	Lively, revealing and enjoyable wall-mount can sound unruly with multi-strand but comes dramatically into focus with solid core cable.	37.5 x 23 x 24.5cm HBS1s against wall	85dB/W 28Hz (in room)	BB	94
Heybrook Point 7 £185	Average Average	Physically an attractive package, but not entirely convincing in lab or listening panel test; interesting for all that	40.5 x 23 x 23cm stands against rear	85dB/w 60Hz		68
Heybrook Solo £159	Average + Average +	Discreetly styled wallmount sounds a little untidy in both bass and treble but handles complex rhythmic material much better than most	36 x 23 x 22cm HBS1 stands close to wall	87dB/w 28Hz	R	90
Heybrook Sextet £949 (inc frame)	Good Very Good	Elegant floorstanding three-way wall-mount is engagingly coherent and a highly analytical, partly due to distinct and not always comfortable upper-mid forwardness.	96x27x20cm close to wall	85dB 25Hz (in room)	R	102
Infinity Kappa 6 £795	Good Good	Interestingly styled US loudspeaker has unusual high tech drivers and good neutrality, but the sound seriously lacks excitement	63 x 38 x 24cm stands, free space	85dB/w 35Hz		66
Infinity Kappa 8 £1850	n/a Very Good	Very nicely made and unobtrusive but large four-way speakers which have a tendency to sound bass heavy unless used with solid core cables	118 x 51.5 x 17.5cm floor standing, open	89dB/w 33Hz		72
Infinity Modulus £695	Good Average +	Luxury high-tech miniature, carefully conceived and beautifully built. Undeniably attractive in the mid and treble, it failed to handle the bass as successfully	30 x 18 x 26cm high stands 1ft from wall	84dB/w 45Hz (in room)		86
Infinity Reference 10 £149	Average Average	Follows the Infinity tradition in providing an engaging and lively sound from a prettily finished and substantial small bookshelf size model	36 x 23 x 23cm stands in free space	87dB 50Hz (in room)	R	98
Infinity Reference 20 £220	Good Average	Large bookshelf size model is well presented and balanced with good bass control, but somehow lacks convincing cohesion and agility; build was slightly suspect too.	46x27x24cm stands 1-2ft from wall	88dB 27Hz (in room)		102
Infinity Reference 50 £499	Average Average-	Despite hi-tech drivers, attractive presentation, good bass extension and sensitivity, this three-way floorstander suffers from a forward, coloured sound	86 x 26.5 x 25cm floor in free space	89dB 25Hz (in room)		98
Infinity RS2001 £180	Average Average +	A little coloured and unruly in the treble, the 2001 nevertheless retains the lively dynamic bounce of its predecessor; pity the price has gone up	36.5 x 22.5 x 20cm lightweight stands	87dB/w 50Hz (in room)	R	78
Jamo Concert II £250	Good Average -	A thoroughly respectable 'bookshelf' performer that needs free space siting but includes attractive cabinetwork and a neat grille	41 x 24 x 25cm stands in free space	85dB/w 48Hz		66
Jamo Concert V £500	Average Average	Compact, solid, nicely finished floorstander delivers unusually extended bass at the expense of lowish sensitivity; midband is smooth but laid back.	86x24x28cm well clear of walls	85dB below 20Hz (in room)		102
Jamo Concert VII £650	Average+ Average	Beautifully built large floorstander uses unusual double reflex bass system, unsuccessfully as far as low frequency resolution is concerned	96 x 28 x 31.5cm floor, free standing	87dB/W 25Hz (in room)		94
Jamo Cornet 40 £100	Average- Average	Pretty little Danish-built miniature with respectable rather than exceptional sound quality for the price	32 x 20 x 22cm stands 1-2ft from wall	86dB 48Hz (in room)		98
JBL Control 1 Plus £229	Average Average	Sub-miniature with forward midrange and no real bass; highish price partly justified by cute, near-indestructible Pro styling and build	23 x 15.5 x 14cm close to rear wall	89dB/w 50Hz		90
JBL L20T3 £249	Average- Average-	Compact bookshelf model delivers bouncy miniature-type sound when free space mounted; pleasant enough but uneven and undistinguished	39 x 23 x 20.5cm stands free space	87dB/W 48Hz (in room)		94
JBL LX33 £259	Average + Good	A bit of a cheat, but a lot of speaker for the money, which manages a better room balance than many 'large bookshelf' rivals, and delivers a fine acoustic	80 x 25 x 21cm floor, 1ft from wall	89dB/w 48Hz	R	82
JBL LX44 £339	Good - Average	This generously built model offers good power handling, bass extension and dynamic range, but suffers from the 'three-way syndrome', with middle muddle	58.5 x 30 x 29cm stands in free space	89dB/w 40Hz		71
JBL LX55 £350	Good Average	This big bluff three-way provides lots of speaker, bandwidth and loudness for the asking price, but is ultimately a bit of a dinosaur	66x34.5x29cm stands clear of walls	91dB below 20Hz (in room)		102
JBL XE2 £149	Average- Average-	Budget Danish-built 'bookshelf' model has anomalous 'laid back' balance and lacks the genuine JBL spirit	38 x 23 x 23cm stands in free space	88dB 48Hz (in room)		98
JBL XPL 90 £699	Good Average +	Though undoubtedly pretty and very expensively engineered, this elaborate near-miniature didn't really convince our listeners.	39.5 x 24 x 24cm stands in free space	85dB/w 45Hz (in room)		86
JPW AP2 £175	Good Good	Few grounds for criticism but purchasers should check out the treble qualities to avoid hammering the ear anvils	46 x 26 x 25cm 40cm from wall on 45cm	89dB/w 65Hz	R	53
JPW AP3 £225	Good Average +	Pretty good stereo and well balanced overall it had its own character which is well suited to vinyl replay	52 x 25 x 29.5cm near wall on stands	90dB/w 57Hz	R	46
JPW Minim £85	Average + Average -	Very civilised but dynamically limited, the Minim is well suited to the smaller room and where limited loudness is acceptable	27.5 x 18 x 19.5cm stands against wall	85dB/w 28Hz (in room)	R	82
JPW P1 £145	Good Average +	Honest and basically articulate if not very sophisticated, resolution is good but it can sound a little wearing in bright systems or with rough sounding material	44 x 25.9 x 26.1cm free space on stands	89dB/w 60Hz	R	59

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MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
JPW P1 Vinyl £135	Good Average	Not particularly pretty, this is still a lot of highly competent loudspeaker for the price, with a safe and middle-of-the-road sound that's unlikely to disappoint.	43.5x25.5x26cm stands 1-2ft from wall	87dB 32Hz (in room)	BB	102
JPW Sonata £115	Good Average +	Well balanced and integrated, this near-miniature offers fine sound if limited bass and dynamic range, plus real tree wood at a nearly silly price	32 x 23 x 20cm stands near rear wall	86dB/w 55Hz	BB	71
JPW Sonata Plus £135	Average Average -	This luxury variation on the redoubtable Sonata theme features a metal dome tweeter, and is not the better for it	32 x 23 x 21cm about 1ft from wall	87dB/w 30Hz		90
JRT AD1 £500 (stands £100)	Average + Good +	A most auspicious Choice debut for relative newcomers JRT. A fair share of cosmetic deficiencies do little to spoil the impressive coherence and timing	59.5 x 28 x 36cm own stands close to rear	86dB/w 28Hz (in room)	R	86
JRT AD1 Micro £389	Average Good	Beautiful bijou miniature has delightful life and coherence and gives surprising impression of scale; some aggressive tendencies but very open to system tuning	28 x 17 x 21cm stands against wall	87dB/W 50Hz (in room)	R	94
Kammerzelt Reference Mini Monitor £545	Average+ Good	Lovely miniature has a beguilingly sweet sound with good pace and drive, but scale is restricted and presence a little dulled considering the high price	stands 1-2ft from wall 85dB/W	50Hz (in room)		94
KEF 104/2 £1,295	Very Good Very Good	A reference point for dynamics, preferred without KUBE, suited to many rooms. Good stereo, high sound level	90 x 28 x 41.5cm floor standing in free space	92dB/w 50Hz	R	60
KEF Q60 £349	Good Good	Uni-Q co-axial driver provides fine imaging and mid coherence, while magnet decoupling reduces cabinet coloration. Goes loud, bass not entirely convincing.	48x25x27cm stands close to wall	90dB 25Hz (in room)	R	102
Lindley New Age £1100	Average - Average +	Attractively different presentation with classy finish, this tall cylindrical floorstander has fine bass extension but a rather uneven overall balance	105 x 23 x 23cm clear of walls	86dB/w 25Hz		90
Linn Index II/KuStone £235/£109	Good Good	Combination of stand and speaker looks and sounds very good for the price, with good bass extension and control, fine dynamic range. Clean, clear if a shade slow	44 x 21 x 23.5cm (box only) close to rear	86dB/w 28Hz	BB	90
Linn Helix II £357 (stands £109)	Good Good+	Ku-Stone supported, this is one of the best 'large bookshelf' size models around. Dry, controlled bass and very open, if slightly aggressive balance.	57x24x30cm KuStones 1-2ft from wall	88dB 33Hz (in room)	R	102
Linn Kaber LS500 £1098	Average Good +	Discreet wall-mount package trades sensitivity for fine bass extension and midbass performance; can be a little relentless but has prodigious dynamic capabilities	93 x 19 x 28cm floor against rear wall	86dB/w 28Hz (in room)	R	82
Linn Kan II £439	Average + Average +	A niche product for those prepared to tolerate its strong character for the sake of its fine bass performance and near invisibility	30.5 x 18.5 x 16.5cm Kan stands against	82dB/w 35Hz (in room)		78
Linn Nexus LS250 £458	Good Average	Good features include a solid, meaty bass plus good imagery and tonal balance. The catch is that Nexus lacks resolution and timing	49 x 23.5 x 30.4cm near rear wall	89dB/w 60Hz		59
Magneplanar MG1.4 £1190	Good + Good +	Replaces the stalwart MG1c with a revised panel layout. Offers a very crisp and articulate sound, particularly revealing of upper mid vocal details	155 x 8 x 57cm open space	88dB/w 40Hz	R	72
Magneplanar MG2.5R £1998	Good Good	Offers the low coloration and profound musical insight of better electrostatic loudspeakers but without loss of low frequency extension	183 x 56 x 4.5cm Open space	83-85dB/w 35Hz	R	60
Magneplanar MG11la £2700	Good Very Good	Another excellent true-audiophile loudspeaker this American panel speaker helps to convey much of the original character of the music	180 x 62 x 38cm well clear of walls	84-86dB/w 35Hz	R	46
Magneplanar SM6a £675	Average - Average	Tonally 'rich', in the right room it proved a satisfactory musical experience	122 x 48 x 4.5cm on floor clear of wall	85dB/w 56Hz		46
Marantz LD-50DMS £230	Very Good Good	Well behaved larger two-way has fine balance, stereo and integration with good bass extension, albeit with mild boxy, chesty and fizzy effects	106 x 22 x 32cm floor, free space	88dB/w 30Hz (in room)	R	71
Martin Logan CLS II £3998	n/a Very Good	Much improved high resolution design, fussy about system set-up and demanding of ancillaries and software alike. It rewards the efforts though	60 x 28 x 7.5cm open space	86dB/w 45Hz	R	72
Meridian Argent 1 £1,200	Good+ Good+	Beautifully built, finished and shaped but pricey compact has fine bass extension and virtual absence of 'boxiness'; needs a big amplifier	33 x 27(max) x 27(max)cm Slate stands	83dB 28Hz (in room)		98
Meridian Argent 2 £995	Good+ Good	This beautiful but pricey high-tech 'large compact' delivers an extended, smooth and neutral sound with fair speed. Slate Audio stands are almost essential	48.5 x 21 x 29.5cm stands free space	85dB/W 23Hz (in room)		94
Meridian M30 £895	Average + Average	Pricey but easy on the ears and worth considering especially where space is at a premium	38.5 x 18 x 32cm free space on stands	Active 40Hz		46
Mission 760 £100	Good Average +	Smart presentation and an engaging sound, this sensitive budget miniature sounds notably more lively and less boxy than most of its peers	29 x 18 x 20cm stands close to wall	88dB/w 50Hz	BB	90
Mission 761i £150	Good Average	Variation on 760 theme adds an extra main driver for easier amp loading and power handling. Sound was judged slightly inferior to its simpler, cheaper stablemate.	38x19x24cm stands close to wall	88dB 48Hz (in room)		102
Mission 762 £200	Average Average -	Mission's 'bookshelf middleweight' offers high sensitivity and loudness capability, but at the expense of a somewhat untidy and rather 'heavy' sound	50 x 25 x 27cm stand, experiment advised	91dB/w 55Hz		66
Mission 763 £300	Average + Average +	A very artful combination of generous volume and good bass extension at a modest price. Works well in the listening room despite a few rough edges	77 x 25 x 32cm near rear wall	86dB/w 40Hz	BB	68
Mission 764i £480	Good Average	Despite improvements, this large floorstander still lacks low frequency authority, which is probably a function of its comparatively modest price	1ft from wall, freestanding 87dB/W	below 20Hz		94
Mission 767 £2500	Very Good Very Good	Magnificent and massive part-active monoliths have fine acoustic subtlety and impressive loudness capability, ultimately limited by partnering (Cyrus) electronics	138 x 29 x 43cm floor, flexible	91dB/w <20Hz (in room)	R	81
Mission Cyrus 780 £180	Good Average +	Pricey but very pretty miniature based on Mission 760 but with beefed up box and crossover network to enhance sound quality still further	29 x 18 x 26cm light stands close to wall	88dB/w 50Hz	R	90
Mission Cyrus 781 £250	Average + Good	Properly run in, the pretty little 781 delivers a fast, dynamic and informative sound which more than justifies its price.	43 x 22.5 x 28cm matching stands 1ft	88dB/w 28Hz (in room)	R	86
Mission Cyrus 782 £350 (stands £80)	Good - Good -	Lively, articulate and beautifully finished, this compact wall-mount model with twin main drivers has good integration but a rather rich, 'Loudness' balance	50 x 25 x 32.5cm Cyrus stands near wall	90dB/w 50Hz		71
Monitor Audio MA1200 £900	Average Average +	This smooth and civilised slimline floorstanding loudspeaker is well built and nicely presented. But it is also expensive	94 x 20 x 26cm in free space	85dB/w 48Hz		68
Monitor Audio MA1800 £1400	Good Average +	Attractive and beautifully finished, even when ballasted with lead shot the 1800 inclines towards upper bass richness and lacks genuine extension	106 x 22 x 32cm floor, free space	88dB/w 30Hz (in room)		81
Monitor Audio Monitor 11 £330	Average Good	This tall and slim and attractive free space compact has an extra driver to help out in the bass, giving extra urge at some price in delicacy	52 x 20 x 24cm stands free space	87dB/W 48Hz (in room)	R	94
Monitor Audio Monitor 14 £400	Average Average	Floorstanding version of M11 suffers from excess upper bass, giving a thick, chesty coloration beneath a quite lively and well focused mid and treble	78 x 20 x 24cm floor well clear of walls	86dB 30Hz (in room)		98
Monitor Audio Monitor 7 £180	Average - Average	This lively and punchy near-miniature looks pretty enough and is good value but is let down by an unruly and indifferently integrated tweeter	34 x 16.5 x 17cm stands 1ft from wall	84dB/w 70Hz		74
Monitor Audio Monitor 9 £220	Good Average	Despite a much better treble balance than the 7, the Monitor 9 is less engaging and lively at low frequencies than its smaller sibling	37 x 20 x 21cm high stands near wall	85dB/w 30Hz		78
Monitor Audio Studio 10 £1200	Average Average +	Expensive, luxury build/finish and all-metal driver diaphragms provide engagingly transparent midrange and treble, spoilt by over-strong mid-bass.	40 x 20 x 25cm heavy stands clear of walls	87dB/w 45Hz		90
Monitor Audio Studio 5 £500	Average+ Average+	All metal diaphragm luxury miniature has splendid presence coherence but sound can be aggressive and lacks welly.	32 x 18 x 20cm stands close to wall	83dB 28Hz (in room)		98
Monitor Audio Studio 15 £1,600	Average+ Good	A little slow and lazy but better balanced than the smaller <i>Studio</i> models, the midband coherence and focus is superb, but it aint cheap	51x20x26cm free space	87dB 45Hz (in room)	R	102

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MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
Mordaunt-Short Classic 20 £395	Average+ Average+	Luxuriously finished compact delivers beguiling mid transparency but bass is altogether less convincing — one for the carpet slippers generation perhaps	37x22x27cm stands in free space	86dB 45Hz (in room)		102
Mordaunt-Short MS3.10 £110	Average Average+	Probably the liveliest and most communicative miniature around, this beautifully presented design is probably better suited to budget 'real hi-fi'	28.5x17.5x20cm stands in free space	88.5dB 48Hz (in room)		78
Mordaunt-Short MS3.20 £140	Average Average+	All the charm of its BB rated £99 baby 3.10 brother, plus a smidgeon more bass for those in a suggestible frame of mind	35.5x18x20cm stands against wall	85dB 50Hz (in room)	R	82
Mordaunt-Short MS3.30 £200	Average Average+	A little too mid-forward for neutrality or formal recommendation this attractive, good sized model nevertheless has more than enough appealing qualities	46x23.5x27cm stands 1-2ft from wall	87dB 38Hz (in room)		78
Mordaunt-Short MS3.40 £260	Average+ Average	It looks pretty and sound civilised but the 3.40 failed to ignite any degree of enthusiasm amongst our listeners. LF room matching is critical	57x23.5x27.5cm stands in free space	87dB 30Hz (in room)		86
NAD 8100 £269	Average+ Average+	Floorstanding variation on attractive 8225 miniature adds some half convincing extra bass thump and saves the price of stands - very cost effective	75 x 20 x 25cm floor clear of walls	88dB 25Hz (in room)	R	98
NAD 8225 £150	Good Average +	Notwithstanding lacklustre styling and an unprepossessing appearance, this NAD miniature has a smooth and even midband plus an appealing overall jauntiness.	34 x 20 x 18cm stands close to wall	87dB/w 45Hz (in room)	R	86
Naim NA IBL £798	Average+ Good	This tiny and elaborately engineered floorstanding wall mount delivers outstanding dynamics, speed and detail, marred by pronounced upper mid forwardness	30.5x23.5x27.5cm wall, freestanding	84dB/W 30Hz (in room)		94
Naim SBL £1,527	Good Very Good	Impressive scale and full bandwidth coherence from an attractively discrete floor standing wall-mount — coloured midband but very well balanced and agile with it.	88x26.5x17-27cm close to wall	86dB 25Hz (in room)	R	102
Neat Petite £525	Average Good+	Pricey and far from perfect, this near miniature is nevertheless one of the most entertaining and enjoyable speakers around, colorations notwithstanding.	30.5x20x18cm stands close to wall	86dB 33Hz (in room)	R	102
NVA Cube 1 £600 (stands £200)	Good - Good +	Attractive, cube-shaped semi-omni is very sturdily built, and gives an idiosyncratic but unusually open, spacious and informative sound	33 x 32 x 32cm own stands c0.5m from wall	85dB/w 52Hz	R	71
NVA Cube 2 £380	Average Good	A rude but exciting miniature, with unusually accomplished bass capabilities for its size	28.5 x 27 x 28.5cm NVA stands against wall	85dB/w 48Hz (in room)	R	82
NVA Cubix £1100	Average Good	Too idiosyncratic for formal recommendation, the Cubix possesses remarkable bass extension for its size, but is tricky to optimise	60 x 32.5 x 32.5cm	84dB/w 28Hz (in room)		78
Opus 3 Capella £599	Good Good	The sound of this Scandinavian curiosity certainly benefits from the crushed marble enclosure, though presentation is strictly DIY	32 x 40.5 x 26(ave)cm amongst books in	86.5dB/w 45Hz		66
Opus 3 Credo £399	Average Average	Credo's odd-shaped silicate-based cabinet confers good box and bass performance, but the sound could be more neutral for the price	32 x 28 x 32cm stands in free space	88dB/w 65Hz		74
Pearl & Oakley Victoria 200 £1099	Average - Average -	Extraordinary — and to many very attractive — 'ginger jar' presentation in Staffordshire ceramics, but let down by need for further acoustic development	93 x 33 x 33cm on floor in free space	87dB/w 30Hz (in room)		78
Philips FB815 £250	Average Average	An impressively — indeed imposing — physical package for the price, clever engineering gives a very competent if slightly hard and brittle sound quality	63 x 27 x 27cm low stands in free space	85dB/w 30Hz		86
Philips FB820 £450	Good Average	Big-but-less-than-beautiful three-way is well enough balanced but lacks communication skills in the time domain	86 x 27 x 35cm floor clear of walls	87dB 28Hz (in room)		98
Philips FB825 £650	Good Good	Generous sounding and impressively uncongested for the type, loudness and bass extension don't quite match the large and rather plasticky box	110 x 29 x 41cm on cones clear of walls	88dB/w 25Hz	R	90
QLN Model One £700	Good Average	Similar to Signature at two thirds the price, Model One exaggerates the latter's rich and heavy midbass and lacks its velvet smoothness	35 x (16-25) x (21-27)cm pillar	85dB/w 28Hz (in room)		82
QLN Signature £1100	Good Good	Beautiful but expensive luxury compact has a rather laid back and 'heavy' sound, but coloration is low and stereo imaging very good	37 x 18 x 36cm heavy stands in free space	83dB/w 30Hz (in room)		78
Quad ESL-63 £2072	Good + Very Good	With its unusual but subtle characteristics this classic electrostatic may not be punchy in the bass, but has strengths that some cannot live without	92 x 66 x 27cm open stand well clear of	84dB/w 34Hz	R	60
RAM Hermes £425	Average- Average+	Slim small floorstander is a bit tall for its footprint. Good sensitivity is combined with an attractively lively sound, but it's uneven and not truly coherent	70 x 21.5 x 23cm floor, freestanding	91dB/W 45Hz (in room)		94
RCF Mytho 3 £1,395	Average Average+	Undoubtedly very attractive and well built, incorporating a number of unusual and interesting ideas, the highish price isn't really justified by the performance.	100x21.5x30cm away from walls	88dB 25Hz (in room)		102
Richard Allan CD5 £184	Average - Average -	This neatly presented small reflex design can sound engagingly communicative, but is flawed sonically and technically and quite expensive too	38 x 19 x 23cm on rigid stands	88dB/w 80Hz		68
Rogers LS2a £193	Average Average	Provides very good engineering and stereo performance for the price, alongside some 'boxiness' and certain dynamic constraints	36 x 23 x 21cm low stands 1ft from wall	88dB/w 50Hz (in room)		82
Rogers LS4a £255	Good Good -	This artfully voiced and well balanced compact gives a fair flavour of the classical 'BBC sound' at a very reasonable price	43 x 25.5 x 24.5cm stands 1ft from wall	87dB/w 32Hz (in room)	R	78
Rogers LS6a £316	Good Good	Stereotypical model with impressively even balance, prospective purchasers will have to weigh the midband naturalness against slightly lazy dynamics and timing	51 x 27.5 x 28cm stands in free space	86dB/w 25Hz (in room)	R	86
Rogers LS7t £449	Good + Good +	A fine combination of classic qualities at reasonable price produces the "R" tag, but try to get a pair home on approval to check for bass 'heaviness'	56 x 27 x 28cm free space on 40cm stands	88.5dB/w 48Hz	R	59
Rogers LS8a £425	Average + Average +	This modestly priced floorstander is a bit of a mixed bag, with plenty of scale and welly but lacking the subtlety, clarity and agility delivered by some rivals	89x25.5x25cm clear of walls	91dB 48Hz (in room)		102
Rogers Studio 1a £612	Very Good Good -	The classic BBC monitor style sound sensitively updated — transparent and natural with fine stereo, but a touch 'heavy' in balance	63.5 x 30.5 x 30.5cm stands in free space	87dB/w 36Hz	R	66
Roksan Darius £1569 (£389 integral stand)	Good Very Good	Now totally realigned, the current Darius provides an exceptionally impressive combination of transparency and delicacy with fine information retrieval and speed	47 x 27 x 40cm own stands angled in space	82dB/w 20Hz	R	86
Royd A14 II £199	Average Good	Not the smoothest or prettiest around, this is still an informative if sometimes aggressive large bookshelf model, with plenty of welly for the price	40 x 26 x 23cm stands 1ft from wall	87dB/W 30Hz (in room)	R	94
Royd A7 Series 11 £115	Average + Average	Lively clear sound; good upper bass and dynamics, but treble "ramp" made vocals sound shut in. Try before you buy	31 x 20 x 17cm shelf or 50cm stands near	86dB/w 75Hz	R	53
Royd Apex £485	Average + Good	Not the smoothest sound around, it more than compensates with an impressively communicative and informative musical presentation	85.5 x 20 x 30cm on floor close to wall	87dB/w 33Hz (in room)	R	78
Royd Eden £235	Average Average +	Delightful mid/treble speed and transparency but determinedly bass light, this oddball miniature threatens cult status but could use a sweeter tweeter	31 x 20.5 x 18.5cm stands close to wall	87dB/w 85Hz	R	66
Royd Sapphire £200	Average+ Good-	Neat little miniature sounds a touch cold and thin but unusual main driver delivers remarkable speed and coherence for such a reasonably priced model	30.5 x 20.5 x 21cm frame stands 1ft from	88dB 28Hz (in room)	R	98
Royd Sintra £330	Average + Good	Balance is bass light and a little bright, but superb dynamics, speed and timing make this luxury miniature musically very informative and satisfying	30.5 x 20.5 x 19cm stands close to wall	88dB/w 50Hz	R	90
Ruark Swordsman £219	Good Average	Very attractively styled and finished, the Swordsman is a well built 'small bookshelf' model that delivered better test than listening results	38.5 x 20 x 27.5cm stands 0.5m from wall	84dB/w 50Hz		71
Ruark Swordsman Plus £269	Good Average	This real world variation on the established Swordsman theme looks and measures rather better than it sounds, probably due to rather prosaic drivers	38 x 20 x 28cm stands 1-2ft from wall	84dB 27Hz (in room)		98
Ruark Talisman £629	Average Good	Clever and beautifully finished compact floorstander has some coloration but is impressively informative and communicative, with fine pace and timing	83.5 x 21.5 x 31 (max) cm close to rear wall	86dB/w 30Hz	R	90

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MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
SD Acoustics OBS £845	Average Good	Recent changes have added some refinement to a seductive midrange, good timing and fine sensitivity, though bass extension is limited and coloration obvious	102 x 35 x 25cm floor, angled, away from	92dB/w 30Hz (in room)	R	82
SD Acoustics Ribbon £2150	Average Good +	Entertaining but a little underdeveloped and rather amplifier sensitive, the Ribbon is a lively and loud hybrid marred by some colorations; some like it, others don't	152 x 30 x (15-30)cm floor, angled, away	91dB/w 30Hz (in room)		81
SD Acoustics SD1 £1350	Average Very Good	A large scale, airy and unusually detailed system with excellent dynamics. Current model has more civilised top-end and warmer balance than original model	123.5 x 38.2 x 31.9cm free space	90dB/w 50Hz	R	60
SD Acoustics SD3 £379	Average Good	Neither cheap nor perfect, this near miniature sounds unusually lively and dynamic within inevitable physical constraints. Both engaging and entertaining!	38 x 19 x 29cm stands 10cm from wall	83dB/w	R	86
Seventh Veil System IV £1290 (£340 integral stand)	Average Good +	Lacks welly and loudness but delivers astonishing results with female vocals in particular. Antithesis of the 'good allrounder'	72 x 44 x 21 x 29cm own-stands close to	84dB/w 28Hz (in room)	R	86
Shan Shinna £315	Average+ Good-	Pretty little miniature with resin-based enclosure has a bright, thin but sweet and communicative sound; loudness and welly are both limited	31 x 21 x 17cm own stands 1ft from wall	84dB 48Hz (in room)	R	98
Sony APM-101ES £100	Good Average	Big hearted sound from small bookshelf successor to BB '10ES, sounds a little untidy at frequency extremes, so suits CD better than vinyl	39.5 x 22.5 x 23.5cm stands, free space	86dB/w 52Hz	R	71
Sony APM-121ES £150	Average Average -	Good perceived high tech value, but the balance has an artificial 'loudness' character, too rich in the bass and too strong in the treble	43 x 25 x 28cm stands, free space	86dB/w 25Hz (in room)		86
Sony APM-141ES £200	Average Average	A great deal of loudspeaker for the money, the rich sounding '141 needs a big room and still shows significant 'loudness' (boom'n'tizz) tendencies	61.5 x 26 x 32cm stands in plenty of	88dB/w 30Hz (in room)	R	78
Sony APM-181ES £300	Very Good Average	Big and beefy but equally fat and bass heavy, this well engineered 3-way has notable strengths but lacks transparency and sounds better at lower levels	57.5 x 29 x 36cm low stands, free space	87dB/w 40Hz		71
Spendor SP1 £800	Very Good Good	A very subtle and musical performer that works particularly well with digital material. An exceptional allrounder	63.5 x 29.5 x 30.5cm stands, free space	87dB/w 41Hz	R	60
Spendor SP2/2* £500	Very Good Good +	Conceding little to the SP1, this 30 litre model displayed good tonal balance with a highly articulate midrange, only slightly marred at frequency extremes	50 x 25 x 30cm stands, free space	87dB/w 45Hz	R	59
Spendor S20 £510	Very Good Good	This solid and elegant luxury compact maintains Spendor's tradition for peerless mid-to-treble coherence and perspectives. Bass is rather unconvincing.	38x22x26cm stands 1-2ft from wall	83dB 25Hz (in room)	R	102
Spica Angelus £1295	Good Average	A little bass shy and soft in the bass and lower mid, the free standing Angelus is otherwise tidy, extremely lively and fluid, if uneven overall	116.8 x 53.3 x 26cm away from walls	86.5dB/w 50Hz		60
Spica TC50 £599	Good - Good	This triangular-profile 'grown up' miniature is a shade boxy and laid back but has good rhythmic and musical integrity	40.5 x 33 x 29cm stands in open space	88dB/w 55Hz		71
Spica TC50SE £799	Good - Good	A heavily UK-modified TC50, the SE sounds less boxy and more spacious, but lacks some of the urgency of the standard model	40.5 x 33 x 29cm stands in open space	88dB/w 55Hz		71
Studio Power DMS100 £249	Average + Average +	Close to a BB rating, and in many respects remarkable value for money. Delivers an impressively smooth and large sound, but sheer ugliness will limit its appeal	51 x 26 x 32cm open stands 1ft from wall	86dB/w 25Hz (in room)	R	82
Tannoy Westminster £3600	n/a Good +	These awesome horn loaded speakers are remarkably controlled and impressive, if only suited to a few pockets and rooms	Huge, flat against rear wall, away from	96dB/w (manuf.)	R	Coll '87
Tannoy 603 £120	Average+ Average+	Pretty hexagonal cabinet miniature is optimised for free space siting and delivers fine imaging with little boxiness, but little in the way of welly and power either.	33.5x22(max)x16cm high stands in free space	85dB 45Hz (in room)	R	102
Tannoy 609 £250	Good Good	Distinctive hexagonal cabinet reduces box colorations, and new dual concentric driver is sweeter than its predecessors, making this one very superior speaker	50x32(max)x22cm stands clear of walls	90dB 25Hz (in room)	BB	102
TDL Monitor £1799	Very Good Very Good	Fine solidity and good accuracy, with enough bass extension to satisfy even organ freaks. Needs a big room and can sound a bit lazy and a shade tinkly	118.5 x 30 x 47cm 0.5m from walls	85dB/w 28Hz	R	66
TDL Studio 0.5 £399	Average Good	This tiny floorstanding transmission line has good agility but doesn't provide the coherence or even balance of the slightly bigger Studio 1	55 x 20 x 30cm own stand, free space	85dB/W 40Hz (in room)		94
TDL Studio 1 £599	Average + Good	Delivering genuinely extended bass from a compact floorstanding enclosure, the Studio is very detailed but a shade clinical and detached in presentation	76 x 23 x 33cm	84dB/w 25Hz (in room)	R	78
Technics SB-CS5 £70	Average Average	Clearly fine material value for money, the CS5 nevertheless betrays its mid system heritage.	42.5 x 25 x 24cm Stands in free space	86dB/w 48Hz	R	86
Technics SB-EX2 £179	Average- Average	Nicely presented, well built and decent size enclosure sounds solid but somewhat dull, thanks presumably to rather ordinary, low cost drivers	48 x 23.5 x 27cm stands clear of walls	86dB 20Hz (in room)		98
Technics SB-RX50 £600	Very Good Average +	With its unique coaxial drive unit the RX50 proved a smooth and well balanced loudspeaker, its minor weakness being a mildly excessive low bass	48 x 30 x 26cm free space on 40cm stands	86dB/w 40Hz	R	46
Technics SBC 250 £140	Average + Average -	Despite a fairly even tonal balance, the 250EK sounded muddled in the midrange and dull in character	36.5 x 23.5 x 20.5cm free space, stands	86dB/w 60Hz		46
Townshend Glastonbury IIS* £1700	n/a Very Good	What? No bass? Actually, like the KEF 107, Glastonbury II goes down so low you might not notice how good it is. A truly remarkable performer. Superb	91.5 x 28 x 4.6 free standing in room	88dB 27Hz	R	65
Townshend Glastonbury Tor £1495	Average - Very Good	Prodigious bass extension, stunning stereo focus and low cabinet coloration, but limited loudness from low sensitivity and power handling	99 x 26.5 x 33cm well clear of walls	82dB/w below 20Hz	R	90
Vandersteen Model One £1000	Average + Average +	This compact American floorstander's elegant staggered baffle arrangement contributes to a refreshing freedom from boxiness, but the price is quite high	100 x 30.7 x 25.6cm floor clear of walls	87dB/w 23Hz (in room)		86
Vecteur Premiere £695	Average Good	Expensive for its material content, this pretty French compact nevertheless has a beguiling sound quality that indicates painstaking development	34 x 19.5 x 25cm light stands clear of walls	88dB 48Hz (in room)		98
Videotone Minimax 2 £80	Poor Average -	Cheap in build and QC as well as price, but cheerful (if coarse) with it - if a little too cheerful after extended listening	27.5 x 17 x 20cm near rear wall	84dB/w 90Hz	R	74
Visonik David 6001 £173	Average - Poor	Sharp styling a classy looking miniature makes, but the complex grillework worsens a sound which starts off with too much top and not enough bottom	20 x 12 x 13cm against rear wall	87dB/w 130Hz		74
Wharfedale 410 £130	Good Average-	One step up from the Diamond, this attractive and sensitive small bookshelf model sounds smoother but is also rather bland and uninvolving	34.5 x 22 x 22.5cm stand against wall	89dB/W 45Hz (in room)		94
Wharfedale 505.2M £260	Average+ Good-	Luxury red mahogany finish version of 505.2, confirms that this well balanced design remains fully competitive nearly three years after the original	44 x 25.5 x 25.5cm stands in free space	87dB 45Hz (in room)	R	98
Wharfedale 505/2 £190	Average Good	This lively Wharfedale provides plenty of speaker with unusual refinement for the money, and should be fairly tolerant of room siting	44 x 25.5 x 24cm stands 1ft from wall	86dB/w 55Hz	BB	66
Wharfedale Coleridge C £600	Good Good	Very prettily dressed and sounds pretty good as well, though whether enough to justify the £600 pricetag is open to debate. Well balanced, smooth and a little dull.	48x25.5x25.5cm stands clear of walls	86dB 30Hz (in room)		102
Wharfedale Delta 30.2 £100	Average- Average	This hundred pounder has a bigger main driver than many of its rivals, and so packs a bit more welly and loudness. Coloration is rather obvious, but timing is good	38 x 22 x 17cm stands close to wall	88dB 48Hz (in room)	BB	98
Wharfedale Diamond IV £109	Good Average +	Thanks to a new metal dome tweeter, the new Diamond is much more civilised than its predecessors, with an attractive lively bounce but some boxiness	27 x 18 x 18.5cm stands close to wall	86dB/w 48Hz	R	90
Yamaha NS 1000M £900	Good Good +	Living up to its monitor label, and tonally well suited to digital material, the NS 1000M is superbly crafted and capable of high levels	67.5 x 37.5 x 32.5cm 30cm from wall, stands	90dB/w 40Hz	R	46

The Directory

PERSONAL STEREOS

Whilst not exactly hi-fi components, personal stereos probably play more music to more ears than all manner of domestic systems and as such demand some attention.

Now that personal CD players have joined the ubiquitous Walkman in the market, the variety and standard of sound quality is huge, with obscurely named cassette players practically falling out of your cornflakes packet and the top Discmen going for £300 or more.

Despite their diminutive size personals attempt to incorporate as many gimmicks and features as possible, cassette players often incorporating tuners, Dolby noise reduction or even graphic equalisers.

CD players are still relatively expensive, although prices have come down a lot, and don't tend to vary that much on the features front, rather the amount and quality of accessories differs. Rechargeable batteries are extremely useful and increasingly popular, some can now be recharged within the unit and charge capacities are also being increased.

Most models come with a mains adaptor, which in some cases doubles as a battery charger and some include a wired remote control. A few are now appearing with infra-red remote control although this is more applicable to CD players.

Sound quality on the cassette front seems to

have a proportional relationship to price and integrity of construction – wow and flutter being quite obvious on the cheaper models.

CD players become less noisy as they get dearer and also reduce in size; one drawback of the latter seems to be that immunity to shock suffers as a consequence, although newer models are starting to buck this trend. Cassette players do, on the whole, seem better suited to the outdoor life than their digital counterparts, as does the software. Bear in mind that the sound and lab ratings given below cannot realistically be compared to those in other categories or between cassette and CD personals.

PERSONAL CASSETTES

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Aiwa HS P505MkII £70	Good	Very good clutch of features and accessories plus good sound at a reasonable price. Could be more user friendly	Remote control, rechargeable battery and charger	BB	102
Aiwa HS-PL707 £135	Very Good	Has a precise, attractive sound, if a little clinical and cold. This player might be ideal for the user who will listen to mostly classical music. Somewhat fiddly to use	Remote control, BBE sound enhancer, charger & battery	R	102
Aiwa HS-JX705 £220	Good	Rather expensive radio-equipped player. Sound quality on tape playback didn't match up to the Aiwa HS-PL707	FM/AM tuner, recording mic remote control, charger		102
Panasonic RQS15 £85	Good	Considerable power and immediacy to the music though with some raggedness. Good features and accessories. Well designed and easy to use	Remote control, rechargeable battery and charger	R	102
Panasonic RQV520 £100	Good	Features an onboard radio without sacrificing sound quality on tape playback. You lose out on accessories, though (no battery charger)	Radio, remote control, bass enhancer		102
Panasonic RQS65 £130	Good+	Solid, warm sound plus a good selection of features and accessories all combined in a stylish and very user friendly package. Comes with one of the better remote controls	Remote control, rechargeable battery and charger	R	102
Sanyo MGR401D £40	Average-	Easy to use budget model with a radio and some useful features (including a simplified remote control). Sound quality on tape isn't great but is helped by the bass enhancer	Radio, remote control, bass enhancer with graphic equaliser		102
Sanyo MGR580 £50	Poor	A more sophisticated radio than on Sanyo's 401D but the feature count is low and the tape playback unexceptional	Radio 'digital tuner', auto reverse		102
Sanyo SPT1000 £40	Average	Despite outlandish colourful trim and features completely unrelated to audio enjoyment (a 'Pedometer' for monitoring jogging) this has a better basic sound than the other Sanyos	Bass enhancer		102
Sharp JC-510 £30	Average	Serviceable sound quality and some decent features at a low price	Radio, bass enhancer, auto reverse		102
Sharp JC-K99 £160	Good-	Sharp's 'extremely lightweight' model. Well made, elegant and it certainly doesn't weigh a lot. Pleasant sound, marred on the test sample by some distortion	Remote, rechargeable battery and charger, bass enhancer		102
Sony WM DD33 £90	Good-	Well built and resistant to vibration on the move but comes with very limited features and accessories for the price	Bass enhancer		102
Sony WM EX80 £150	Good	User friendly Sony with a good remote control and high quality, accurate sound. Comes with all the extras	Remote control, rechargeable battery and charger	R	102
Sony WM DD99 £240	Good-	Mixed bag of accessories (nice headphone storage system, but no remote control) with variable sound quality at a steep price. But it does have Dolby B&C, good build quality and ergonomics	Dolby B&C, rechargeable battery and charger, auto reverse		102
Sony Walkman Pro £249	Very Good	One of the finest sounding cassette decks on the market today. A mandatory Best Buy, it takes other personals to the cleaners (except on weight and power consumption)	Dolby B, C, types I, II & IV, record, line in/out, varispeed	BB	52/56

PERSONAL CDS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Aiwa DX-P50 £155	n/a	A tad aggressive both through earphones and domestic systems, not very walkable but it has got two stage bass enhancement	Digital output, mains adaptor, remote		94 Supp.
Denon DCP-100 £250	n/a	Solidly constructed and nicely finished in the slightly impractical Velvex, almost walkable, competent if uninspiring sound quality	Remote, mains adaptor, no earphones, rechargeable batts		94 Supp.
Denon DCP-50 £180	n/a	Not very walkable, but lightweight and nicely finished in a nextel like grey. Sound through a system is a tad unexciting but not too bad	No headphones, remote, mains adaptor		94 Supp.
Goodmans GCD-10 £120	Average - Poor	Cheap, flashy and not short on accessories, the GCD-10 is a rather noisy player that left a lot to be desired on the sound quality front	13.5 x 2 x 18cm, 478g, mains adaptor		66
Kenwood DPC-41 £130	n/a	Lightweight, not very walkable but nice control layout. Sound through the phones is on the thin side, through the line output it's pretty average for a portable	Mains adaptor, rechargeable batts		94 Supp.
Kenwood DPC-81 £200	n/a	Chunky metal cased player that makes pretty confident sounds through a system but sounds dry via earphones and ain't exactly walkable	Remote control, mains adaptor/charger and batts, digital output		94 Supp.
Philips AZ6897 £200	n/a	Unusually designed and equipped with a radio the Philips is almost joggable, it sounds remarkably good via a system and a little cautious through the phones	Mains adaptor with built in plug, wired remote, clock and carrying case	BB	94 Supp.
Sanyo CP-12 £260	Average Good +	Sonically amongst the more enjoyable personal CD players and capable of revealing the musical aspects of a disc in an interesting and entertaining fashion	12.5 x 2 x 12.7cm, 380g, wired remote, mains adaptor	R	66
Sony D-350 £300	n/a	More buttons and widgets than any of the others but not the sound quality or walkability to go with it	Mains adaptor, clock, comprehensive facilities, rechargeable batteries		94 Supp.
Sony D-66 £180	n/a	One of the few walkable CD players on the market, sound quality is a little muddled but not offensive	Mains adaptor, rechargeable battery pack	R	94 Supp.
Technics SL-XP1 £140	n/a	Remarkably competent and enjoyable player that you can actually use on the move and sounds enthusiastic through a domestic system	Rechargeable batts, mains adaptor/charger	BB	94 Supp.

The Directory

TUNERS

The radio medium operates at a much lower profile than TV, but in areas outside pop music the BBC service is the envy of the world. Live Prom concerts can rival all other sources from a hi-fi perspective. Only the FM (VHF) bands give stereo hi-fi sound, though AM (MW & LW) are useful for certain transmissions in the UK.

Something of a hi-fi afterthought, tuners are often selected merely to match a chosen amplifier

cosmetically. However, the task they carry out is far from simple (or cheap), combining the skills of RF (reception) and audio (signal processing) engineering. The importance of the former will depend on local reception conditions, but money invested in a high quality outside aerial system is well spent

Tuners come in two basic types. Analogue models tune gradually (and usually manually)

acrossthe bands, and can have analogue or digital displays; they are often preferred for sound quality, and are certainly best for AM bands. Digital tuners offer convenient automatic tune facilities and hold many station positions in pre-set memories. (The Lab and Sound results for models tested in issue No. 65 refer to FM only. For AM results see under Comments.)

TUNERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Aiwa XT-003 £105	Average	Economically designed and built in the UK, but trade-offs have a marked influence on FM and AM sound quality.	FM/AM digital, 30 presets, no signal strength meters.		93 Supp.
Akai AT-52L £150	Very Good	Holds its own on FM against many much more expensive tuners, but AM is very poor	All bands	BB	65
Akai AT-93L £250	Good + Good +	By AM standards presentable (good) while FM delivers the goods	All bands, aerial switch	R	65
Arcam Alpha 2 £185	Good Average+	Re-styled to blend in with the Alpha system, Arcam's cheapest tuner makes up for its lack of features with a sensitive front-end and mellow sound.	FM/AM analogue, no presets, manual tuning + AFC	R	93 Supp.
Arcam Delta 80 £340	Very Good Very Good	Hi-fi sound on FM, good on AM, a dependable British all-rounder	6AM, 6FM presets. FM/MW/ LW display, manual tune	BB	55
Creek T40s3 £220	Average+ Average	Creek's FM-only analogue tuner is now in series 3 form, though the aesthetics remain unchanged. Our sample was hampered by an obvious bass 'hump' though production units are said to be cured.	FM-only analogue, no presets, manual tuning + AFC		93 Supp.
Denon TU-260L £100	Very Good Good+	A new cheapie from Denon with the bare minimum of features. Careful designwork promises a surprisingly open and vivacious sound, so don't overlook it!	FM/AM digital, 20 presets, manual and auto tuning.	BB	93 Supp.
Harman Kardon Citation 23 £600	Good Very Good	Fine performance, interesting features and ease of use are this tuner's forté, and the sound quality is top notch	FM/AM seek/manual adjustment muting 16 presets remote control	R	60
Harman Kardon TU9400 £250	Good Very Good	Striking in appearance and with a sound to match, this new digital tuner comfortably exceeded our expectations. On stereo FM it's HK's best yet.	FM/AM digital, 24 presets, auto-tuning, signal strength meter	R	93 Supp.
Linx Theta £475	Good Very Good	A Magnum Dynalab on the cheap with the hallmark styling of this small British newcomer. Some of the best midrange from any tuner	Manual analogue tuning, no presets, signal strength meter	R	72
Magnum Dynalab FT101 £599	Good Very Good	Although expensive for its fairly minimum set of facilities, its excellent sound makes up for what it lacks elsewhere	Analogue manual tuning, no presets, signal strength meter	R	72
Marantz ST-40L £140	Average + Good	A little slow to tune but once accomplished it provides a meaty and dynamic sound on FM. AM too has a little extra bite to its performance	FM/AM digital, 30 presets, manual/auto tuning	R	93 Supp.
Meridian 204 £660	Good + Good	Pleasant sounding with a fine finish but does not make the grade at this price	FM only, auto scan, digital, remote, timer		55
Naim NAT 01 £1377	Very Good Excellent	There may be better sounding tuners in the world, but we have yet to hear one	No presets. Two box, flywheel tuning, FM only, Analogue	R	50
Nakamichi ST-7E £750	Good + Good +	Exceptionally good for weak-signal areas, and good all round	16 AM/FM presets, auto time digital		55
Pioneer F91 £360	Excellent Good +	Easy to use, this model has excellent RF performance and scored very high ratings on the listening tests	FM/AM 24 presets	R	60
Proton AT-300 £199	Good Good	The AT-300 is pretty on the outside, orthodox on the inside and rather dear. AM - poor	FM/MW only	R	65
Quad FM4 £399	Very Good Good +	Fine sound, excellent ease of use, good build and finish and a more than satisfactory technical performance	7 presets. Digital	R	50
Revox B260 £1120	Excellent Very Good	Sophisticated and expensive, the B260 is ideally suited to the rest of the Revox range and should also work well in other systems	FM - virtually everything	R	60
SAE T-102 £449	Good + Good +	Expensive for all the radio you get, but sounds interesting. AM - poor	FM/MW only	R	65
Sony ST-S530ES £200	Good+ Good	The cheaper version of Sony's revered '730 certainly looks and feels the part but its sound is, well, less startling. Civilised, yes, but lacks much enthusiasm.	FM/AM digital, 30 presets, hi-blend + Cal tone + manual/auto tuning.		93 Supp.
Technics ST-G70L £200	Good+ Good+	Another very polite and refined-sounding tuner but one that does retain just enough sparkle to keep your interest. Plenty of widgets to play with too...	FM/AM digital, 39 presets, selectable RF/IF + fine tuning, signal. str. mtr.	R	93 Supp.

TURNTABLES - CARTRIDGES

Very much the 'slave' of turntable and tonearm and to some extent undermined by the supply of free 'starter' cartridges on many turntable systems, the cartridge is still worth taking seriously. The quality of both the stylus itself and the cartridge's tracking performance are important in preserving that most important part of the hi-fi system – the record collection – and the cartridge also plays a significant role in determining the overall balance of a system.

Cartridges fall into two groups: high output models, capable of working directly into any amplifier, and more expensive low output models.

Stereotypically, low output cartridges use the moving coil principle of operation, have better mechanical integrity and tighter tolerances, and give better performance but at much higher cost. Most under-£150 amplifiers and many valve designs need either an extra head amp or

transformer to cope with the low output.

Cartridge/amplifier interfacing can be very subtle, but even basic high output moving magnet designs benefit in overall balance from optimised amplifier capacitance loading. Still more important, the mechanical cartridge characteristic of cantilever compliance ('springiness') needs to be considered in the light of the effective mass of the tonearm which will be used.

TURNTABLES - CARTRIDGES

MODEL PRICE	LAB SOUND	COMMENTS	ARM EFFECTIVE MASS OUTPUT/TYPE	VALUE	ISSUE
Arcam C77 £22	Average + Average +	A sensible moving magnet package with good bounce at a competitive price	6-16g Normal, MM	BB	48

The Directory

TURNTABLES - CARTRIDGES

MODEL PRICE	LAB SOUND	COMMENTS	ARM EFFECTIVE MASS OUTPUT/TYPE	VALUE	ISSUE
Arcam C77Mg £30	Average - Average	Punchy sound quality with plenty of extra energy to liven things up. The solid body seems well worth the extra £10	4-8g Normal, MM	BB	67
Arcam E77Mg £50	Average Average	Our sample had a disappointing stylus, but gave a coherent, rich and laid back sound, with good 'scale'	3-8gN Normal, MM	R	48
Arcam P77Mg £60	Average + Average +	Cautiously recommended, the P77Mg was preferred to its cheaper partner by virtue of a better tip. Channel balance could have been better	4-9g Normal, MM	R	48
Arcam PMX10 £100	Good + Very Good	Not the very clearest in complex high-frequency sounds, but lively and exciting, good transients	5-11g Low, MC	R	85
Audio Note I02VDH £1295	Good Very Good	One of the best, giving 'an extraordinarily relaxing midrange clarity', needs a transformer	8-18g Very low, MC	R	43
Audio-Technica ART1 £800	Good + Very Good	This is a delicate and very fluid-sounding MC that tracks well, offers very low distortion and exceptionally good stereo separation	9-18g Low, MC	R	72
Audio-Technica AT-420E £35	Average Average	Better suited to pop recordings, this MM bears some of the sonic hallmarks of the Linn K5	7-14g (damp) Normal, MM	R	67
Audio-Technica AT-95E £19	Average - Average	Clear, dynamic if richly balanced, the magnetic '95E is a definite Best Buy	8-14g Normal, MM	BB	48
Audio-Technica OC-10 £307	Good + Good +	Good treble and good detail too, but some congestion and coloration reduces its informativeness.	4-12g Low/MC	R	103
Audio-Technica OC-5 £123	Good + Good	For the price, it's unusually effortless and detailed, but it tends to become rather relentless and tiring after a while.	5-14g Low/MC	R	103
Audioquest AQ 404i-L £400	Very Good Good +	Slight harshness detracted from the performance of this otherwise clear-sounding and detailed cartridge	8-16g Low, MC		84
Audioquest AQ 7000 £1200	Good Good +	Stunning stereo imaging and good detail at low levels are spoiled by less-than-perfect tracking and high sensitivity to arms.	6-20g Low, MC		91
Audioquest MC5 £220	Average Average	Offers high-output benefits but the drooping frequency response and severe VTA error preclude recommendation	10-20g Normal, MC		54
Cello Chorale £750	Average + Good	Now available through a new distributor at a saving of some £300, the Chorale is still blessed with a delicate but highly detailed treble. Arm matching is a problem	3-9g Low, MC		72
Denon DL103 £99	Good Average +	An oldie but in many ways a goodie, the 103's good performance in bass and general 'life' is seriously let down by its spherical stylus which kills subtle details.	9-22g Low/MC		103
Denon DL110 £69	Good Good	Firmly recommended as a fine all-rounder, this high-output moving coil model is likely to perform well in nearly all circumstances	6-16g Normal, MC	BB	48
Denon DL160 £89	Average + Good	Although listeners just preferred the 110, its brother here proved a twin in lab tests and is still "thoroughly competent"	6-16g Normal, MC		43
Denon DL304 £200	Very Good Excellent	Uncoloured, detailed, neutral, superb tracking; top notch altogether, and a top notch bargain too.	4-12g Low/MC	R	103
Dynavector 17D2 £280	Very Good Very Good	Clear, detailed, neutral and generally very informative - excellent	6-18g Low, MC	R	91
Dynavector DV-50X £99	Good Average	A high-output MC model with impressive lab performance, but whose tip and sound quality both disappointed	6-14g Normal, MC	R	48
Dynavector DV10X IV £125	Average Average +	Fine sounding and realistically priced, damping is recommended to ensure successful tracking ability	8-18g (damping) Normal, MC	R	48
Dynavector DV23RS £230	Average + Good	Sound quality was described as "shut-in", lacking energy and sparkle but with some "edginess" in high frequencies	10-22g Low, MC		28
Dynavector XX-1 £680	Very Good Good +	Good, but not immensely competitive at the price, and not helped by comparison with the low output version	7-15g Normal, MC		84
Dynavector XX-1L £680	Very Good Very Good	Very clear, very detailed, no troubles with tracking; response lift around 20kHz seems to do no harm	7-13g Low, MC	R	84
Empire Benz Micro MC-Gold £130	Good + Good	Nothing is obviously wrong, but nothing is stunningly right either and tracking isn't perfect. Safe, but perhaps a little too safe	7-17g Low/MC		103
Empire Benz Micro MC-Silver £130	Good Good	High output MC that though ultimately not the peer of the MCGold is more appropriate to the sort of equipment it's likely to be partnered with	8-18g Normal/MC	R	103
Empire Benz-Micro MC-2 £699	Average Good +	Similar to both the Empire MC1000 and vdH MC2 in design, the Benz offers a warmer and very transparent account of the music. Its tracking prowess is slightly limited	5-12g Low, MC	R	72
Glanz GMC-10EH £50	Good Good	The rising HF trend of this high o/p MC may cause problems in certain systems but with a favourable wind its seductive qualities will win out	8-14g Normal, MC	R	67
Glanz GMC-10LX £80	Average + Average +	Bearing some of the hallmarks of the '10EH, the '10LX is still less competitive in the sonic stakes	7-15g Low, MC		67
Glanz GMC-20E £129	Good + Good +	Very good tracking, smooth sound and good detail. Very slight surface noise enhancement	5-10g Low, MC	R	91
Glanz MFG-110EX £25	Average Average	A little bright but giving detailed bass and clear treble, this was competitive at the price	6-16g Normal, MM	R	43
Glanz MFG-310LX £50	Good + Very Good	Detail and treble outstanding for sub-£100 cartridge. Slight coloration may be due to body resonance	6-10g Normal, MF	BB	85
Glanz MFG-610LX £90	Good + Good +	Similar to cheaper '310 but slightly clearer transients and bass. Benefits from lowish impedance loading	3-10g Normal, MF	R	85
Goldmund Clearaudio £1500	Average + Very Good	Something of a mixed bag overall, its sonic character bears a strong resemblance to the Pradikat though it shares some of the hallmarks of the more expensive Accurate	5-12g Low, MC		60
Goldring 1012 £50	Good + Good	Slightly harsh sound but plenty of life and quite good detail. Some very high frequency coloration apparent	6-12g Normal, MM	R	85
Goldring 1022 £70	Good + Good	As with 1012, a touch harsh; detail and transient purity improved, though, and it goes well with electric guitar!	5-11g Normal, MM	R	85
Goldring 1042 £90	Good + Good	Not terribly subtle, and not such good value alongside 1012 and 1022. Quite lively, though	7-12g Normal, MM		91
Goldring Elan £20	Average + Average	A lightweight and frisky-sounding MM that appears to be based upon the same body as the Nagaoka mm4	7-15g Normal, MM	R	67
Goldring Elite £200	Good + Good	The basics are right, and the Elite will cheerfully tackle any source material, but its sound possesses a certain dirtiness which can irritate.	8-18g Low/MC		103
Goldring Epic II £32	Average Average +	An excellent budget choice though the limitations of the stylus are rather obvious at higher frequencies	5-12g Normal, MM	R	67
Goldring Eroica H £105	Good Good -	More confused and coloured than its low-output sibling - high output less of an issue in these days of cheap MC-compatible amplifiers	8-15g Normal, MC		84
Goldring Eroica LX £120	Good + Good	Not the most subtle cartridge in the world; can sound edgy at times, but lively and informative	8-14g Low, MC	R	84

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The Directory

TURNTABLES - CARTRIDGES

MODEL PRICE	LAB SOUND	COMMENTS	ARM EFFECTIVE MASS OUTPUT/TYPE	VALUE	ISSUE
Goldring Excel £549	Average + Good	Goldring's most expensive cartridge to date errs on the warm and heavy side of neutral. Strong bass lines are its forte though its ability to resolve subtle treble details is weaker	6-13g Low, MC		72
Goldring Excel GS £600	Very Good Good +	The Excel has some true high end quality in its lack of annoying colorations, but tracking seems indifferent and high levels tend to sound rough and edgy.	9-20g Low/MC		103
Grado ZF3E + * £47.50	Average - Average	Downtilting balance disguises the brightness of this cartridge; bit of a mixed bag at this price	9-20g (damping) Normal, MM		54
Grado ZTE +1 £26.50	Average - Average	Bass and treble are a trifle coloured but the midband proved highly enjoyable. Ideal for budget systems	6-13g (damping) Normal, MM	R	54
Kiseki Blackheart £1795	Good Good	This cartridge demonstrated refined poise and a delicate but at once potent security, however, the price did seem a little on the high side compared to other Kiseki	6-16g Low, MC		60
Kiseki Blue Goldspot £450	Very Good Good +	Good bass and imaging, but hints of spit and coloration let the side down slightly	8-15g Low, MC		84
Kiseki Lapis Lazuli £4000	Good Very Good	Combining very sensible design concepts at a silly price, the Lapis Lazuli is best thought of as combining the detail of the MC3000 and the fluidity of the Clearaudios	4-12g Low, MC		60
Kiseki Purpleheart Sapphire £799	Good + Good +	Rare, beautiful to look at and sweet to listen to, our review of this high-flyer conjured up images of Japanese art	5-14g Low, MC		48
Koetsu Black S £612	Average Good +	The S is an OEM design built to Koetsu's blueprint. It features a sturdier fixing plate and offers a brighter, faster and more tactile sound than the earlier K	8-15g Low, MC	R	72
Linn Asaka £373	Good + Good +	Disciples of Linn who are trying to realise their true "Karma" may find that saving money is not a short cut to heaven	9-18g Low, MC	R	Coll. '86
Linn K5 £39	Average Average +	Not as crisply focused as the costlier Linn magnetics, the K5 offers a smoother presentation	7-16g Normal, MM	R	67
Linn K9 £89	Average Good	Linn threw this model into the leading pack by beefing up the Basik's bodywork, adding a super stylus, and keeping the price fair	6-15g Normal, MM	BB	Coll. '86
Linn Karma £564	Very Good Very Good	A specialist which is strongly recommended for Linn-based systems; results may be less predictable in more general application	9-18g Low, MC	R	Coll. '86
Linn Troika £798	Very Good Good +	Good all-rounder, but still some hint of unhappiness at very high levels. Good imaging and bass.	6-18g Low, MC		91
London Maroon £149	Average Average +	Now manufactured under the London brandname this Decca cartridge is as iconoclastic as ever	9-20g (damping) Normal, MM		67
London Super Gold £300	Poor Average -	Immediate and (in the midrange at least) detailed, but very coloured, very nonlinear and questionable effect on records. Devotees swear by it	9-15g (damping) Normal, fixed stylus MM		84
Milltek Aurora £249	Good + Good +	An overall feeling of relaxed ease characterised this clear and atmospheric Kiseki-built cartridge	8-16g Normal, MC	R	Coll. '86
Milltek Olympia £349	Average + Good +	Warm and detailed sound - packs the punch of the best MCs with high output as a bonus	12-20g (damping) Normal, MC	R	54
Nagaoka MM4 £9	Average - Average -	Clear punchy sound that delivers the rudiments of a good performance	6-16g Normal, MM	R	54
Nagaoka MP10 £18	Average Average	High frequencies sounded "shut-in" with this spherical-stylus model, but mid and mass were energetic, bouncy and punchy	5-13g Normal, MM	R	48
Nagaoka MP11 Boron £40	Average Average +	Responding well overall in PM's equipment and listening room, this model was mildly criticised for low level and dynamic limitations	5-13g Normal, MM	BB	48
Nagaoka MP11 Gold £47	Average - Average +	There were mild criticisms directed at most areas, but in general the sound was clear, open and even	3-8g Normal, MM	R	48
Nagaoka Stilton TS10 £50	Good - Good	Stilton-designed solid body (with three-point mounting) certainly gives remarkably resonance-free sound, but tip and generator are less good - a little rough at times.	5-10g Normal, MM	R	85
Nagaoka Stilton TS11 £70	Good - Good	Differs from TS10 in having Vital stylus with better tracing but still some high frequency harshness.	5-10g Normal, MM		85
Ortofon 510 £30	Good Good +	For the price, a good blend of virtues - weight, clarity and neutrality.	3-11g Normal, MM	BB	85
Ortofon 520 £50	Average Average +	Very sensitive to load capacitance this new Ortofon maintains the company tradition for a lively, effervescent SQ	7-16g Normal, MM	R	67
Ortofon 530 £80	Good + Good +	Very clean and assured sound; transients not quite perfectly pure but plenty of detail.	4-11g Normal, MM	R	85
Ortofon 540 £100	Average - Average	Graced with an advanced FGII stylus our sample possessed too high a compliance for broad arm matching. It could also sound a little unforgiving	3-8g Normal, MM		67
Ortofon MC10 Super £70	Average Good	"What a delightfully sweet-sounding cartridge this is ..." we said	5-15g Low, MC	BB	48
Ortofon MC15 Super £100	Good + Very Good	A good all-rounder, with outstanding performance in detail retrieval, even if it can be very slightly bright and close-up at times.	10-24g Low/MC	BB	103
Ortofon MC20 Super £200	Average + Good +	An "inviting" sound quality; polite rather than exciting it approaches much more expensive models, but does not better them	6-15g Low, MC	R	Coll. '86
Ortofon MC3 Turbo £100	Average + Good	Not terribly subtle, but it obviously doesn't aim at that. The 3 Turbo is bright, cheerful and bouncy - take it as it comes!	10-24g Normal/MC	R	103
Ortofon MC30 Super £270	Very Good Good +	Beautifully engineered and well-balanced, it was slightly criticised as bland, though some may appreciate the lack of rough edges	5-14g Low, MC		Coll. '87
Ortofon MC3000 MkII £850	Very Good Excellent	Low levels of body resonance are a real ear-opener. Nothing to criticise elsewhere; one of the very best	9-16g Low, MC	R	84
Ortofon MC5000 £1500	Good + Good	Review sample could not be fully run-in, which might explain limited tracking ability and bright and forward sound, though imaging is excellent. Fussy about s.	12-20g Low, MC		91
Ortofon Quartz £120	Good + Good	Lively, quite detailed, and a touch bright, the Quartz has many qualities of the much dearer Quasar	3-12g Low, MC	R	91
Ortofon Quasar £300	Very Good Very Good	Many of the qualities of the MC3000, although a touch bright. Good detail and delicacy	8-15g Low, MC	R	84
Ortofon Quattro £200	Good + Good +	Undoubtedly a competent performer, the Quattro however seems a less obvious choice than the other Qs. Generally neutral, but can be edgy and bright in loud passages.	6-18g Low/MC		103
RATA RP20 £22	Average - Average	Good integration, a clear dynamic midrange and the beginnings of fine stereo imagery merits clear recommendation	6-14g Normal, MM	R	48
RATA RP40 £44	Average Average +	The '40 did a good job of sorting out the layers and complexity of the mix, with good focus, excellent stereo spread and fine scale	6-15g Normal, MM	R	48
RATA RP70 £77*	Average Average +	Clearer and sweeter than the '40 this also seemed heavier and less lively. For £99 you can have a van den Hul stylus	6-14g Normal, MM		43

The Directory

TURNTABLES - CARTRIDGES

MODEL PRICE	LAB SOUND	COMMENTS	ARM EFFECTIVE MASS OUTPUT/TYPE	VALUE	ISSUE
RATA RP70vdH £99	Average + Good	Able to retrieve bags of musical detail (thanks to the vdH stylus), RATA's top cartridge ranks as one of the most articulate MM's available	11-18g Normal, MM	R	67
Rega Bias £34	Average Average +	Difficult to mount in some arms due to its shallow build, the bias offers a gentile, refined SQ that certainly makes it worthy of audition	4-10g Normal, MM		67
Rega Elys £74	Good Good	Clearly superior to the Bias, despite their common heritage, the Elys is both more detailed, accurate and musically convincing	8-15g Normal, MM	R	67
Revolver £20	Average + Average	This modified AT-95E enjoys a very lively mid and treble even if the bass is somewhat 'slower' in comparison. A firm budget buy	8-16g Normal, MM	BB	67
Roksan Corus Black £110	Good + Good	Recognisably related to Corus Blue, but distinctly more civilised and smoother.	7-12g Normal, MM	R	91
Roksan Corus Blue £65	Good + Good	Roksan-specified modified Goldring 1012; slight harshness detracts from otherwise good sound.	7-11g Normal, MM		91
Shure M104E £36	Average - Average	Capable in many ways, but giving no substantial improvement over the 92E in our view	5-15g Normal, MM		38
Shure M105E £49	Average Average -	A slightly 'spitty' sound lacking deep bass and dynamic contrast, but can be used in virtually every system where it will perform "unobtrusively"	5-12g Normal, MM		38 Summ
Shure M110HE £60	Average Average	Sound quality was thought eminently presentable, but not exciting; smooth clear high frequencies, but a loss of bass definition	5-10g Normal, MM		38 Summ
Shure M111HE £72	Average Average	Early reviews of this cartridge complained principally of the price - which has since come down	5-10g Normal, MM		38 Summ
Shure M92E £17	Average - Average	Though lacking depth, the overall sound quality was competent, but treble was not its forte	10-15g Normal, MM		43
Shure M99E £29	Average - Average -	Sister to the 92E this is a solid but not particularly exciting cartridge	5-10g Normal, MM		38 Summ
Shure ME75ED £26.50	Average Average -	Rather bright and splashy in the high frequencies but nevertheless a competent model	5-10g Normal, MM		38
Shure ME97HE £49	Average Average +	It won't turn a sow's ear of a turntable into a silk purse, but will at least keep going and produce an acceptable result	8-20g Normal, MM	R	48
Shure ML120HE £95	Average + Average +	Quite decent sound quality and a generally fine balanced performance	6-18g Normal, MM		48
Shure ML140HE £120	Average + Good	Qualitatively the treble of this well-balanced moving magnet model was a match for many moving coil cartridges	6-16g Normal, MM		43
Shure Ultra 500 £499	Good Good	There was no doubting the accomplishments of what could well be the finest moving magnet cartridge around	6-14g Normal, MM		48
Shure V15 VMR £215	Good Average +	Initial listening gave promising results, but extended familiarity gave the feeling of a lack of energy and a "shut-in" sound	5-12g Normal, MM		38
Shure VST V £173	Very Good Very Good	Quite exceptional assurance with difficult material; very stable and clear sound. One of the best. Dynamic Stabilizer actually works!	4-11g Normal, MM	R	85
van den Hul MC One £699	Good Very Good	This extended all the positive qualities of the '10 but added greater authority and scale - worth it for the extra money	6-12g Low, MC	R	60
van den Hul MC Two £899	Good Very Good	Connected directly to any standard MM input the vdH MC Two rewards with a highly detailed yet fluid and musically convincing portrayal	6-13g Normal, MC	R	72
van den Hul MC1 Super £799	Very Good Very Good	Slight softening effect on transients was the only real flaw, but it didn't quite seem to have that special touch one expects for the money	8-15g Low, MC		84
van den Hul MC10 £599	Good Good +	A neutral balanced performer giving transparent midrange, fine depth and focus with firm extended bass. Gosh!	5-10g Low, MC	R	60
van den Hul MM1 £200	Good + Very Good	If its wooden-sounding midrange coloration could be tamed, the excellent imaging and admirable all-round security of the MM1 would make it an excellent performer.	7-15g Low/MC	R	103

TURNTABLES

The schizophrenic split between consumer electronics and 'real hi-fi' is most obvious amongst turntables. The former are supplied simply as a means of playing vinyl in a system context. Cheaply manufactured in the Far East, these are complete players with a variety of automatic facilities, sometimes tied into system remote control. But engineering compromises severely limit sound quality, cartridge choice may be P-mount restricted, and such machines are rarely stocked by specialist hi-fi dealers these days.

Specialist turntables offer big sound quality improvements, but lack so-called convenience features (that practised users often find irksome). Such turntables at the cheaper end of the market (sub-£350) tend to be supplied with matching tonearm, and often include a 'starter' cartridge. Still better quality is found at higher prices amongst the separate motor units and tonearms. Careful partnering and set-up is essential for these individual components, but 'naturally sympathetic' combinations do exist, and the good dealer can help.

Listed separately as integrated players and as turntable motor units and tonearms, our sound quality rating is based on results achieved using a high quality system - but in point of fact the turntable is usually the limiting factor soundwise in any system. Lab performance summarises the speed stability, vibration generation and environmental isolation of turntables, along with the friction, alignment and adjustment of tonearms. The tonearm's physical characteristics also define a range of compatible cartridges.

TURNTABLES - INTEGRATED

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES ARM EFF. MASS	VALUE	ISSUE
Acoustic Research EB-101 £230	Good Good	This genuine high fidelity product offers an impressive package at a competitive price	Subchassis, manual, 13.5g	BB	48
Alphason Sonata/HR-100S MCS/Atlas £835/£550/£400	Very Good Very Good	Good sound in all areas - bass, clarity and neutrality all in the top class and bettered by very few decks. Atlas PSU expensive but worthwhile	Belt drive, suspended, optional PSU, 13g	R	79
Ariston Pro £160	Good Good	Remarkably clear and detailed for the price, very neutral. Benefits from cartridge upgrade	Manual, belt drive. 12g, cart.	BB	91
Ariston Pro Maxim/RB250 £210	Average Fair	Warm, full sound with a deep bass and solidity is partly offset by lack of fine detail in mid and top. On a suitable surface, with a crisp sounding cartridge, it easily qualifies for shortlisting	Solid plinth, belt drive, manual, 11.5g		103
Ariston Q-Deck £180	Good Average +	Well engineered and good sounding low cost package which is both easy to set up and to use	Semi-auto, belt drive, solid, inc. cart	BB	67
Dual CS-505-4 £170	Average Average	Easy to set up and to use, this is a consistent sounding and well isolated turntable with a long pedigree. It is slightly lacking in balls, but compensates with a consistently unmulled presentation and good stereo focus perspectives.	Auto-armlift, interlocked cueing, 2 speed, pitch control	R	103
Dual CS-750 £300	Average- Average-	Attractive but lazy performance from a deck with many good ideas and which is a pleasure to use. Cartridge is past it's sell by date. Has 78rpm facility	Solid plinth, belt drive, cart. 3-speed, quartz referenced, auto lift		103

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TURNTABLES - INTEGRATED

■ MODEL ■ PRICE	■ LAB ■ SOUND	■ COMMENTS	■ FEATURES ARM EFF. MASS	■ VALUE	■ ISSUE
Dual CS430 £100	Average Average -	Ragged, sometimes unpleasant cartridge mixes with a modest pleasing player in a very sharply priced package	Belt drive, with cartridge, auto return, 5g	R	67
Dual CS5000 £230	Average Average +	The rare 78 facility may give grandma's collection a new lease of life but the player did not merit recommendation on price vs sound	Electronic, belt drive, subchassis, 10g		48
Dual CS-503-2 £145	Good - Average	Not wholly inspiring; generally coarse and woolly sound is at least not offensive, but easily bettered by the CS505-4. Good value in material terms	Semi auto, belt drive, 10g	R	91
Goldmund ST4 £4589	Very Good Excellent	The Studio turntable takes on a cheaper tonearm than the T3F, yet provides a similar reference standard performance at £2,000 less, in a neatly integrated though bulky package	Solid subchassis, direct drive, parallel arm, detachable h/shell	R	60
Goldring Excelda 1 £160	Poor Poor	Untidy, resonant sound, narrow effective dynamic range and lack of tracking security. The cartridge (the only authentic Goldring part) is quite nice	Manual integrated arm, synchronous motor, auto-start/stop		103
Heybrook TT2 turntable & arm £469/£269	Average Good +	A gradual process of informed evolution and a sensibly designed arm combine to make this a good sounding middle of the road package. Well supported by dealers	Manual subchassis motor with arm, R belt drive, 14g	R	67
JVC AL-FQ555 £170	Average - Poor	Clear midband sound but woolly bass and crude treble. Ease of use however ranks highly, and there's little to go out of adjustment	Auto, direct drive, 5.5g		67
Kuzma Stabi/Stogi Reference £995/£899	Very Good Very Good	Beautifully made in a solid oak plinth, the Stabi also sounds very clear, detailed and extended. Stogi Reference is also most capable.	Manual, belt drive, subchassis. 12g	R	91
Linn Axis/Akito £443	Good - Average +	A neat, attractive and well-made package which delivers a rather harsh sound with a 'one-note' effect in the bass, but it's well suited to mid market systems	Belt drive, semi-suspended, electronic PSU, 10g		79
Linn Basik £250	Good Average+	Strong midband analysis and imagery, clean if sharp treble is matched to a good if occasionally wooden bass. Good at the price, and requires no complex setting up or fine tuning in service	Solid plinth, inc cartridge, manual speed change	R	103
Linn LP12 Basik/Akito £599/£137	Very Good Good	Familiar Linn virtues and vices - plenty of the former though and few of the latter. Trails the full LP12 significantly, but pace, rhythm, timing etc. still in top class, and bass tauter than of old	Suspended subchassis, belt drive, R single speed, 45rpm adaptor	R	103
Linn LP12-Lingo/Ekos/Troika £1168/£1097/£798	Good + Good +	The classic reference is improved (at a price) by the Lingo but character remains the same - not as detailed or neutral as the best. Ekos arm, though pricey, is well made and suited to many decks	Manual, subchassis, belt drive, 9g	R	91
Manticore Mantra/Musician £340/£170	Good + Good +	Well engineered deck with satisfying sound. The arm is particularly fine and very good value	Belt drive, suspended, 15g	R	79
Marantz TT400 £160	Average - Poor	Everything one hopes a budget deck won't be; coarse, confused, muddled and woolly. Construction isn't wonderful, either	Manual, belt drive 16g		91
NAD 5120 £90	Average Average	A number of running improvements have given this player a range and tautness denied its lazier sounding antecedents.	Semi-auto belt drive, detachable armtube/weight, 9g	BB	67
Opus 3 Continuo/Decca London International (Revise) £599/£99	Poor Good	Heavyweight motor unit with many fine properties, but which needs further development. The idiosyncratic arm is a suitable (though not ideal) platform for the Decca cartridge. For all its faults though, the whole transcends the sum of the parts	Belt-drive manual, damped unipivot arm, 12g		67
Rational Audio Aura 01 £189	Poor Good	Poor lab results reflect bad rumble, but midrange and treble are very pure and clean; idiosyncratic sound and styling should be tried!	Manual, belt drive, linear tracking arm 10g	R	91
Rega Planar 2 £185	Average + Good	A remarkable product at the price, surprisingly articulate and confident	Manual, 11.5g	BB	48
Rega Planar 3 £250	Good Good	A long time leader in its price category, the '3 (with its excellent RB300 arm) sounded nicely 'musical' in a balanced and coherent manner	Manual, 11.5g	BB	48
Revolver Rebel £185	Average Good -	Quite lively and detailed but not the strongest on subtlety, with slightly lumpy bass. Motor breakthrough audible, and watch for bent motor shaft on delivery!	Manual, belt drive, semi-suspended 12g	R	91
Revox B291* £892	Average - Average -	Sound quality ranks as below average. Subjective bandwidth is narrow and the music lacks grace and energy. Ease of use however is unrivalled	Automatic, remote controllable, direct drive parallel arm, cart		55
Roksan Radius/Tabriz zi £635	Good Good	Truly modern turntable in appearance. The design is subtle, refined and easy on the eye. Musically it offers exceptional performance with a minimum of setting up and operational fuss	Semi-suspended, belt drive, mains plug PSU.	R	103
Roksan Xerxes 33/Tabriz zi £550/£255	Good Good	Good but not exceptional sound quality from expensive package. At its optimum with a relatively inexpensive arm/cartridge unless upgrade to full Xerxes is contemplated. XPSII PSU adds 45rpm and much to sound quality	Semi-suspended, belt drive, 33rpm only, mains plug PSU, one piece arm tube, 'intelligent' counterweight		103

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The Directory

INTEGRATED TURNTABLES

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES ARM EFF. MASS	VALUE	ISSUE
Roksan Xerxes/Artemiz /Artaxerxes £785/£655/£559	Excellent Excellent	Superb though costly record playing hardware, highly integrated and synergistic in nature, but suitable for use with any good MC cartridge. Will not suit all tastes, however	Semi-suspended, belt drive, quartz locked 2 speed PSU	R	103
Rotel RP-855 £200	Good Good	Great sound for the money - detailed and clear with good bass and no irritating nasties	Belt drive, solid, speed adjust, 9g	BB	79
Systemdek 1/900 £188	Poor Average-	The motor unit is derivative of the Rega Planar 2, but sounds inferior by virtue of insufficient structural integrity. Pitch stability is also far from acceptable	Solid plinth, manual speed change, no cartridge		103
Technics SL-DD33 £120	Average Average	As with the QD33 though better value	Automatic, direct drive, solid plinth, 7.5g, P-mount	BB	48
Technics SL-L20 £120	Poor Average -	A rather lightweight parallel tracker achieving a poor overall rating, with little to recommend it unless you dig facilities	Electronic, solid plinth, 5g, P-mount		48
Technics SL-QD33 £150	Average Average	The quartz speed controlled version of the DD is short on sound quality but not features. But it did have fair focus and some depth	Automatic, Quartz, direct drive, solid plinth, 7.5g, P-mount	R	48
Technics SLBD-22 £100	Average - Average -	Not bad for the price and a great improvement on the L20, it performs reasonably when not stretched	Semi automatic, solid plinth, electronic, 6g P-mount	R	48
Thorens TD 166 Mk V £240	Good Good	Classic suspended-subchassis deck with clear, stable sound of no particular character. Unlikely to make enemies	Belt drive, suspended, 12g	BB	79
Thorens TD 280 Mk II £190	Good - Good -	Legendary Thorens build quality on the cheap - slightly unobtrusive sound but eminently liveable-with and very good value	Belt drive, solid, electronic PSU, 12g	BB	79
Thorens TD 316 Mk II £250	Good Good -	Very solid deck with neat split-chassis construction. Sound is a bit insecure in the bass, but it could suit classical music lovers well	Belt drive, suspended, electronic PSU, 12g	R	79
Thorens TD-3001/TP90SF £850	Very Good Good	Excellent middle ranking esoterica, with strong all round abilities rather than excellence in particular areas. Engineering content is particularly high	Suspended subchassis, belt drive, available w/o arm	R	103
Thorens TD166 VI/UK/RB250 £270	Good Average-	Refined and articulate sound with well focused imagery, suitable for use with good MM and budget MC cartridges. The Rega arm is the best at its price, a good purist deck	Manual, belt drive, suspended, 11.5g	BB	103
Thorens TD2001 £650	Good Good -	Similar to TD320 but much dearer - why? Sound is comfortable but not very detailed	Semi-auto, belt drive, subchassis 15g		91
Thorens TD280 II/UK £189	Average Average	Excellent value for money from a built to last player which is also easy to use. Will benefit from a cartridge upgrade in due course, but has an energetic and detailed sound	Solid plinth 2-speed player, inc cartridge	BB	103
Thorens TD320 Mk II £400	Good Good	Good, consistent sounding deck with much improved (but not ideal) arm. A little expensive for performance offered	Semi-auto two speed belt drive, 14g		67
Townshend Rock Reference/Excalibur £2295/£745	Excellent Excellent	Overall the closest reproduction to master tape we've yet heard, with stunning real bass and excellent neutrality. Front end damping trough improves LF detail significantly	Belt drive, suspended, electronic PSU, front-end damping, 12g	R	79
Voyd Reference/Helius Cyalene £5414/£1350	n/a Excellent	Voyd's flagship is equipped with three of the biggest motors in the business, a Lexan platter and a real brute of a power supply (it dwarfs most power amps!). A strong contender for best turntable in the known universe	Belt drive, 3 motors, subchassis, outboard PSU, 12/14g	R	Coll. '90
Well Tempered WTAT £1690	Average Very Good	Intriguing and challenging design. Musically it is not ideal, but it has a limpid quality and a lack of artificiality that sets standards as well as turning the ear, though it's not completely uncoloured. A charmer yet mainstream enough in its virtues to be viable	Manual 2-speed, damped, suspended arm, 7.5g	R	67
Zarathustra S4/Pluto 5A Prestige/PSU £1500/£2500/£500	n/a Excellent	The very well made and finished heavy platter S4 with the superb Pluto arm make a devastating combination ranking up there with the very best	Subchassis, manual, available without PSU	R	72

MOTOR UNITS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
CEC ST930 £599	Good Very Good	A rarity - a serious hi-fi product that loses nothing to budget rivals in finish or convenience. Good clean sound, very stable and assured	Belt drive, external PSU, 78 speed inc.	R	79
CS Audio Resan kit for Rega £90	Good - Good	Alter-market kit to convert Rega 2 or 3 to semi-suspended subchassis style. Looks good and sounds tidier than original. Feedback is much reduced	Conversion kit, all work reversible	R	79
Michell Gyrodec £595	Good Good	Sweet and natural sounding player, well exploited by the Rega RB300 arm. Aesthetics, and the acres of acrylic, are unique	Manual, belt drive, suspended motor unit		55
Michell Syncro £265	Good Good	A happy blend of qualities endows the Synchro with a blend of subtlety and force - the mailed fist in the velvet glove. Easy on the ear in the best sense.	Manual, belt drive, suspended motor unit	R	67
NVA Senior £450	Good - Average	Very high sensitivity to low-frequency vibration, especially on NVA stand, gives strange subjective bass response and confused sound. Looks are unusual but pleasing	Belt drive, electronic PSU, two-part plinth		79
Oracle Paris £695	Good - Average	Looks good but sounds coarse, confused and uneven, with bass liable to thump	Belt drive, semi-suspended, electronic		91
Origin Live Oasis A £495	Good - Average	Rather coarse sound with lack of detail resolution - but lively presentation may appeal. Appearance is industrial	Belt drive, external mains filter, 33rpm only, suspended		79
Origin Live Oasis B £199	Average Average +	Aesthetics are not its strong point, but its lively and articulate - if idiosyncratic - sound will please some tastes. Highly resonant construction is very sensitive to feedback	Belt drive, 33Gyrpm only, solid plinth/subchassis		79
Oxford Acoustics Crystal Reference £2495	Very Good Excellent	This big, open and powerful sounding turntable works beautifully with Airtangent arm to give superb 3-D imagery. Recently updated to mk.II form	Manual, belt drive, subchassis, stand	R	60
Pink Triangle Anniversary £1175	Excellent Excellent	Possibly the most detailed, clear, neutral and therefore accurate deck around. Likeness to master tape is almost uncanny	Suspended, belt drive, electronic, motor on subchassis	R	91
Pink Triangle Export £676	Very Good Excellent	Basically a PT T00 with built-in power supply. Retains features of great transparency and neutrality. Review sample had highish motor noise - presumed untypical	Suspended, belt drive, electronic	R	91
Pink Triangle Little Pink Thing £392	Good + Very Good	Leads the field for clarity and neutrality at this price or a good bit more. It also looks very smart! Excellent value. Arm cut-out suits Rega or Linn style	Belt drive, semi-suspended, electronic PSU	R	79
Revolver £150	Average Average	Nicely balanced, but unimpressive timing and lightweight bass made this deck rather average for the price. Manufacturer has since made several changes, but not re-submitted for review	Manual, belt drive, solid plinth		48
Systemdek IIX/900 £200	Good Good	The Systemdek IIX is a high performance, low cost turntable which is particularly strong in the areas of fine detail resolution and imagery. Tested with Rega RB250	Suspended subchassis, metal armboard, glass platter, 2 speed	BB	103
Systemdek IIXE/900AP £358	Good Good+	A development of the IIXE/900, with a comparably detailed sound reinforced by better frequency extremes, timing etc. Needs careful setting up.	Suspended subchassis, metal armboard, acrylic platter, PSU	R	103
Systemdek IV £495	Good Very Good	The level of wow is a theoretical concern at least, but elsewhere this player shines, combining euphony, information and imaging in a polished, untemperamental package	Two-speed manual belt drive	R	67
Voyd 0.5 £3062	n/a Excellent	Based on the standard 3-motor Voyd but with upgrade options (better bearing, platter, etc) which take it half way to a Voyd Reference. Superb build and finish; colourful, dramatic performance.	Belt drive, 3 motors, subchassis, outboard PSU	R	72
Voyd Valdi £868	Good - Very Good	Recent power supply upgrade has resulted in around improvements. This Perspex plattered, two motor deck is remarkably competent, revealing and neutral	Belt drive, suspended subchassis, electronic PSU		79
VPI HW-19Mk3 £1600	Very Good Very Good	Built to accommodate parallel tracking arms, this large but elegant deck produced clean, smooth sound when fitted with an SME arm. Good bass	Belt drive, suspended subchassis	R	79

The Directory

TO NEARMS

MODEL PRICE	LAB SOUND	COMMENTS	ARM EFF, MAS	VALUE	ISSUE
Airtangent 1B £1990	n/a Excellent	A complex but superbly built arm for high quality systems, giving excellent stereo and resolution	7.5g (vertical)	R	60
Alphason Delta £230	Good Average +	A highly competent design from Alphason gives good sound quality but with slight blurring and treble fizz	16g	R	48
Alphason HR100S £490	Very Good Very Good	This S-shaped arm sounds smooth, but nevertheless reproduces transients with fine attack	10g	R	Coll. '86
Alphason Xenon £286	Good Good +	A trimmed down HR100S, the Xenon has inferior bearings and a simpler finish, but sounds crisp and coherent. Fits any Linn cutout	12.75g	R	55
Audio-Technica AT-1130 £186	Good Good	Well suited to most cartridges including high compliance ones, the AT is smooth and tonally neutral, if slightly lacking in 'balls'	8.5g	R	67
Decca London International £49	Average + Average +	This uni-pivot design gives a rather rich tonal balance and some bass muddling. Could be good with Decca cartridges, but not well built	12g		48 Supp
Eminent Technology £1000	Good + Very Good	One of the best sounding tonearms around, the linear tracking Eminent delivers impressive stereo imagery, focus and transparent sound	9g (vertical)	R	Coll. '86
Goldmund T3F arm £4400	Excellent Excellent	This complex parallel tracker created an "ear-opening" experience when tested with a (since updated) Goldmund Studio turntable	16.5g	R	Coll. '87
Kuzma Stogi Reference £899	Very Good Very Good	A large, solid and well-made arm that holds the cartridge firmly, giving exceptionally clear sound with just a hint of brightness	12g	R	79
Linn Ekos £1097	Very Good Very Good	Superb, state of the art design which builds significantly on Ittok's strengths	9g	R	67
Moth Arm £95	Good Good +	The ultimate budget arm? Refined, detailed, sweet and natural - performance improves in line with the rest of the system	12g	BB	60
Naim Aro £752	Good Good -	Designed for use on the Linn LP12 turntable and Troika cartridge, the Aro is a little bright and congested.	10.5g		91
Rega RB300 £139	Very Good Very Good	Despite its modest price this sets exceptional performance standards and could be used on a number of high-quality turntables	10-11g	BB	60
Roksan Artemiz £655	Average Good	Interesting design which works a treat on the Xerxes deck. Fits Rega cut-out.	8g		67
Roksan Tabriz £165	Good Good +	Though obviously targeted at Roksan's own Xerxes, it is also a good alternative to the Rega arms in many applications. A trifle bright.	9g	R	91
SME 3009 Series III £253	Good Average +	Comprehensively adjustable and very well made, suited to MM and high compliance MC cartridges		5g	48
SME 3009 Series IIIS £182	Good Average +	A simplified less flexible (as regards adjustment) Series III with a similarly 'soft' sonic character	5g		48
SME 3009R £335	Average + Average +	A higher mass version of the Series III designed for low compliance MC cartridges	12g		48
SME 309 £568	Very Good Very Good	Beautifully made, finished and presented, this arm is fully and easily adjustable and a highly neutral performer	10g	R	79
SME Series IV £828	Excellent Very Good	Superb engineering and finish with a finely balanced sound giving impressive stereo focus and low coloration	10.5g	R	60
SME Series V £1232	Excellent Very Good	Excellent in terms of design engineering and sound quality, this arm arguably sets a new reference standard regardless of price	10.5g	R	60

VIDEO RECORDERS

For some time there's been a move to improve both the video and the audio quality of video recorders and TV sets alike as a necessary prelude to a proper integration between the two. Hi-fi video is obviously an important element in the story, and so is Dolby Stereo, the ambient 'surround sound' system.

The weak link of course is on the broadcast side. Although TV sound is well up to normal hi-fi standards, it has always been in mono and unjustly or otherwise has rarely attracted much audiophile interest. But TV sound is – or shortly will be – freed of the shackles of mono by the introduction of NICAM stereo. NICAM – an

acronym for Near Instantaneous Companding and Modulating – is the missing link that will help facilitate the much feted integration of video with audio. And then we have S-VHS, a system which does for picture quality what the other developments promise to do for the sound.

VIDEO RECORDERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Akai VS-75EK £550	Average Good	Excellent performance and a slick set of controls make this recorder a pleasure to use. Good price is a bonus	Hi-fi, NICAM, programmable remote	BB	71
Akai VS-967EK £500	Average Good	Many well implemented facilities, but unsuitable for dedicated audio use due to lack of LP mode, manual record levels or audio input	Hi-fi, NICAM, on-screen programming	R	86 Supp
Grundig VS680 £1250	Very Good Average	State of the art technology gives top notch sound with tremendous flexibility but somewhat disappointing picture quality. It's also very hard to drive	Hi-fi, NICAM, LP/SP, teletext programming, on-screen graphics		86 Supp
Nordmende V4405K £549	Good Good	Fine basic sound and picture quality, but the RF converter introduced significant losses. An excellent model, but configured for German home market. The recorder lacks NICAM	Hi-fi, transmitter handset, digital FX	BB	71
Panasonic NV-F65 £500	Good Average	Uninspired but competent and well made deck. Plenty of features, decent sound and reasonable video ensure recommendation	Hi-fi, NICAM, LP audio only, bar code programming	R	86 Supp.
Sanyo VHR-D4890E £1000	Poor Excellent	High grade S-VHS recorder with digital effects which gives first rate screen-based results but relatively poor sound recording	Hi-fi, NICAM, S-VHS, PIP etc		86 Supp.
Sharp VC-S1000H £1000	Good Poor	Clean, accurate and stable off air and from tape, and LP modes are satisfactory — but on-screen S-VHS results are well below par	Hi-fi, NICAM, LP, S-VHS, titling		86 Supp.

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Personal Messages

Something Completely Different has become the cliché of the Python generation, but is still the most apt phrase to describe an established range of American loudspeakers that is just making its UK debut. Shahinian Acoustics will be a name familiar only to those who subscribe to the American specialist press, but the eponymous founder and moving force is a well known and larger than life figure on the New York music and hi-fi scene.

Although I've never met the man, and find the prospect a trifle intimidating, I couldn't help being charmed and a little awed by the determined individuality, staunch attitudes and powerful personality that comes through in his homespun but exceptionally erudite propaganda. There's considerable arrogance and some verbosity too, but also humour and the fundamental humility of a guy who loves music first and foremost, and who's doing his best to overcome the inadequacies of a necessary evil in the pursuit of those aims — the high fidelity loudspeaker.

Omnidirectional loudspeakers certainly aren't yet omnipresent. But are they omnipotent? We asked the omniscient Paul Messenger.

The teeth of a recession is not a propitious time to launch a decidedly unusual and individual range of upmarket loudspeakers. But I reckon there's a much better than even chance that we'll soon be seeing Shahinians popping up in — and selling out of — some of the better respected specialist hi-fi shops, for two distinct reasons.

Hijack plug

One reason is that UK distribution is being handled by a new operation Pear Audio, headed by one Charlie Brennan, an exceedingly bright and experienced Irishman who played striker/sweeper for Linn Products over the past fifteen years or so, his Dublin charm and balm doing much to soften Glaswegian ascerbity. Having your first pre-sold shipment hijacked isn't a good start, but I don't somehow see that stopping Charlie.

The other and more important reason is that the speakers themselves are very interesting, and very different from the norm in both construction and operation. I had less than 24 hours with two of the smaller models of the range, so any conclusions are still very tentative, but by the end of that time I'd heard more than enough to want to go on and hear some more.

The crucial factor that distinguishes the Shahinians from the herd must be their relative omnidirectionality, though an enthusiasm for unusual multiple driver arrays also plays an important part. Both these approaches fly in the face of loudspeaker orthodoxy, creating conditions that are far too complex for simple analysis, and therefore label them

controversial from the outset.

Despite the philosophical attraction of the 'loud-speaker as pulsating sphere' concept, the omni has never been widely accepted in the UK, frequently suffering a lambasting (and/or misunderstanding) in the specialist press. Such treatment notwithstanding, examples from Sonab and Bose have enjoyed a fair measure of commercial success, while Linn's semi-omni *Isobarik* has consistently and over a great many years sold as well or better than any two thousand pounder.

Monopoles apart

Even though one can criticise omnis for, say, a lack of stereo image precision, they have other qualities that more directional (or di-polar) speakers somehow lack. Much as I've enjoyed my last few months with Naim *DBLs*, I still miss something about the openness and naturalness of the *Isobarik* presentation that I found very satisfying over a great many years. The Shahinians possess something of this same quality, which seems particularly appealing to those who don't consider themselves hi-fi enthusiasts, and those who find conventional monopoles frustratingly box-bound.

Whereas conventional monopoles and dipoles tend to ignore the fact that they're going to be used in and interact with real rooms, with usually unfavourable consequences, the omni accepts and even glorifies in the room as an extension of itself. The results may be exasperatingly unpredictable, but a happy corollary can also be a delightful experience.

The two Shahinians I tried — the £1,100 *Arc* and £1,860 *Obelisk* — are both very solidly built little floorstanders, designed for siting clear of walls and standing less than 75cm off the ground. Mid and treble units are set into angled baffles that form the top surface, spraying the upper range in most directions, while bass output is augmented by mass-loaded passive radiators and transmission lines.

Qualitatively nice and sweet, with a fine airy quality, both were a little strong in the treble in my (distinctly lively) room. This was made all the more noticeable because the upper mid and lower treble is laid back and a little suppressed. Perhaps the treble would be a little less obvious in a more HF-absorbent room, such as is commonly found in the States (perhaps omnis in particular should offer some adjustment of treble output to help compensate for room differences).

Elsewhere the in-room balance is pretty good. Neither speaker could be described as particularly fast or driving, but the bass is very nicely judged in both cases, with good clarity and timing, and the *Obelisk* was the more convincing and authoritative of the pair. (I suspect a set of proper spikes in place of castors might help tighten things up a bit here.)

Whatever one's reaction to the balance, the Shahinian experience is essentially musical and communicative, yet quite distinct from that offered by conventional box or panel speakers. Hijackers permitting, I'm really looking forward to trying the £6,880 *Diapason* package — and hope it can stay for a couple of weeks instead of just 24 hours.

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