

HIFI CHOICE

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

CD Mini Systems

20 PAGE SPECIAL — TOP PRODUCTS UNDER TEST

Free! Audiophile CD

SPECIALLY COMMISSIONED FROM REFERENCE RECORDINGS

Digital to analogue converters

UPGRADE YOUR CD — 11 DACS REVIEWED AND RATED

DCC and MiniDisc

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HI-FI CHOICE MARCH 1989



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HI-FI CHOICE

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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.

READER DIFFICULTIES

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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Back issues of the magazine are also available, please refer to page 25 for full details.

THE GET OUT CLAUSE

While every care has been taken in the preparation of this journal, the publishers cannot be held responsible for the accuracy of the information herein, or any consequence arising from it. Readers should note that all judgements have been made in the context of equipment available to *Hi-Fi Choice* at the time of review, and that 'value for money' comments are based on UK prices at the time of review, which are subject to fluctuation and are only applicable to the UK market.

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Menu

Over the last couple of months no-one can have failed to notice the proliferation of audio-visual products. Just look at the news section in this issue and you'll see product announcements from Denon and Celestion, both previewing products aimed at recreating the cinematic experience in your own home.

Home cinema is big business nowadays and judging by your letters and phone calls there is great interest in the subject. Our problem, here at *Hi-Fi Choice*, is how to give this exciting new area the coverage it deserves. Each month we try and cram as many products into our pages as possible and if we were to start reviewing TVs, VCRs and Laserdisc machines as well we wouldn't have the room to do them justice.

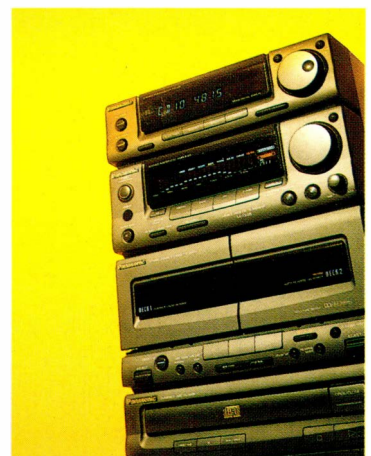
Our answer to this is simple, we're launching a new magazine, *Home Entertainment*, which will serve the home cinema market in the same way that *Hi-Fi Choice* serves the audio market.

We'll be using many of the reviewers that we employ on *Choice* and our new sister title will carry out the same in-depth reviews. We've already lined up Paul Messenger to review TVs, Alvin Gold for AV amps and Paul Miller to look at VCRs while Barry Fox will have a regular column to expose heroes and villains to public scrutiny. In addition to all the hardware reviews the magazine will carry a comprehensive software section looking at all the new Laserdisc and widescreen video releases.

The first issue, which will be in the shops on November 27th, will look at subjects as diverse as in-wall loudspeakers, the people behind the current Laserdisc revival, and 16 by 9 television sets. As the whole concept of home cinema is relatively new, we'll also be running a series of beginners' guides, aimed at those of you who don't know a SCARTs from a S-VHS socket. Over the course of the first couple of issues we'll explain how to get the best from the kit that is already available as well as taking a look at what's likely to appear in the near future.

So if you've been thinking about taking the plunge into the world of home cinema then check out the only magazine in the UK aimed at helping you to build an Odeon in your very own front room. But be warned, after you've had Arnie chasing Terminators around your front room in glorious surround sound, reality might just seem that little bit boring.

Andy Benham



Cover photograph by
Chris Richardson

HI-FI CHOICE

ISSUE 113 DECEMBER 1992



Sony's MiniDisc:
How will it face up to
the DCC challenge?

The Front End

4 UPDATE

Your monthly quotient of hi-fi news, with details of the latest products from across the audio world and information on forthcoming events.

13 CHOICE SESSIONS

Paul Miller digs deeper into Pioneer's Legato Link oversampling system and Jason Kennedy tries out an integrated hybrid amplifier for the masses.

19 STATEMENTS

Vandersteen is not a particularly well known brand this side of the pond, but with products like the 2Ce loudspeaker it could make its mark.

21 FREE REFERENCE CD

Details of this month's Reference Recordings sampler CD together with cut out sleeve notes.

39 READERS WRITE

Having trouble choosing the ideal component for your system? We have the answers, and in *Write On* you too can air your views.

46 21ST CENTURY FOX

Barry Fox brings you a three page special on the troublesome birth of DCC and MD.

Aspirations and Craftsman

26 A MUSICAL CHOICE

This month we've found a rather nice system incorporating Quad *ESL 63* electrostatics with Celestion *System 6000* subwoofers.

32 PLATTERS OF THE HEART

Takes Dan Houston to visit Tom Fletcher, of Nottingham Analogue, who hand builds both serious and affordable record players.

DACs

55 CHOOSING AND USING DACS

Paul Miller considers the reasons for using an outboard DAC and points out some of the things you should look for when buying one.

57 THE REVIEWS

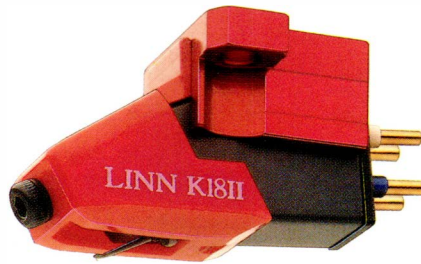
Paul and his listening panel bring you full evaluations of 11 digital to analogue converters.

83 CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS

Paul Miller summarises the results of this month's DAC reviews and picks the best.

Tubes for the masses? Will we warm to AMC's *CVT 3030* hybrid amplifier?





Mini systems:
Bonny babies or bad
bets?

84 TECH TALK

Details of the rigorous technical methods used in *Choice's* comprehensive lab tests.

Mini Systems

91 CHOOSING AND USING MINI SYSTEMS

Alvin Gold shares his thoughts on the pros and cons of mini systems and offers some help on what to look for when buying one.

92 THE REVIEWS

Alvin brings you full technical and sonic evaluations on nine of the latest mini systems.

115 CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS

Instant access to the results of this month's mini system tests.

The Directory

133 THE CHOICE DIRECTORY

Concise information, prices and details of every currently available product reviewed by *Choice*.

Choice Matters

10 COMING UP

In the January issue we'll be looking at 25 new loudspeakers. Your super soaraway free gift will be a comprehensive blank cassette supplement.

25 BACK ISSUES

Thinking of buying a new component? Get the full story in the relevant *Choice* back issue.

51 CHOICE SUBSCRIPTIONS

Take the legwork out of getting *Hi-Fi Choice* every month; get the postman to do it for you.

118 READER'S OFFERS

Audiophile accessories and fine recordings courtesy of the *Hi-Fi Choice* mail order pages.

123 READER CLASSIFIEDS

Look here for all your hi-fi bargains and a chance to sell your second-hand hi-fi equipment.

168 PERSONAL MESSAGES

This month Paul Messenger contemplates the pros and cons of wall mounted speakers.



Digital converters:
11 newcomers fall
under the micro-
scope.



Blank MiniDisc price announced

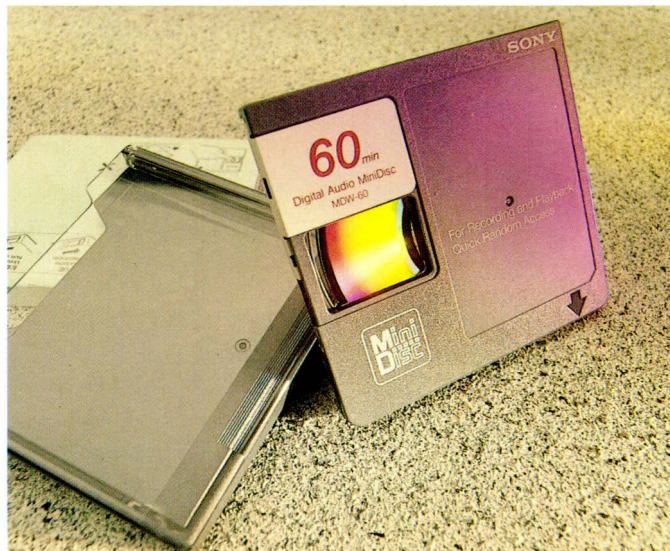
Sony's C60 blank MiniDiscs will cost £8 each when it launches MD hardware this November. At Sony's Blank Media Symposium in Cologne, it was announced that the first blank MDs will be 60 minutes long, with 74 minute discs becoming available next spring. This, however, is as long as MDs will get, because at the time that Sony set the Rainbow Book standard for MD it was the limit of MO (magneto optical) technology. Unlike prerecorded MDs, which are cased in oversized cassette type packaging, the blank discs come in neat little slide in cases with overall dimensions of 68x72x5mm, so you could fit three or four in an average shirt pocket. However, the price, described in Cologne as 20 to 25 Deutschmark which currently equates to £8-10 is higher than expected and not far off the price of a prerecorded disc, which will be the same as Compact Disc.

In the established formats, Sony launched new S-VHS and Hi8 tapes, together with a new version of its UX-S chrome cassette (£1.69). This incorpo-

rates a low friction guide block designed to reduce wow and flutter, an anti vibration case and (even) smaller, more densely packed magnetic particles.

Not exactly aimed at the hi-fi field but interesting nonetheless is Sony's NT (non tracking) postage stamp sized digital cassette and Scoopman micro

recorder, designed for business and journalism use. Non tracking indicates the way that the DAT style record/playback head drum is pushed into the tiny cassette rather than the tape being pulled out a la VTRs. However, with hardware at £500 and tapes at close to £10 Sony isn't encouraging widespread use.



Sony's blank MiniDisc with its new slimline slot in case. Just add pocket.

Buy now to prevent being scrooged

As the pound continues to slide, the price that importers have to pay to purchase the products that then turn up in the shops has increased by as much as 20 per cent over a couple of months. So just how much are prices going to go up, and more importantly, when?

Technics' Alan Ainslie refused to be drawn on the subject, commenting that because of the "competitive situation" the implications are still being considered. Technics' main sources of supply are Germany and Japan — whose currencies have seen the biggest growth against the pound — and although the 'if' and 'when' of price rises at Technics is still a secret, Ainslie readily admitted that the situation is causing "extreme loss of sleep".

The story at Kenwood seems less gloomy. Although many of its products hail from the Far East and Japan, and it is thus facing price increases, Brian Cockram confidently proclaimed that "Kenwood will absorb all the costs incurred by the changing exchange rates."

The problem is not just confined to those companies who manufacture in the Far East, as Nick Thomas, a spokesman for Philips pointed out. "A component can come from anywhere in the world. Two currency changes or more could well be involved and each one will effect the final price. In the short term it seems prices will have to go up, it's just a question of when and by how much. Decisions are difficult while things are so volatile, and so we can't say when for sure,

but it will probably be before Christmas."

Not even British based companies escape the effects of the sliding pound, as Arcam's John Dawson told us, "We've already had to put the price of our CD players up by seven per cent because of the high Japanese component content. At the moment tuners and amps will remain as they are. However, their prices will be reassessed at some point in the future, though we're holding off as long as we can."

Whatever the final outcome, no-one really seems to doubt that in the short term prices are likely to have to rise. And so the moral is clear, if you're considering treating yourself this Christmas, get down the shops soon or you could end up out of pocket.

Highland fling

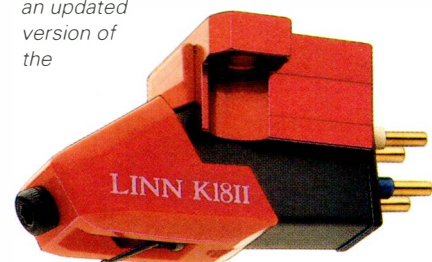
Scottish manufacturer Linn Products has announced two new and two updated products in its ever expanding portfolio. Linn has fitted an onboard DAC to its Karik CD transport, creating the £1,497 Karik CD player. Featuring a delta-sigma bitstream convertor, the Karik has a three beam laser assembly, Linn's own transport mechanism, diagnostic output for dealer servicing, sync input for the Numeric DAC plus all the usual socketry.

The Keilidh, (pronounced Kay-lee) is a new two and a half way floor standing loudspeaker costing £492 and can be driven in a number of configurations depending on how much wire or how many amplifiers you want to use.

Supplied in bi-wire mode as standard, the Keilidh can be used with anything from an integrated amp to six monoblocks for Aktiv overkill. The drive unit complement is a ceramic sputtered metal dome tweeter and a pair of carbon loaded polypropylene 160mm coned mid/bass units.

Linn has also brought out a line only version of its Kairn preamp in the form of the £989 Kairn-Pro. This is a primarily remote control beast with six inputs, three line outputs and source level equalisation which means you can adjust the gain to suit different sources.

Finally, Linn has also launched an updated version of the



Resplendent in red, Linn's beefed up K18II cartridge looks set to put the record straight for Linn MMs.

K18 moving magnet cartridge in the form of the £169 K18II. Featuring a tapered cantilever, new suspension and the original's bolt on stylus assembly, the K18II can be distinguished by its all red livery.



The Swiss get radical

Revox has launched a frontal attack on the style oriented audio marketplace with the £1,995 *Evolution* modular system. This radical system was designed by Swiss industrial designers Freug, best known for their Swatch watch styling, and consists in its basic form of a 150W amplifier, a bitstream CD player, and an RDS FM tuner. Each component is housed in its own minimalist quartz/acrylic enclosure and sits on a bus bar that connects it to the backlit liquid crystal display and controls. Needless to say, there is a suitably space age remote control as well.

Further sources, including both analogue and digital cassette (DCC) and a multi disc CD player, are due to be added next year. Until then the UK, along with Revox's home market and Germany will be the only countries allocated part of the initial 200 unit production batch.

The *Evolution* measures 675mm high including its display and is 390mm wide by 330mm deep in its basic form.

Tannoy's £2,000 definition

Tannoy has set out to re-define the £2,000 loudspeaker with its new *Definition D700*. Priced at £1,970 the *D700* is a hefty floorstanding design equipped with a pair of ten inch (254mm) drive units per side and a multi-faceted cabinet that's reminiscent of the *Six* series. The drive units utilised are a bass driver and a dual concentric. Both units have polyprop cones and cast frames but the top one incorporates a Duralumin tweeter at its centre with a Tulip Waveguide used to integrate the output of the two drivers.

The *D700*'s cabinet is made out of 18mm particle board with rigid internal bracing. It is reflex loaded with "twin lamina flow ports" and employs DMT (Differential Material Technology) which is said to control energy flow from drive units into and through the cabinet.

The *D700* is said to offer very high power handling and much is made of the speaker's suitability for home theatre applications though no mention is made of magnet shielding; the emphasis being more on ground shaking, indisputably an important factor in the cinema effect.

Tannoy has also souped up a 1,000 pairs of its budget 605



Definition of sound: Tannoy's new floorstanding heavyweight, the *Definition D700*, is the company's first bid for the high-end home theatre market.

speaker now available for £190 in limited edition guise. It features an inverted drive unit configuration (they've turned it upside

Systems for your telly

Kenwood is launching itself firmly at the A/V market this Autumn with a range of systems and separates aimed at fully integrating the hi-fi with 'watching the telly'. Dolby surround facilities have been built into most of the new systems and the most expensive one features Dolby Pro-Logic.

There are three new mini systems each offering the option of multi-disc CD playback and all come complete with magnetically shielded loudspeakers for the safety of your TV screen. The £600 *UD-500M* base model offers a 30W amp. Moving up to the £700 *UD-700* gives you an improved CD player and speakers, along with a 15W surround amp on top of its 35W main output. Top of the range is the all singing £900 *UD-900* with full Dolby Pro-Logic facilities for five speaker cinema style sound.

On the separates front, Kenwood has added a 55W £180 remote controlled amp called the *KA-3050R*. There are two new three motor cassette decks, both of which incorporate Dolby HX-Pro, track search functions and power loading. The £150 *KX-3050* adds peak search compatibility with Kenwood CD players and the £200 *KX-5050* makes making CD dubs from (certain) Kenwood CD players much easier.

Denon attacks home cinema

Denon looks set to grab a slice of the rapidly expanding home cinema market with the launch of the £650 *AVC-3020 AV amplifier*.

This 80W Dolby Pro-Logic amplifier also sports 35watt outputs for the centre and rear channels. It comes equipped with an automatic input system that ensures Pro-Logic decoding is efficiently carried out regardless of the level of the incoming signal.

The *AVC 3020* comes complete with a learning remote control and no fewer than five video inputs alongside the five audio inputs. A single S-VHS loop is also provided.

Also on the new release list from Denon comes the *PMA-450*; an all-purpose amp for £250. The amp packs 60W per channel.

Not content with the above two products the busy people at Denon are adding another mini separates system to the current line up. The £880 *D-250* comes with or without speakers and features artificial intelligence power switching, a preamp with multiple inputs, a twin cassette deck that has Dolby B/C and HX-Pro, a CD player with twin super linear 18-bit DACs and eight times oversampling, and a 50W power amp.

All change at Meridian

Meridian has been updating its product range. The £895 200 transport has been updated with twin processors, a new re-clocking system designed to reduce jitter and improved servo technology that reduces error correction. The popular 203 DAC will shortly become the 263 at the slightly lower price of £495. It will be equipped with a Crystal delta-sigma chip in place of the DAC7 in its predecessor.

The standalone £995 206 has also changed to a Crystal DAC and has now gained the D/S suffix. Meridian's top of the range 606 DAC remains the same but the £1,750 602 transport now has twin processors and a jitter busting double re-clocking system which is said to provide the same sort of results as the sync links used by other transport/DAC combos. The 602 now conforms to the Orange book standard and will play unfixed CD-R discs.

Marantz DCC. Treasures The Original.

Imagine, if you will, standing in your living room. You've read about DCC, but words cannot fully describe what you are hearing from your new Marantz DCC deck.

It sounds like the original recording. Clean and pure as mountain air. Beautifully captured and perfectly reflected in the pure blue waters of digital technology.

How, you may be asking, do we achieve such a faithful sound from our new DD-92 and DD-82 DCC decks?

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Focused ribbons from Clements

Distributor Wollaton Audio has added Clements loudspeakers to its portfolio of international audio components, which includes Maplenoil turntables and XLO cables. A Canadian company, Clements manufactures two ranges of loudspeakers, *si* and *Reference*. The *si* range are fairly conventional two way boxes that cost from £350 for the *100si* to the £1,095 *1000si*. Somewhat more interesting are the £1,395 *Reference 1* and £2,995 *RT7* which feature a ribbon tweeter with a fin shaped lens in front of it. The ribbons, which are virtually bi-polar, have their positive sides mounted on the inside of the sound stage (each pair is mirrored) and the lens

prevents summing/cancellation of the output.

The floorstanding *RT7* uses a patented compression line system to load the 200mm, 20 mil (0.5mm) thick, bass cone and is available in a variety of custom finishes. The *Reference 1* is a stand mounted design with a compression line loaded 133mm bass unit and a 127mm ribbon. Emphasis is placed on the use of kapton voice coils, pure polypropylene cones and minimalist crossovers with designer components.



IN BRIEF

Sennheiser has produced a successor to the HD40 headphone in the shape of the £30 HD440 II. This dynamic, open backed phone employs OFC cable and neodymium magnets.

Acoustic Energy has taken on the Ensemble range of loudspeakers, amplifiers and cables from Switzerland. Products include the £2,050 PA-1 and £3,300 Reference mini monitors together with the new £2,860 Profundo subwoofers.

The Tripos speaker stand is a new deckchair like design that supports the speaker with two spikes underneath and one at the top of the rear baffle. Priced at £89 the Tripos comes in five different widths to suit most loudspeakers. Call Aberdeen (0224) 322520 for more info.

Revolver has reduced the price of the Rebel turntable from £200 to £160 complete with arm and cartridge.

SD Acoustics has moved to The Factory, Alpha Rd, Surbiton, Surrey, KT5 8RP. Tel: (081) 339 9594.

Overture Audio of Banbury is holding a Naim musical evening featuring DBL loudspeakers and the new NAC 82 preamp on December 8th.

The Kinergetics group of companies; Celestion, KEF and Kinergetics Research, has signed an agreement with LucasArts to manufacture THX home theatre equipment.

Celestion sounds out home entertainment

Celestion has moved into the home entertainment arena with a range of products it has christened *Home Theatre*. Each one consists of a surround sound processor and loudspeaker system designed to be used in conjunction with your TV and hi-fi.

Two of these *Home Theatre* systems have been developed. *HT One* at £299 consists of a pair of Celestion 1 speakers for the rear effects and a standard Dolby Surround Sound processor. *HT3* — whatever happened to *HT2*? — at £499 includes a pair of Celestion 1s, a Dolby Pro-Logic processor, remote control and a centre channel speaker to improve the positioning of dialogue.

Both set ups feature 'Matrix' which synthesizes stereo sound from a mono source, and 'Hall' which can be used for non Dolby encoded material. Also included are the necessary cable and wall brackets to get the things up and running.



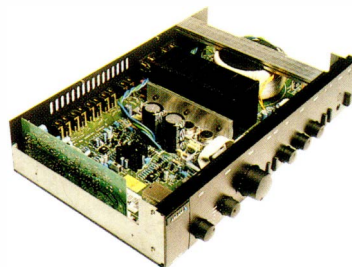
Celestion's *HT One*; just add your TV and hi-fi for instant surround sound thrills.

A return to the golden age

The age of the horn loudspeaker is back in the form of the Living Voice Air Partner, an XXL size three way horn loudspeaker that weighs in at 130kg a side and £8,990 a pair. The Air Partners were designed to make the most of simple, low power valve amplifiers and offer a quoted 108dB efficiency. Living Voice recommends amps with outputs from three to 20W.

The driver array starts with a 380mm paper coned Vitavox bass unit that's fitted with a phase plug to give an extra octave of extension, the majority of the 1660x640x900mm birch ply cabinet is taken up by the horn for this unit. Midrange, from 500Hz to 13kHz, is covered by a 75mm, aluminium dome, pressure driver with a multi cellular aluminium horn. The very high frequencies are covered by a chunky Gauss pressure driver, which likewise is horn loaded.

For further information contact Living Voice on (0602) 813562.



Arcam unveils a new integrated

Arcam's entry for this season's new product line up is the *Delta 290* integrated amplifier, retailing at £450.

The amp has a power output of 75W into 8ohms and the 18 amp peak current capability can cope with speaker loads that dip as low as 2.5 ohms. Alps switches and potentiometers, metal film resistors and both polypropylene and polystyrene capacitors are used in its construction.

The amp has independent 'listen' and 'record' controls which allow you to listen to one programme while recording another. There are six line inputs and a remote control handset, due out later this year, will control volume and the input selection.

This new amp has high standards to live up to as Arcam scooped three major awards at the Consumer Electronics Show in Chicago over the summer. These were awarded to the *Alpha 3* amplifier, the *Delta 100* Dolby S cassette deck and the *Delta 170.3* CD transport and *Black Box 5* DAC.



We'll put back what you've
been missing in your CDs.



When CDs first appeared, they were hailed as being the perfect music medium.

However, some people maintained that CDs sounded harsh and lacked the warmth of vinyl records.

Now, Pioneer's Legato Link Conversion is about to change everything.

You see, when material is recorded onto CD, the format is such that frequencies above 20 kHz are abruptly cut off. And it is these upper frequencies which are abundantly present in musical instruments, giving them their warmth and natural timbre. Although you cannot hear these upper frequencies, you can actually feel when they are missing.

Pioneer's Legato Link Conversion now addresses the problem by putting back that original, natural warmth.

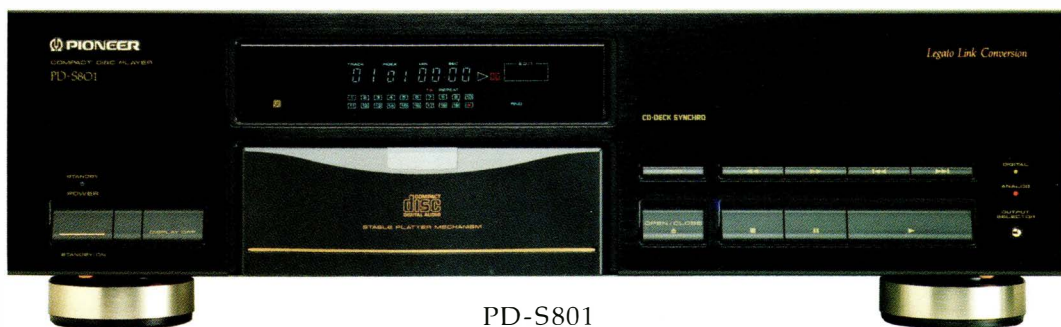
Using data already on the disc, Legato Link Conversion calculates almost exactly what and where the missing data should be and literally recreates a sound wave pattern that is much closer to the

original music. It's a revolutionary new technology that takes CD a real step forward and puts natural sound within the reach of every enthusiast.

Pioneer's unique Stable Platter Mechanism is also a key contribution to this more natural performance, giving full width support to the disc for reduced vibration and truly transparent sound.

Out of sight but certainly not out of mind, twin Pulseflow D/A converters cancel noise generated in and out of the audible range. While Direct Connection enables the music signal to travel along the shortest, most logical path possible for minimal interference.

So why not listen to Pioneer's new range of CD players (PD-95, PD-S901 and PD-S801) very soon? Because if CDs have left you cold until now, you'll



PD-S801

certainly warm to the sound of Legato Link Conversion.

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For a full information pack call us on freephone 0800 480 480



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Loudspeakers on test

An in-depth look at the loudspeaker market with 23 of the newest models on test, including designs from AR, Canon, Linn, Monitor Audio, Thiel and Wharfedale.

Plus . . . A mini hi-fi tour of Japan featuring the Tokyo Audio Fair, Marantz' DCC factory and a look at Kenwood's plans for the future.

All this and a FREE blank tape supplement.

HI-FI CHOICE

JANUARY ISSUE ON SALE
11th DECEMBER 1992

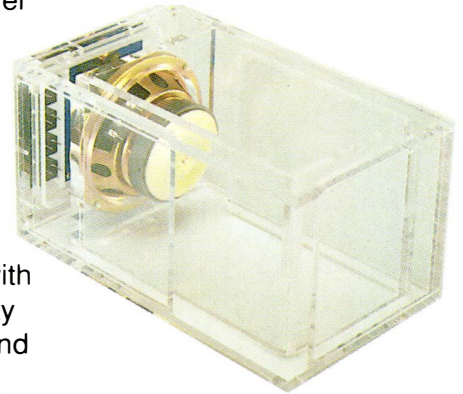
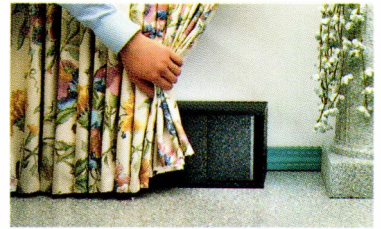
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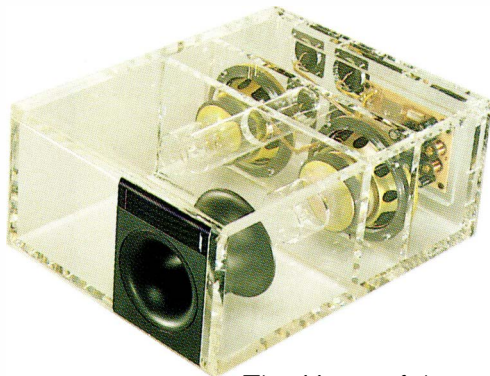


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Choice Sessions

by Jason Kennedy and Paul Miller

Tubular Belle

AMC's CVT 3030 is a very mellow sounding tube amplifier that's mass produced in Taiwan. Jason Kennedy gives it a glow.

The AMC CVT 3030 is a rather unusual amplifier; an integrated transistor/tube hybrid that costs less than £500. Given that tube amps are expensive beasts made in small numbers by generally small companies, to come across one that costs £469 and looks as though it's one of several thousand rather than a few hundred is quite novel. The amp is the brainchild of three people, Malcolm Blockley who runs distribution company Campus International (and who set up the Hi-Fi Markets chain in the Seventies), designer Peter Bath whose previous employers include NAD and Dolby, and Ameli Lin who runs the manufacturing side.

The CVT 3030 has a MOSFET based preamp section and a power amp built around a pair of Siemens EL34 pentodes for each channel. A sign of this amp's mass production roots can be seen in the way that the tubes are soldered directly to circuit boards rather than being seated in valve bases as is the generally case. This makes a better connection and the amp is more robust, although when the tubes eventually wear out you have to replace the board as well. Unless you are pretty handy with a soldering iron this leaves you reliant on AMC being able to supply new tube/boards. Siemens estimates that the tubes should last 5,000 hours or about five years and currently AMC is charging £58 for a set of biased tubes on boards.

The amp itself is apparently well built with good quality phono and speaker terminals, the latter offering four and eight ohm tapings to suit different loudspeakers. Underneath the 3030 you'll find a pair of cooling fans, one for each pair of tubes which are necessary because the tubes are fixed horizontally in close proximity to the solid state circuits and output transformers. The selection of facilities on offer includes bypassable tone controls and a headphone socket, two things I've never seen on an all tube amp. The amp has six inputs including MM phono and DAT (well it might have happened), as well as a tape output and monitor switch. Output is a creditable 30W per channel, the pure class A claim however, is less easy to swallow though it would more fully explain the cooling fans.



I listened to the CVT 3030 through my faithful Audio Note AN-E loudspeakers and used a Rotel RCD-965BX as well as the usual Voyd and Marantz CD12 sources. I also dragged in a Pioneer A-400, OK it's £200 cheaper but it's *the* integrated amp to beat.

A warm feeling

Initial impressions were of a mellow sounding creature that had a tendency to smooth off high frequencies and limit absolute bass extension. The latter observation seems to disappear from my notes in the long term and it may be that the CVT 3030 needs to warm up some before it lets the bass kick in. It's not so mellow as to make up for bright sounding discs — *Heavy Duty Judy* on Zappa's *The Best Band You Never Heard*... still sounds as aggressive as ever — but more attractively balanced material does tend to sound a bit more laid back than usual. The effect makes for very relaxed listening but one tends to lose out on the boogie factor front, its laziness taking the edge off of timing related information.

Comparisons with the aforementioned A-400 further exaggerated the AMC's mellow character, the Pioneer sounding very lively, detailed and quick. If you like one of these amps you are unlikely to be very keen on the other. With the 965BX as source I must say I preferred the AMC, it traded off excitement for endurance which for my money is a pretty important factor. With darker sounding speakers,

however, it's not difficult to imagine the Pioneer's balance becoming the most natural sounding and I know quite a few people who would prefer the A-400/AN-E combination.

The CVT 3030, once it was fully chilled out and warmed up really came into its own with the Voyd record player. Although the timing skills of CD players, or lack thereof, was fully revealed, the records I played trucked along just fine. All right only the best tracks held me entranced but virtually all the vinyl I played through this amp was most enjoyable.

The fact that I was using an IO cartridge (with a step up transformer) undoubtedly helped but it can't be denied that the AMC did a good job with its output. The amp's character would undoubtedly prove to be a healthy influence on the majority of sub £100 MM cartridges which are inclined to be a bit ragged.

Typical

The AMC CVT 3030 has what most people think of as a typical valve sound, it's warm, mellow and very unlikely to offend (though you can make it shout if you try). But it has some of the dynamic skills associated with tubes and if you don't like the sharp, fast sound produced by some CD players it could prove to be your cup of tea. As long as it avoids speakers with the same sort of character, and inefficient ones at that, I imagine that this amp will find a lot of fans.

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* Hi-Fi Choice talking about the NAD 5420 CD player.



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The Legato factor

Is Pioneer's Legato Link oversampling filter Wadia technology on the cheap? Paul Miller takes a closer look.

No, this is not another review of Pioneer's PD-S801 CD player. That was in the November issue, where the results of our blind listening test were revealed in all their controversial glory. So, if only to shed some light on this result, I'm going to spend a little extra time discussing Pioneer's unique-ish technology.

Unique-ish? Frankly yes, because what Pioneer calls Legato Link Conversion (LLC) and Wadia describes variously as Bio-digital or DigiMaster Software add up to one and the same thing; a very unusual eight times oversampling filter!

The characteristics of the Wadia and Pioneer filters remain virtually indistinguishable from one another yet utterly distinct from any conventional eight times FIR-style filter (used by The Rest of the World Inc).

But what is the role of a conventional eight times oversampling filter? The idea is to delay the appearance of sampling images, the digital rubbish that exists outside of the audio band, by pushing them up to an inaudible 352.8kHz (eight times the 44.1kHz sampling frequency).

By contrast, both the Pioneer and Wadia filters make use of this digital rubbish, moulding its contours to give the impression of a smooth and gently tailored response that extends well beyond 20kHz. The response of any other CD player would cut-short at 22kHz but the Pioneer (or Wadia) extends to 40kHz (see fig 1).

Nevertheless the concept is foiled in practice as most CDs will have a 'notch' in their new-found response. This notch (see fig 2) is LLC's reaction to the severe filter employed during the original recording of the CD. Many of you will already know that a CD cannot, by definition, contain any musical information over 22.05kHz. Without delving too deeply into the maths, digital theory rules that you can't sample any analogue frequency that is more than half the chosen sampling frequency. Thus CD, with a sampling frequency of 44.1kHz, cannot contain any information over 22.05kHz.

To comply with this rule, during the recording process any information above this point has to be removed. In an ideal world this information could be erased using a so-called brick wall filter, which simply stops anything above 22.05kHz but lets anything below pass straight through.

However in the real, or at least analogue world, the filter starts to take out a

little information around the 20kHz point, gradually removing more information as the frequency increases until it is removing everything at 22.05kHz

Pioneer makes play of the filter's 'extended frequency response', even declaring in its latest brochure that 'frequencies beyond 20kHz — the frequencies contained in the original music — are recovered in full'.

Now this, in my view, is very misleading because any signal that does appear beyond 22.05kHz is not harmonically related to the music but is simply an intermodulation with the 44.1kHz sample frequency. In real life, for instance, the harmonics of a brass instrument might extend from 6kHz to 30kHz. Yet every-

thing beyond 22kHz is removed at the point of digital recording.

So what emerges from Pioneer's player are signals at 6kHz, 12kHz, 18kHz but also at 26.1kHz, 32.1kHz and 38.1kHz. The last three are not harmonics but images or reflections off 44.1kHz!

So in reality Pioneer's LLC players can only mimic the wideband (0-40kHz) spectral output of analogue systems like LP and reel-to-reel tape. It cannot, however, claim to be recovering lost musical information because the information above 22.05kHz has been completely destroyed during the recording process. In fact this high frequency "shaped noise" could well provide a clue as to why the player can prompt such mixed and unpredictable

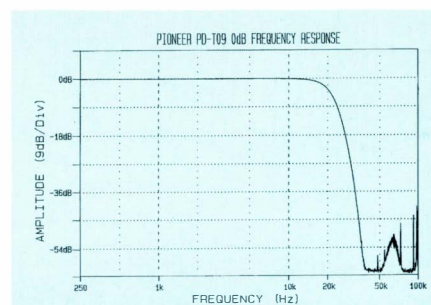


Figure 1

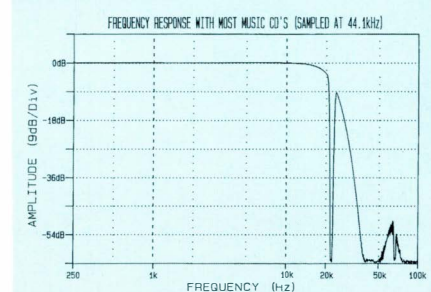


Figure 2

results in different systems.

After all, these players will be dousing your amplifier and speakers with far higher levels of ultrasonic (20kHz+) energy than any conventional player. This will provoke (analogue) intermodulation distortion in a good many amps, and this will in turn influence the sound of the system.

Similarly, the presence of strong signals in the 30kHz region may set-off dome resonances in many modern tweeters - a cause of audible 'mechanical' intermodulation. Furthermore not only will different systems react unpredictably to this splurge of ultrasonic noise but so too will different listeners.

The moral of this tale? Treat Pioneer's literature with a healthy dose of skepticism but don't write off the LLC players until you've heard them in your own system. This is one occasion where you shouldn't dismiss the player out of hand, even though we were unable to award it a formal Recommendation.

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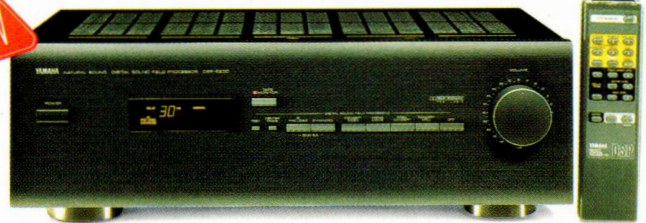


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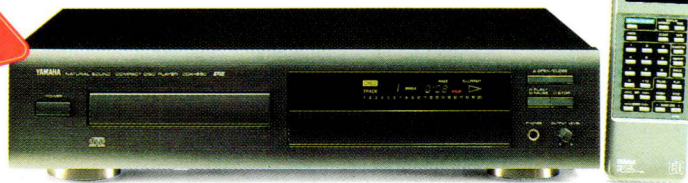
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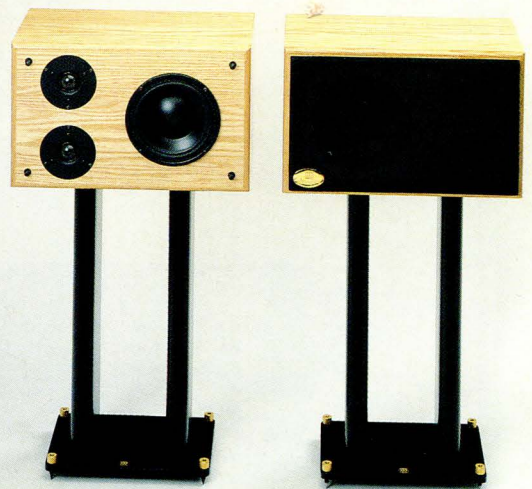
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Statements

by Jason Kennedy

VANDERSTEEN 2CE

Vandersteen is not a name that will be familiar to a lot of British audio enthusiasts but it's a brand that has been quietly making a reputation for itself in America since 1977. Recently the brand has been taken on in the UK by Arcam to complement its own range of rather less expensive speakers. The model 2Ce reviewed here costs £1,395 including low 'T' shaped stands and so far is the only model that is being imported.

Despite its outwardly ordinary shape the 2Ce is quite unusual beneath its stocking'd frame. It is basically a complex cabinet within a cage made up of four tubular uprights with a wooden base and a frame like top plate, all but the plates being enclosed in grille cloth. If you shine a light through it you can see that the cabinet tapers upwards in steps, in a similar vein to the old KEF 107 or a B&W 801. The bass and mid/treble drivers each have their own enclosures which reduces air pressure interaction between the bass and midrange drivers. The driver complement starts with a 200mm bass unit that shares its cabinet with a rear firing 254mm passive radiator, the woofer itself uses a polypropylene cone and covers the range from 35 to 600Hz. A 115mm midrange unit with the same cone material takes it up to 5kHz where a 19mm metal dome tweeter takes over. Nothing unusual there, except perhaps the low mid to treble crossover point.

What the amplifier sees of the Vandersteens is a reasonable 88dB efficiency coupled with an impedance that runs from seven to four ohms, so you'll need a reasonably beefy amp to get best results. The company recommends something between 40 and 160W but goes to considerable lengths to dissuade users from driving these speakers too loud for too long, this presumably being something of a problem over the pond. The 2Ces even have a warning light under the grille which comes on if the drivers get too hot, and can even switch out individual drivers if the going gets unduly tough, but it doesn't have positec style bomb proof protection. I can imagine Vandersteen owners using this warning light to prove how macho (see deaf) they are, I'm prepared to admit that I didn't manage to push them that far.

The manual makes quite a big deal of the virtues of bi-wiring, suggesting that users double up their cables as soon as possible with extensive instructions on how to bi-amp with theory to back it up. And yes I did bi-wire the 2Ces, with Audio Note AN-SP.

The aforementioned stands bolt to the base of the speakers and increase its footprint rearwards. The three spikes can be adjusted to alter the tilt of the speaker to suit different height listening positions.

The final novelty is a pair of what Vandersteen calls contour controls on each speaker, one for the tweeter and one for the midrange. Each gives plus or minus 3dB of adjustment and they're designed to compensate for room acoustics.

I didn't really have the right amplifier to use with the Vandersteens, they need something beefy that's on the lean side of neutral, say EAR 509 or Michell *Alecto* monoblocks. However, the results I achieved with the apparently unsuitable

Audio Note *Kegon* (17W) were quite impressive, the best I managed in fact. After the silver wired AN-Es the 2Ces sound distinctly dark in balance and lacking in midrange transparency, however if anything the Es are a shade exposed in this region sitting above the imaginary line of subjective neutrality. Relatively speaking Vandersteens sit below it with a tonal character that appears to have been engineered with Compact Disc in mind. Which, whatever your feelings in this area, is a logical way of voicing a loudspeaker in this day and age. Consequently I found myself enjoying more aggressive than average CDs a lot more than I would usually. The 2Ces imaged very nicely for such a big box and delivered solid fast bass lines which, if not as deep as possible, had good weight and power with very little overhang. I expected greater bass extension from such an apparently large speaker (1009x406x260mm, HxWxD) but when you remember that the bass cabinet only represents about two thirds of the volume, and that the amplification on hand probably didn't have the sheer power to force 35Hz out of the 2Ces, things become a little clearer.

Being an LP user sans muscle amp I found myself craving the transparency of the AN-E a lot of the time that I was using the Vandersteens, they don't really make the most of tube amps like the *Kegon* but on the other hand you can play your CDs as loud as you like for as long as the neighbours can stand it. And do so in a remarkably controlled and coherent fashion. To an extent they trade dynamics at low volume levels for the ability to remain calm under fire. And their character doesn't change under that fire, something which can't be said of many loudspeakers, even at this price level.

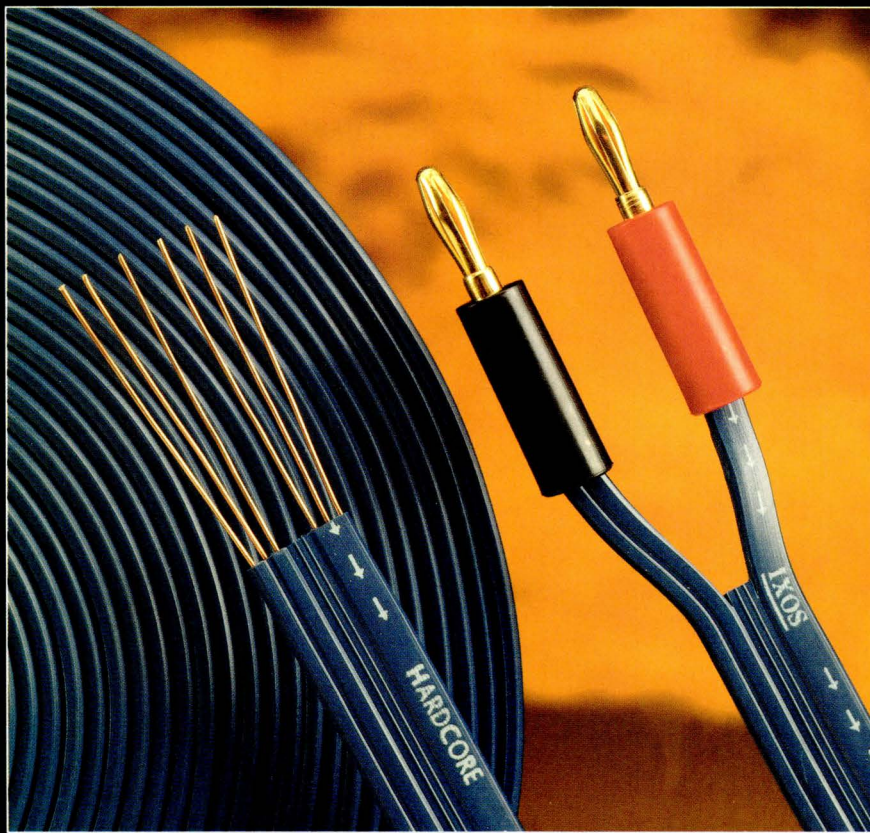
Space and time

The Vandersteen 2Ce is an interesting speaker, the sort of thing that would be useful to have around as a reference. Its strengths lie in its coherence of timing and imaging which are very good for the price, however the lack of absolute transparency is, in my view, a shortcoming in the context of more civilised systems. However, if you are dedicated to CD but find the going a bit tough at times, the 2Ces are likely to win you over. The fact that they seem such good material value for an American speaker is another not so minor point in their favour.



The Vandersteen 2Ce: designed with CD in mind.

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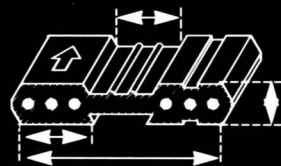


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Reference Recordings

The Hi-Fi Choice audiophile CD

This month we are delighted to be able to give you a free CD attached to the cover of your magazine. The CD is a specially commissioned sampler put together by *Hi-Fi Choice* and Reference Recordings, the leading American audiophile record label.

On the pages that follow you'll find an inlay card and booklet to accompany your free disc. If you need a spare jewel case then we have managed to secure a supply of cases at a very reasonable rate and these can be purchased from our mail order section on page 118. In our mail order pages you'll also find most of the discs from which the tracks have been taken, and because of a special deal with our friends at Reference Recordings we have managed to bring the price of the discs down considerably.

Reference CDs had been selling for £18.50, but as a special offer, we have been able to reduce the price of the discs to just £13.99. If you do wish to purchase any of the discs from which the tracks on this sampler have been taken then please

order immediately because the pound's problems on the foreign exchange markets mean it is unlikely that we will be able to hold these prices for long.

Unfortunately, because of copyright considerations, we are only able to supply free discs to the UK market, so apologies if you've just bought the magazine in America.

Regular readers of *Choice* will know that we have been big fans of Reference Recordings for a couple of years now, and indeed, judging by our mail order sales, our readers are big fans of the label as well. Because of this long association it was natural that Reference was the first company to spring to mind when we decided that it might be a nice idea to give you an early Christmas present in the

form of a cover mounted disc.

Reference is hardly a new name on the audiophile recordings scene, having been around for 15 years now. In that time the company has built up a strong reputation, not only for its exceptional technical quality, but also for the high artistic standards it sets.

We visited a Reference Recordings session at Watford back in January this year while the label was recording works by Robert Farnon with the Royal Philharmonic. We were so impressed by the label's care and attention to detail during this session that we decided to go ahead with the project and start planning a sampler for later in the year. It also gave us a chance to meet the legendary 'Professor' Keith Johnson, the engineer responsible

The Hi-Fi Choice audiophile CD

for the tracks contained on your free CD.

At each recording session Johnson actually records everything twice. The reason for this is simple, as he explained when he was over doing the Royal Philharmonic 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.

"The data is recorded on a Sony U-Matic video recorder, as per the professional standards. Perhaps by the next 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 ampli-

capsule; that's intrinsically quieter than normal capacitor microphone amplifiers."

Simplicity is very much the watchword at Reference, and something which pays off in terms of the sound quality of its recordings, as you'll be able to appreciate from your free CD. When it comes to microphones, less is definitely considered more, as Johnson explained.

"The mixing desk has been expanded to accommodate 12 pairs of microphones, although we've never used that many. We use as few mics as possible, perhaps only a three-point set-up 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 to perform."

When it comes to the future, Reference is confident that it can keep up the same high standards. When we talked to him Johnson was very excited about the tracks he had just recorded with Farnon and Arnold. "I get 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 — with the composers themselves directing."

We've been lucky enough to get tracks from both of these recordings to include on the sampler so we'll leave you to make up your own mind whether Reference has been successful. We hope you enjoy your free CD, and would like to take this opportunity to thank everyone concerned for the help and encouragement we received in putting together the disc.

CD back Cut-Out



The Professor, Keith Johnson — and his legendary tape recorder — orchestrates the engineering side of the process.

fier 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 equalizing within the microphones. Because different frequencies are attenuated at different rates in air, the microphones are calibrated for the distance at which they are working from the sound source.

"The signal from each microphone comes in 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

HI-FI CHOICE • REFERENCE RECORDINGS SAMPLER

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Reference Recordings sampler

- 1 Beckus the Dandipratt (Arnold/LPO)
- 2 Pachelbel Canon (Tafelmusik)
- 3 Entry March of the Boyars (Fennell/DWS)
- 4 Weber Quintet (Daniels/Composers Quartet)
- 5 State Occasion (Farnon/RPO)
- 6 Alborada del gracioso (Nojima)
- 7 Carnival (Dunn/DWS)
- 8 Tropic Affair (Brook)
- 9 Nothin' to do Blues (Garson)
- 10 Tribute (Blazing Redheads)
- 11 Lush Life (Eileen Farrell)
- 12 The Clothed Woman (Hyman)
- 13 For Lena & Lennie (Norvo)



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**The Hi-Fi Choice
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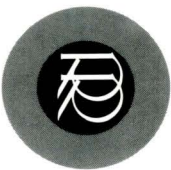
HI-FI CHOICE

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HI-FI CHOICE

The
**Reference
Recordings**
sampler



Reference Recordings

Reference Recordings sampler

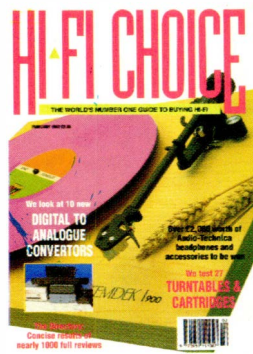
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|---|---|----|--|
| 1 | Malcolm Arnold: Beckus the Dandipratt 10:46
<i>The London Philharmonic/Malcolm Arnold</i>
Taken from Arnold Overtures, RR-48CD | 7 | H. Owen Reed: La Fiesta Mexicana, "Carnival" 6:42
<i>Dallas Wind Symphony/Howard Dunn</i>
Taken from Fiesta!, RR-38CD |
| 2 | Pachelbel: Canon in D 4:06
<i>Tafelmusik Baroque Orchestra</i>
Taken from Popular Masterworks of the Baroque, RR-13CD | 8 | Tropic Affair (J. Sharp) 6:56
<i>Jim Brock Group</i>
Taken from Tropic Affair, RR-31CD |
| 3 | Halvorsen: Entry March of the Boyars 4:43
<i>Frederick Fennell/Dallas Wind Symphony</i>
Taken from Fennell Favourites!, RR-43CD | 9 | Nothin' to do Blues (M. Garson) 5:35
<i>Mike Garson Trio</i>
Taken from The Oxnard Sessions, Vol 1, RR-37CD |
| 4 | Weber: Quintet in B-flat, Con Moto 5:57
<i>Eddie Daniels, clarinet/Composers Quartet</i>
Taken from Brahms and Weber Quintets, RR-40CD | 10 | Tribute to Dollar Brand (D. Viscuso) 3:45
<i>The Blazing Redheads</i>
Taken from Crazy Women, RR-41CD |
| 5 | Farnon: State Occasion 3:28
<i>Royal Philharmonic Orchestra/Robert Farnon</i>
Taken from Captian Horatio Hornblower, RR-47CD | 11 | Lush Life (B Strayhorn) 5:03
<i>Eileen Farrell/Robert Farnon Orchestra</i>
Taken from It's Over, RR-46CD |
| 6 | Ravel: Alborada del gracioso 6:40
<i>Minoru Nojima, piano</i>
Taken from Nojima Plays Ravel, RR-35CD | 12 | The Clothed Woman (D. Ellington) 3:12
<i>Dick Hyman, piano</i>
Taken from Dick Hyman Plays Duke Ellington, RR-50CD |
| | | 13 | For Lena & Lennie (Q. Jones) 4:54
<i>Red Norvo Quintet (1957)</i>
Taken from The Forward Look, RR-8CD |

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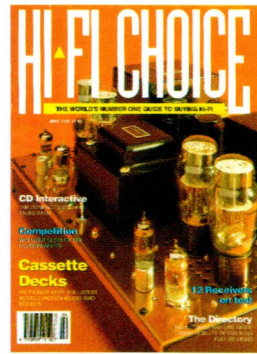
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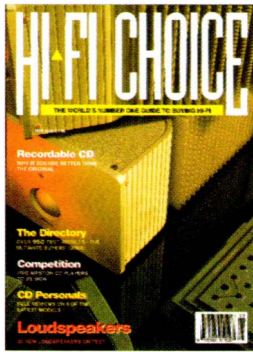
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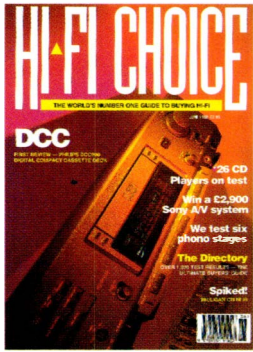
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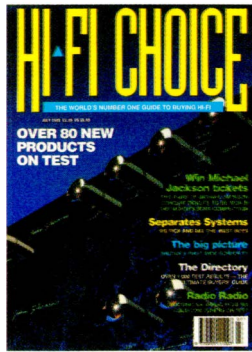
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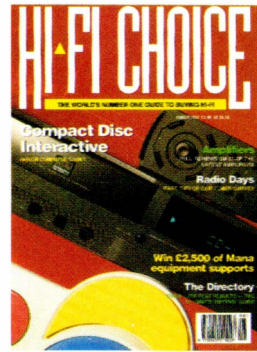
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personals plus explanation of
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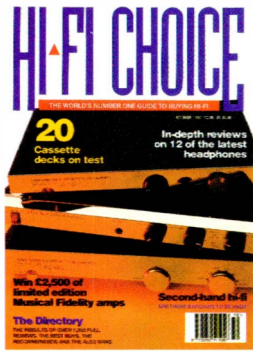
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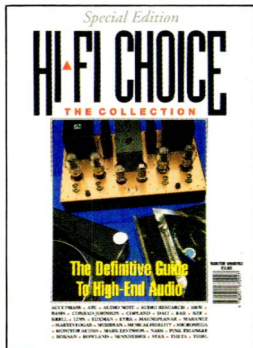
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A MUSICAL CHOICE

This month's Aspirations comes from Newcastle under Lyme where Dan Houston visits an ex-musician whose system is an unusual blend of old and new technologies.

Musicians are often uninterested in hi-fi. There are stories of fabulously wealthy stars who are content with a ghetto blaster and tapes. This could be for the same reason that cowmen prefer beer to milk, but the more usual explanation is that musicians are better at mentally filling in the gaps in recorded music. They know intimately how a Fender *Telecaster* guitar or a Stradivarius violin should sound, and recordings on hi-fi hardly come close... so why bother?

This month we're in Newcastle-under-Lyme to visit John Evans, an ex-musician who *has* bothered to equip himself with a sound system worthy of some of the better recordings available on CD.

John's playing career began after he finished art school and was called up for military service. Army life was made bearable, even enjoyable, for musicians and he signed on the dotted line, eventually completing a 12 year stint playing the cornet in the regimental band of the Scots Guards. But regimental music never appealed as much as classical and he remembers moonlighting, playing trumpet at music halls and with theatre orchestras up and down the country throughout the Fifties.

A highlight was playing trumpet on stage in Verdi's *Aida* with Sir John Barbirolli at Covent Garden Opera House. After years of freelancing he formed the Royal Doulton Band and was its first musical director before taking over the conductor's baton for a couple of years in the early Seventies. Music took second place in his life when he started a fine art publishing company from which he has now semi-retired.

The hallway of his home combines both artistic and musical influences with his own miniature watercolours of his favourite composers. At the back of the

house, with glass doors opening onto a conservatory and through to the garden, the living room looks more like a dedicated listening room. Quad *ESL 63* electrostatic loudspeakers create an imposing presence while the hi-fi separates next to the sofa look slightly incongruous against the Ercol furniture. The burgeoning collection of Compact Discs reflects a taste for many of the great recordings of the past, re-released for the digital music lover. A revolving set of shelves is a convenient way of storing twice as many discs and keeping them to hand. More CDs are on bookshelves above the system.

John first became interested in hi-fi in the Sixties while he was working as a rep for Goodmans. During his stint with the company he became friends with the loudspeaker designer Ted Jordan.

"Goodmans were turning out excellent speakers at that time and Ted was working on an electrostatic to go into competition with Quad," he says. "I had made my own loudspeakers using Lowther *PM6* drivers and boxes built to Lowther's specifications, but I remember how I liked the sheer open transparency of the electrostatic. It was then that I became an addict of the electrostatic sound. I think it goes extremely well with works for small orchestras and chamber music. But Goodmans never made the loudspeaker, and it wasn't until ten years ago that I bought these."

A real glower

At first the speakers were used with a Quad *44* preamplifier and *405* power amplifier but over the last four years John has been "system building like a maniac". His amplification is now from the esoteric American Audio Research Company, namely an *LS1* preamp partnered with the *Classic 30* stereo hybrid valve power amplifier.



The front-end of the system is a Meridian *606/602* CD player while a Celestion external cross-over, racked with the main electronics, gives a clue to the unusual speaker combination lurking at the other end of the room.



"There seems to have been a renaissance of interest in valve amplifiers, and I find this combination has a warmth and musicality that suits my taste. They are very well suited to these loudspeakers and I couldn't find a transistor amp as good as these."

But the output of the ARC tipped the balance against the electrostatics and the system started to clip, according to John "the speakers were overloading, especially in the heavy passages, so I decided to add a subwoofer."

John decided on the Celestion *SL 6000* system, which he drives with a Quad 606 power amplifier.

"Coupled with this pair of subwoofers I think the *ESL63s* are difficult to beat for classical music reproduction," he says, vouching that he has banished the clipping problem. The subwoofers come complete with a crossover which feeds them with frequencies below 100Hz.

It's a reasonably seamless combination which marries the driving force of the unusual dipole subwoofer design with the delicate nature of an electrostatic diaphragm. John has sited the galactic-looking black subwoofers on the floor just behind the Quads.

The *SL6000* is unusual in that it is a stereo system and the dipole nature of the sound field it produces makes positioning critical in getting the best from this



John's *SL6000* sub-woofers are partially hidden behind the huge Quad electrostatic panels making for an interesting marriage of disparate technologies.

imposing boxless design.

John is now onto his fourth CD player, his introduction to the medium taking place in 1986 when he started off with a Marantz unit. He recently upgraded to his current two box Meridian 602/606 combination, the new system replacing a Meridian 208. "I bought the 208 a couple of years ago, because it was one of the first BitStream models on the market" he says. "I preferred the sound of the single bit

player, it seemed to improve the clarity of the music and was smoother to listen to."

His turntable and LP collection have since been relegated to the attic, "In terms of absolute sound quality you can't beat the standard of a good LP, but I like the lack of surface noise from CD. And many of the finest recordings ever made are being released on CD, with conductors like Beecham, Furtwangler and Toscanini, they really are things to treasure."

Turn the other tweak

John has embraced current audiophile trends and 'tweaked' his system with esoteric cables and isolation equipment. "Top class separates are never at their best unless accompanied by similar quality interconnects and loudspeaker cable," he enthuses. "Of course the cables should be matched in terms of impedance and sound quality to the equipment itself. And it's fairly pointless putting some expensive Deltec cable with a cheap amplifier."

Between the CD drive unit and the digital to analogue convertor John uses Audioquest *Video Z* digital interconnect and has some Deltec *Black Slink* between the DAC and the amplifiers. Speaker cable to the Quads is again Deltec, some *Gortex Black 16*, while Kimber *4TC* cable feeds the subwoofers.

The cables were chosen on sound quality grounds, "I don't know why manufac-



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York

Frequency Response: 50Hz-20kHz · Crossover Frequency: 3.3 kHz · Nominal Impedance: 8 ohms · Sensitivity: 89dB · Amplifier requirements: 25-100 watts · Castek Overload Protection: Up to 300 watts · System Type: Twin port reflex · Bass unit: 150mm · Treble unit: 25mm soft dome · Dimensions: Height 430mm Width 220mm Depth 260mm · Weight: 7.2 Kgs



Chester

Frequency Response: 44Hz-22kHz · Crossover Frequency: 2.7kHz · Nominal Impedance: 8 ohms · Sensitivity: 90dB for 1 watt input at 1 metre · Amplifier requirements: 30-100 watts · Castek Overload Protection: Up to 300 watts · System type: Quarter Wave Bass Loading · Bass unit: 150mm rubber roll surround · Treble unit: 25mm metal dome · Dimensions: Height 915mm Width 230mm Depth 250mm · Weight: 16.8 Kgs



Winchester

Frequency Response: 35Hz-22kHz · Crossover Frequency: 3kHz · Nominal Impedance: 8 ohms · Sensitivity SPL: 90dB for 1w input at 1m · Amplifier requirements: 30-150 watts · System Type: Quarter-Wave Bass Loading · Overload Protection: Castek · Crossover: Hardwired multi element 81 wired · Terminals: Suitable for large diameter cable and 4mm plugs · Bass Unit: 2 x 150mm rubber roll surround · Treble Unit: 25mm Metal Dome



Tower

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“I do think that hi-fi is creeping closer to the real thing though, and I’m sure there will be many more advances in the next 50 years, but I won’t be here to hear them!”

turers sell their equipment with these ‘bits of string’. It certainly seems a mistake because it often leads people to believe that what they hear is the sound quality from the equipment. Different cables can make a tremendous improvement.”

Isolation has been similarly appraised. The equipment stands on Sound Organisation supports and underneath the CD player and amplifiers there are Mission Isoplats and rubber-like plastic Sorbothane feet. “I think isolating equipment from vibration is as important as buying the equipment itself, what you are doing is letting the equipment work properly. I never thought I was a tweeker until I found out what improvements it can bring,” beams John.

The superb sound quality of this system is also used when viewing the Sony Nicam television, with the stereo audio channel wired through the ARC amplifiers. “That’s made a remarkable difference, especially with a recording of an opera, but I don’t feel the need to have extra speakers or a surround sound processor, it’s just a case of improving the sound quality from the TV.”

All the hi-fi equipment, bar the Quad loudspeakers, has been bought from Creative Audio of Shrewsbury. It’s 90 minutes drive away but our host finds the journey worthwhile. He has been able to trade-in equipment as he upgraded and he lauds the benefits of buying from a professional specialist. He auditioned all the equipment, confident that if a component disagreed with the system at home, or broke down he would be able to exchange it.

John feels he has gone about as far as he can towards audio bliss on a reasonable outlay. “Of course I could go on — look at something like the Audionote *Ongaku*, that’s £36,000 just for the amplifier — you can get outrageous with this stuff!

I think, being an ex-professional musician, that listening to the music is far more important than listening to the hi-fi, which is what some audiophiles seem to do. I was once listening to a Mozart piano concerto with a colleague and I remarked that a particular transition passage was wonderful, referring to the music, but he replied that he didn’t think my ‘transients’ were that good at all!”

In spite of such occasional comments about his system John finds that musical evenings spent with like-minded friends

are far more rewarding and pleasant than listening alone. “I suppose it’s like having an audience at a concert, listening with other people seems to enhance the enjoyment of music. We tend to sit in silence and just chat between the pieces.”

Going live

He’s quick to tell me there is no substitute for live music and enjoys listening to the Halle Orchestra at his local concert hall in Stoke on Trent or going to Birmingham to hear Simon Rattle and the City of Birmingham Symphony Orchestra. “I do think that hi-fi is creeping closer to the real thing though, and I’m sure there will be many more advances in the next 50 years, but I won’t be here to hear them!”

We had arrived to find the musical score of *Les Nuits D’Ete* by Hector Berlioz on the coffee table. John hung up his trumpet long ago, but still reads music and will listen to a recording with the composer’s score in front of him to hear the conductor’s interpretation.

Fittingly he puts on the Philips recording of Berlioz’ *Symphony Fantastique* with Colin Davis and the Concertgebouw orchestra, Amsterdam. We turned to *The Night of the Sabbath*, to see what the Quad/Celestion team would make of its low octave opening bars.

“This is just phenomenal, he (Berlioz) uses E Flat clarinets to conjure up the image of these screeching hags. And he did it in 1829, it’s one of the greatest pieces

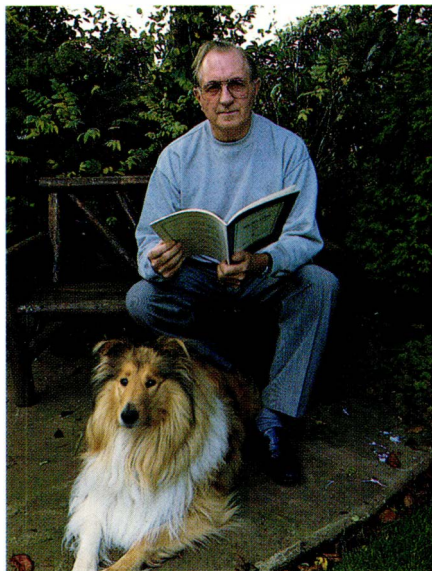
for orchestra to this day!”

We sift through some of his favourite recordings from the Fifties to the present. Buying a CD when you already had the vinyl version is an expensive way to keep abreast of technology he rightly complains.

The Quads are hardly new, but it’s unusual to find them partnered with such components as the ARCs and Meridian. The subwoofers give this system the edge though, and provide the sort of low level attack that Berlioz’, and all, orchestral music requires. The Quads excel with instruments of a more delicate timbre, however, and in John’s home their transparency provides a clear window onto the recording situation, it’s difficult to believe that the design is 30 years old.

Such transparency allows for criticism of a recording, especially if you know what you’re talking about. John praises Telarc’s productions in the main but finds Robert Shaw’s interpretation of Verdi’s *Requiem* with the Atlanta Symphony Orchestra less than accurate. Listening to the *Dies Irae* he says, “I played this with three other trumpet players in London once and the trumpets’ sound is meant to be antiphonal — it’s supposed to sound distant from either side of the stage — but here they’re all up front.”

He’s not drinking Heineken, so maybe only hi-fi can do this. Perhaps other musicians should show more interest and take the subject more seriously.



One man and his dog.

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Loudspeaker Cable (to subwoofers) Kimber 4TC	£17.65/m
Equipment Supports: Sound Organisation Isolation supports: Mission Isoplats and Sorbothane feet.	

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EVER BE THE SAME



For 25 years Tom Fletcher has been making the Nottingham Analogue turntables, tonearms and cartridges. A staunch defender of the analogue faith he now wants to launch a 'vinyl only' record label, as Dan Houston found out.

Platters of the heart

In Tom Fletcher's workshop there are great platters of gravity spun iron which look as if you might need to take steroids to lift them. These provide the mass for Fletcher's turntables, and are quietly aging in the same way that wood is left to 'season'. "Nobody does this any more in engineering," says Tom in his dyed-in-the-wool Nottinghamshire accent, "but iron needs to settle for at least three years before you can machine it, the shape of these platters would alter if I didn't leave them first."

It's an attitude which reflects his entire approach to design, Tom makes very different turntables. The iron platters are smoothed before becoming the central feature in his *Mentor* and *Mentor Reference* turntables, the record being placed on a carbon platters supported by aluminium spacers.

Like every other turntable designer Tom Fletcher would dearly love to get rid of the motor — a major source of vibration and lateral 'pull' on the platter — but instead of using a suspended subchassis, his turntable bearings are 'solidly' mounted on the plinth.

The colossal platters rely on their momentum, once up to speed they spin evenly and constantly, minimising the effects of the belt-drive system.

"The platter on the *Mentor* weighs 70 pounds," Tom explains, "to stop it dead you would need a vice that could exert a pressure of 40 tons per square inch, the motor's nothing to that." One does not like to ask about the force required to stop the *Mentor Reference's* 140 pound platter!

With mass like this a turntable's bearing has to withstand extraordinary pressure, normal metals would be ground

down like an elephant pirouetting in stillettos. To enable him to guarantee his turntables for life Tom uses a sleeve-type bearing of Admiralty bronze and a mineral he doesn't care to publicise. He machines these to extremely fine tolerances and adds that the *Mentor* and *Reference* bearings take about two years to 'run in'. "When it's turning, the platter has to be as stable and level as possible to allow the arm and cartridge to retrieve the information in a record groove," he says, "that information is moving the cartridge cantilever in tens of thousandths of an inch, so if you don't have stability it's like me holding the needle and you trying to thread it while we're both standing on a trampoline." While his turntable platters are described as being based on solid foundations he would disagree with the word solid. Just as he respects the fact that iron has some initial viscosity after it has been cast, his self-taught lucid grasp of physics accepts that 'absolutely everything is in some state of suspension'.

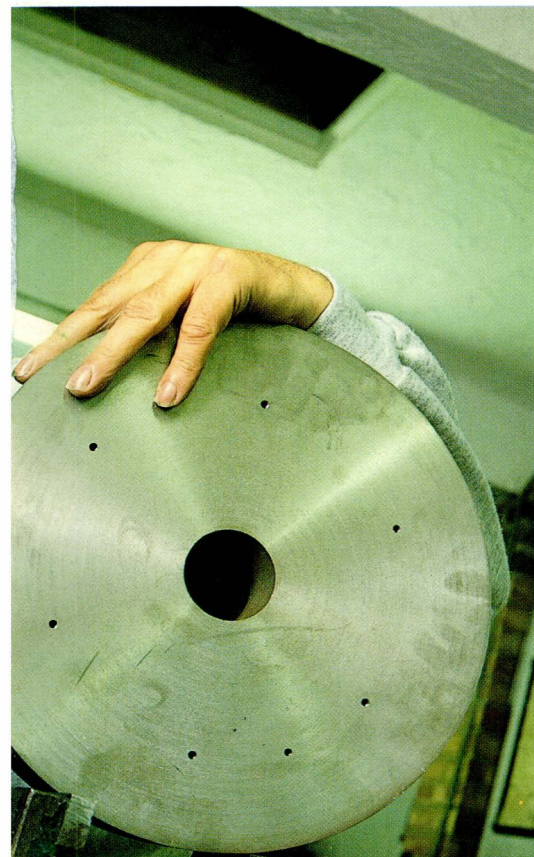
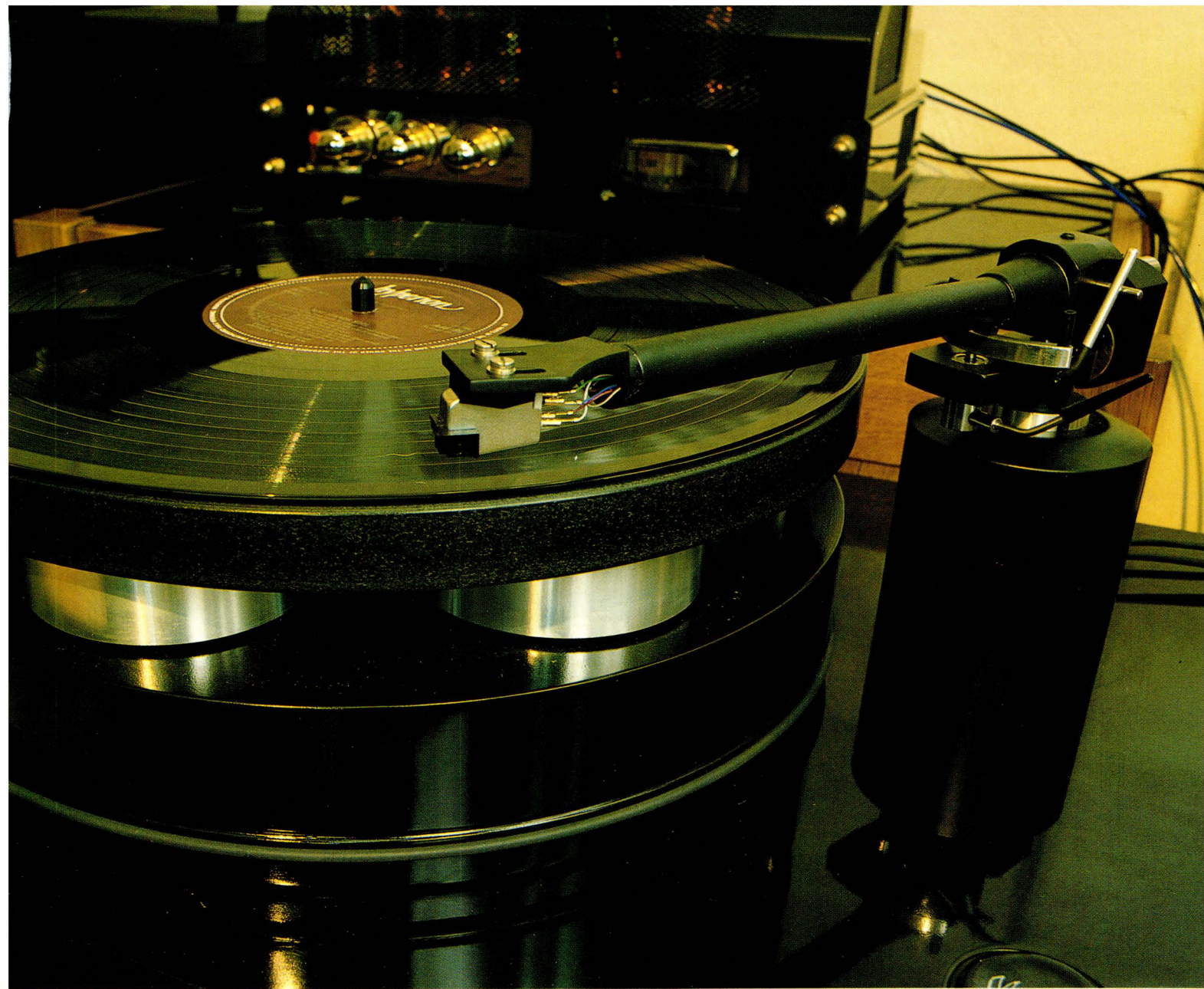
Given the push

Although the £2,300 *Mentor* and £4,400 *Mentor Reference* decks use a platter which isn't affected by the vagaries of vibration and speed from the motor, Tom nevertheless isolates the motor and its pulley from the plinth, siting it on rubber feet.

His other turntables, the £570 *Space Deck* and £1,175 *Graphic* use lighter platters, belt driven by motors which seem barely man enough for the job. Indeed the *Space Deck's* motor is only strong enough to keep the alloy platter spinning once it has been given a push by hand. Taking the belt off and giving it such a push makes the platter spin for more than a

Main pic: Any old iron, Tom's decks are based around a massive ferrous platter, as the man himself, pictured below in his workshop, is keen to show off.





minute before coming to rest. The synchronous motor's strength isn't even enough to drive its two-speed pulley which sits on top, once touched it starts and then runs at a constant speed.

He has even tried to get rid of the motor altogether and experimented with the falling weight Cuckoo clock principle and even a steam jet to drive the platter!

The *Space Deck* is probably the best known product of the NA stable. It is visually unusual being plinthless, sitting on a three-footed chassis. Tom now supplies it with a 'marbled' wooden isolation board. The motor isn't attached to any part of the *Space Deck*, but is sited close to its 'North Western' foot. Tom's decks do not require any setting-up, all that is needed is a level surface. Final levelling is achieved by adjusting the feet. The *Space Deck* is supplied with a light fibre mat, also available as an accessory, which is similarly absorbent to the carbon platters of the more expensive models.

Another neat accessory is a black perspex dust cover. The size of a conventional LP, it can be used overnight to keep

dust off the platter. Tom is against normal hinged dust covers, which, he claims, can make record players sound a touch boxy. He also points out that: "When you open a normal dust lid you create a vacuum that sucks in the surrounding dust which then falls straight onto the record," he says.

Tom can claim to have been an engineer since he could walk. Born and bred in Nottinghamshire he describes how he began his apprenticeship at the age of seven in his father's workshops, often working from six in the morning until ten at night. By the time he left school at 15 he was capable enough to be placed in charge of the 20 strong workforce, but it wasn't until he was 30 years old that he was able to break away to set up Nottingham Analogue. He doesn't regret his truncated education and muses that if he had attended an audio science course at university he would probably be making a suspended sub-chassis, or 'bouncy bouncy' turntable as he describes them.

One of his early decks was the *Dais*, made in 1975 which was a sub-chassis



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Why compromise?

design: "When I made that model Linn was so strong that I could not have sold anything but a spring-loaded sub-chassis, but nobody in their right mind listened to it like that, the instructions recommended it was used with the transit screws bolted down."

One suspects he has the artisan's disregard for highfalutin theory, in his workshop at the back of his house there is a desk, but no computer to aid design. Nor is there a drawing board, he makes all his components himself (bar some of the finishing) so there is no need to brief other engineers with diagrams.

Use your illusion

Tom dislikes the word hi-fi and prefers to say that he works for the 'illusion of music'. To help himself see whether he is creating this illusion correctly he is a fanatical live music fan and says that three quarters of the music he listens to is at concerts and gigs. "Listening to live music is like washing your ears out," he says.

He's also a fierce advocate of analogue audio. "What we do (with record players and records) is a little magic trick," he says, "sometimes we get it right but we're still a long way from a complete illusion. Digital audio is advancing by trying to join all the dots together, but when they have achieved that they will have the analogue wave form."

Tom points out that digital media will never reproduce the analogue wave form in its entire smoothness, and contends it is therefore an expedient rather than emotional carrier of musical information. "If we all moved around like this digital would be wonderful," he says — doing a good impression of a jerky Thunderbird puppet under a strobe lamp — "but we don't. We move smoothly and that's why we respond emotionally to records."

"Digital data is fine for things like calculators and fax machines where emotion doesn't matter, but with music you have this emotional criterion which is the full analogue curve. Analogue music is like a candlelit dinner for two compared to digital which is like a McDonalds takeaway."

Tom is championing theory here. He admits that CD players often sound better than record players, and he is aware of the many detrimental effects distorting the musical illusion such as imperfect recordings, bad pressing and subsequent 'hi-fi' elements such as amplification and loudspeakers. But the 'hyped and marketed' move to digital hasn't rectified these 'detrimental effects'. "They threw the baby out with the bath water," he laments.

One of his current projects is to start a purist record label using valve driven

recording and cutting equipment à la Fities. He promises engineering and even production will be kept to a minimum. "If an artist fluffs a note we won't be putting in perfect sounding tape sections to hide it," he says, "our main objective will be to reproduce a live recording on LP. We have several musicians lined up and there are some good venues we can use such as local churches."

The nascent label now awaits a tweaked Studer *Revox* one inch tape recorder, to be supplied by EAR of Huntingdon.

His main task is to establish a name for both musicality and engineering prowess, and the initial 2,000 pressings will be targeted at audiophiles.

He sees music in the same way he sees his turntables, or maybe it's the other way round. "Music is all about silences," he



Tom's rather novel tonearms are born in the same workshop as the decks on which they will eventually be used.

says, "it's the breaks in music that make emotional. And I make my turntables to play silence, not music. If you can play silence — which has no character of its own — then you have the right background on which to work."

Mostly armless

Work on setting up the new label has run alongside the development of his new silver-wired tonearm, nicknamed *The Alien*. Its tube is made of steel-grey carbon, a material chosen for its rigid and inert qualities. Like his *Omega Point* arms it's a unipivot design: "When resonance travels down the arm tube it needs a channel, like an 'electrical earth' to go to," Tom explains. "Conventional arms use three point bearings which just confuse the resonance so it goes from one to the other and bounces about.

So using one bearing is the answer. But an arm should only move laterally and vertically, the problem with most unipivots is that they allow the arm to revolve as you look down the tube. I control that with silicone riders which stop the screwing movement."

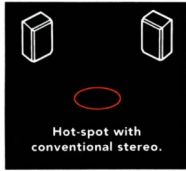
He also makes the three *Analogue Tracer* cartridges, sourcing parts from different manufacturers. These are moving magnet designs, priced between £90 and £350, and are sold with valve amplifier users in mind. Tom describes the noise levels on many moving coil step-up devices as being unacceptable and prefers the simpler engineering of the moving magnet.

Tom refused to expand his business in the Eighties when his bank manager was desperate to lend him money but claims there is a three year waiting list for his

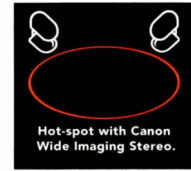
Reference turntable. He admits that record players and records will only be of marginal influence and bought by 'those who know'. But he sees the future of audio lying with some form of analogue technology, "Only Jesus could get analogue sound from a digital source and he doesn't come down very often. Whatever it is everyone will buy it, the same as they did with CDs and transistor amps, but at least they won't yawn when they listen to it. I think it'll be something very clever — like a form of yeast — some living thing that clones itself perfectly."

He's laughing and I guess his analogue *Mentor* will be spinning silently long after such things have come and gone.

Nottingham Analogue, 128 Cordy Lane, Underwood, Nottingham. NG165FD. Tel: 0773 762947.



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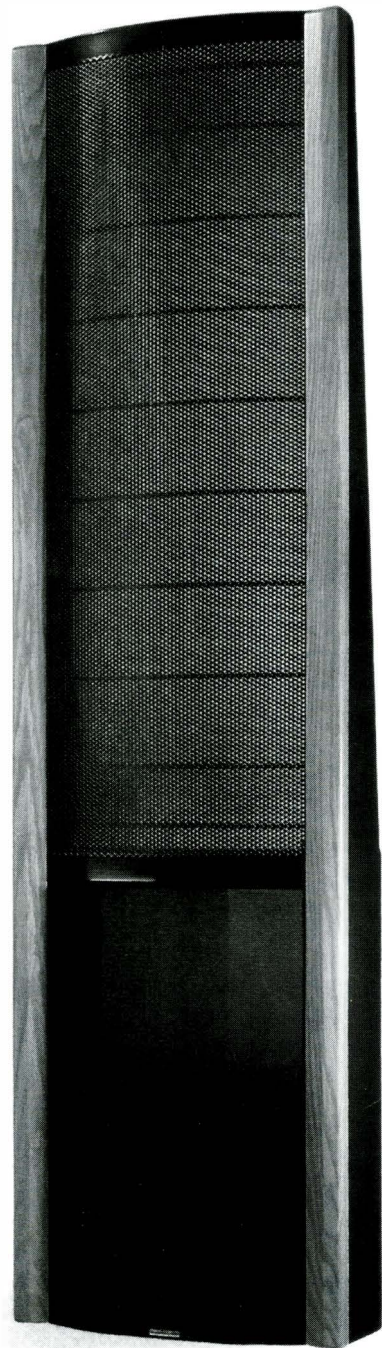
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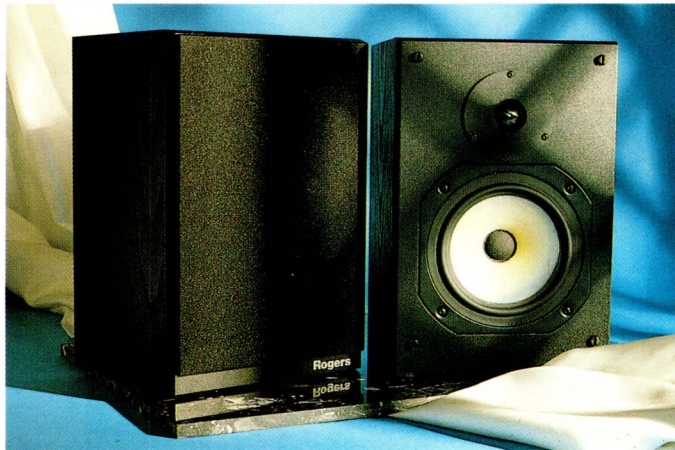
CHOICE ANSWERS

Best Buys beaten by midi systems

I have been gradually changing over to a system consisting of Best Buy products and now have three sources which I assume you would approve of. They are; NAD 5120 turntable, Aiwa XC700 CD player and Denon TU260L tuner. All these seem to be performing well, especially the Denon.

They feed into an Onkyo A22 amplifier rated at 44W which outputs via QED cable into KEF Carina 2 speakers on low spiked stands. Owing to the shape of the room, they are 3m apart and I tend to sit 2m in front of them, which I know is not as it should be. I have tried them closer together but the result was worse, no stereo.

The sound seems to lack the liveliness provided by midi systems bought without much consideration by friends and acquaintances. Is it the amplifier or are my expectations simply too high? Will I have to move to a house with a different shaped living room (mine is long and narrow)?



Rogers LS2a/2s could save buying a house with a different shaped living room.

What do you think?
John Ashurst, Manchester.

I suspect that the fault lies largely with your loudspeakers. Choice never reviewed the Carina 2 but it did criticise the original Carina for an overly full lower mid/bass and a lack of sparkle, sound familiar? The amp may not be helping either

but I'd start with the speakers, have a look through the Directory and find a recommended model that suits your budget and sounds like it will inject some life into your system. A couple of models that come to mind are the Arcam Alpha (£200) and the Rogers LS2a/2 (£220) if the budget will stretch that far.

Hard to Handle

My first hi-fi system consists of an Arcam Alpha CD player, Rotel '960 pre/power amplifiers and Cyrus 780 speakers with Monster Interlink 500 and van den Hul Clearwater cabling. At the time of buying I had very little knowledge of 'stereo imaging' but I liked what I heard.

However, having used it in two different places I've become dissatisfied with the imaging. Vocals seem to come from either one of the speakers rather than between them and there does not seem to be any depth to the sound stage. I also find that when played reasonably loud, tracks like *Hard to Handle* by The Black Crowes become muddled and the speakers sound as if they are losing control.

I remember reading that speakers which require wall mounting for bass reinforcement typically have poorer imaging abilities than freespace models. Is this something I will have to put up with until I upgrade? Or is the sound stage something rock producers do not concern themselves with?
Paul Butt, Essex

Spot the lack of depth culprit

My system comprises a Thorens TD321/SME 3010R/Dynavector 19A record player, Meridian 206B, Nakamichi Cassette Deck 1, Luxman T117L, one Cyrus II/PSX

amp per channel and Linn Kaber LS50B speakers. All cables are Audioquest and I use a variety of tweaks including mains filters, Sicomin

and Isoplat platforms and Nav-com feet.

I get a lot of detail and clarity from the system but the sound stage lacks depth and I want to know if replacing the amps would improve this aspect of its performance.

If so which models should I be considering that would be a good match for the Kabers, regardless of price? I'd also like to upgrade the turntable but intend to carry on using my SME. What do you suggest?

José Bell, Madrid, Spain



It's true that amplification can limit a system's ability to produce deep, believable images but in this instance I suspect that the main culprits are the loudspeakers. Linn speakers have never been renowned for their imaging abilities and I'm afraid the Kabers are no different. Basically they seem to have been designed with one purpose in mind; speed. If you want image depth but don't crave bass extension (which the Kabers imply) I'd suggest you consider Mission 753s (£599), Thiel SCSs (£1,000) and Spendor SP2/2s (£555).

A new turntable sounds like a good idea but hanging on to the SME is going to have a slightly limiting effect on your options. You'll need a good sized solid plinth design or a suspended deck with a decent sized armboard. I suggest you try and listen to a Kuzma Stabi (£995), Pink Triangle Export (£885) or a Michell Gyrodec (£659).

Linn Kabers: not renown for their imaging abilities, but good for speed.

It's true that wall mounts don't tend to image as well as their freestanding brethren, whether this is because there is no space behind them for you to imagine the musicians standing in or because walls create conflicting reflections is hard to tell. But that said the music shouldn't be confined to the speaker cabinets, are you sure that they are connected in phase? Another point to consider is that in our review of vdH Clearwater it was noted that it tended to foreshorten stereo depth, a change to Mission Stranded or Furukawa FS-2T14 might make a difference.

Your comments about rock producers also holds some sway, I've rarely heard as good an image from studio made rock records as I have from live or acoustic recordings of any type of music.

As for sounding muddled, the whole Shake your Money Maker CD does sound rather nasty under most circumstances. Significantly more expensive systems can emphasise the music rather than the noise, but I suspect that they wanted it to sound a bit dirty.

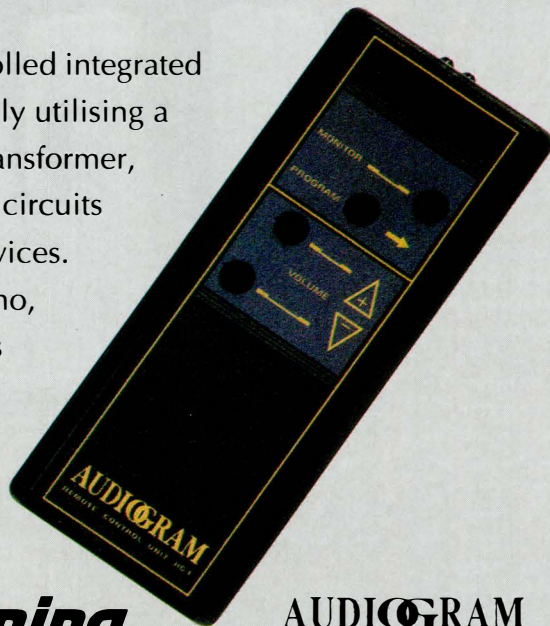
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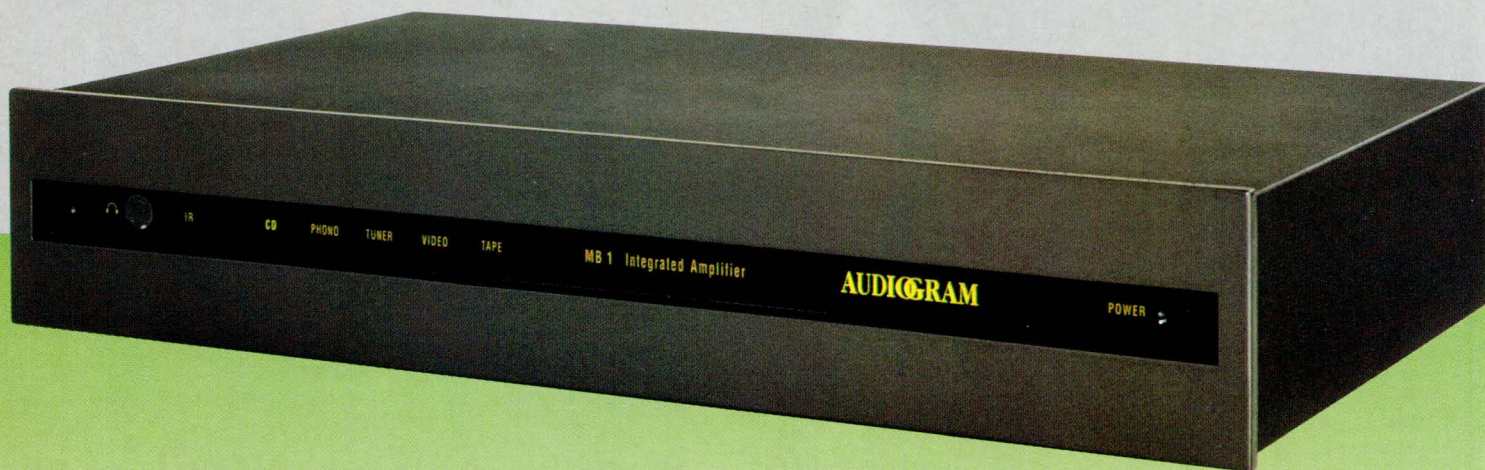
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The smoker you drink . . .

About 18 months ago I purchased a Pioneer P500 midi system which you recommended as a Best Buy. Whilst the system appears to be very good, I have some doubts about the sound quality which I suspect is limited by the loudspeakers.

If I were to replace the speakers would this result in a significant improvement in the sound quality, and if so can you suggest a few small models around the £100 mark to consider? A Harris, Oldham, Lancs.

The loudspeakers supplied with mini systems, although not necessarily the weakest link in the chain, are usually nothing to get excited about and replacing them can hardly fail to improve matters sonically.

Given your requirements, the models that seem to stand out are the Allison AL100 (£120) and the JPW Sonata (£115). Not quite so highly rated but also worth considering is the Mission 760i which costs £120.

. . . The player you get

Despite being marooned in a hi-fi no man's land I have managed to put together a not displeasurable sound system composed of an aged but respectable Technics SL-P310 CD player, Pioneer A-400 amp and Heybrook Solo speakers. The speakers are linked up with Heywire and the source with Chord Co interconnect.

While I enjoy the sounds that my CDs make there is, as ever, room for improvement. There's a certain lack of rhythmical control and definition, with complex rock tracks sounding somewhat unruly and confused. It is also a long way short of being realistic.

Given that the Solos are reputedly very system fussy, are they suited to the A-400, and if so are these two excellent products merely highlighting the limitations of the CD player?

If this is the case, would something like the Marantz CD52II represent a significant upgrade, or would I have to go for



The Technics SL-PS620A could provide a raft from hi-fi no man's land.

something in the Arcam Alpha league?

Tony Watson, Aberdeen, Scotland.

Your grievances would seem to point at the CD player, the speakers, though not that civilised tonally, were praised by PM for their rhythmic coherence. If anything the combination with the Pioneer might sound a bit bright

but it shouldn't sound confused.

It therefore makes sense to consider some of the better CD players currently on the market, these include the Technics SL-PS620A (£230), NAD 5425 (£200, recently replaced by the 502 but still in the shops and possibly at a discount) and Pioneer's own PD-S801 (£300) which is a bit system dependent but should be happy with the A-400.

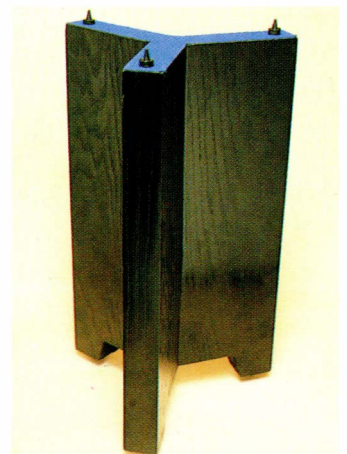
Hands on stands

I accept that loudspeaker stands are necessary if a hi-fi system is to give of its best. Unfortunately, I think that a lot of the stands on the market (certainly those I can afford anyway) would look out of place in my living/listening room, so my Rogers LS2as stay firmly on the shelves.

I am a competent wood-worker and am sure that I could make some attractive looking stands, but is wood an acceptable material? Even using dense hardwoods and a design incorporating a hollow central pillar which could be weighted, I am concerned that the inherent elasticity of wood might make it impossible to construct stands which would be sufficiently rigid. I don't want to spend a lot of time making something that might end up visually appealing but sonically appalling. So do I start sawing or do I start saving? Richard Shillitoe, Ilkley, West Yorks.

Wooden speaker stands aren't all that common but I suspect that that's because it's pretty expensive to manufacture adequately stiff ones, rather than because they are inherently unsuitable. I know that Italian speaker specialists Sonus Faber make rather attractive hardwood stands for their models but they cost £500 plus.

To get back to your question, I see no reason for not making your own wooden stands. Just make them as rigid as possible, spike the bases and you should achieve sonically and aesthetically pleasing results.



To bi or not to bi, that is the question

I wonder if you would be kind enough to adjudicate on conflicting advice I have been given by two dealers. What I want to know is, is it possible to bi-wire a Pioneer A-400 amp to KEF Q80 loudspeakers?

If so what is the best way to go about it, and would the expense be worthwhile?

D V Hopkins, South Molton, Devon.

Yes. The only possible complication is that the Pioneer won't accept two banana plugs on its speaker outputs, but you can do it with bare wire or one bare wire and one plug. Generally the expense is worthwhile, although not having A/B'd single and bi-wiring on Q80s it's not possible to say what sort of improvement you can expect, but as long as you use two equal lengths of the same cable, things are not likely to get worse.



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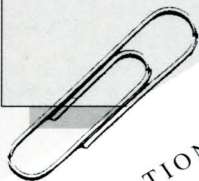
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Write on . . .

What do you think about the way things are shaping up in the ever broadening world of audio entertainment? We want to know your views and ideas, so send 'em in and each month we'll award a record token (that should just about cover the price of a CD) to the writer of the most witty or interesting contribution.

Twin transports of delight

The thorny question of the audio capabilities of twin-transport cassette decks was raised again in the *Hi-Fi Choice* October review feature. I wonder whether manufacturers are actually failing to recognise and so cater for a small but significant market niche.

Last year I was looking for a deck to replace my vintage Sony top loader. My ideal machine would have had a 3-head primary transport, with a typical *Choice*

Best Buy spec of goodies for such a machine, plus a second read-only transport for convenience and economy of

space. I was not interested in hi-speed dubbing, reverse play and the like, and would even have settled for normal dubbing via line output to the system amplifier.



Unfortunately, no manufacturer makes such a beast. With the help of *Hi-Fi Choice* reviews, I eventually settled for an Aiwa ADF-810, with which I am extremely pleased, but it does mean that my 18-year old Sony cannot yet be consigned to its final resting place in the sky (OK — attic). Am I alone in having this requirement? There seems to me to be no fundamental reason why twin transports should necessitate inferior quality.

On a different though related topic, *Hi-Fi Choice* articles on formats for recording at home ignore what must be the second most popular format in terms of installed base, namely video tape. This surely represents a convenient and viable alternative to twin transport cassette decks for extended recording and playback. How about some back to back comparisons to compare audio performance?
N D Reynolds, Orpington, Kent.

Black on the right track

The manufacturers of the Laserway CD Applicator claim that by using it on the inner and outer edges of a CD, the specially formulated green coating applied will absorb the reflected light from the edges, thereby minimising error correction, and thus resulting in improved sound quality.

The reason for the choice of green is that it is opposite in the light spectrum to the red laser light generated in all CD players.

I understand that black pigment is effective in absorbing red light as well. Surely a black permanent marker would be cheaper and just as effective an alternative?
Alwyn Tan, Glasgow.

Since the last time the subject of green inks was raised on these pages we've been digging through our physics text books and doing a little further investigation.

It turns out that what the ink is trying to do is to prevent laser light from leaving the CD, in that it is the light bouncing around inside the polycarbonate layer that you are trying to prevent from getting into the guts of the player. Although the laser light is roughly equivalent to red, or at least infra-red, in the air, once it is inside the polycarbonate, it is slowed down and becomes green, which is why the green paint does a good job of reflecting the light.

If you don't believe us, just encase yourself in a large block of polycarbonate and get a friend to fire a laser at you, the beam will appear to be green!

Black ink, should, and indeed, does work, but so far it appears that green gives the best results.

**Record
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Winner**

Noisy cans

In his introduction to the headphone reviews in the October issue, Jason Kennedy recommends the use of a £300 dedicated headphone amplifier. While I am sure such a device gives excellent results, he neglected to mention a far cheaper alternative which also works very well. Appropriately valued resistors connected as a passive alternator between speaker terminals and headphones will provide a source resistance of a few ohms. This will also overcome the problems of inconveniently low volume control setting and amplifier residual noise, which occur when driving the phones directly from the speaker terminals.

May I refer readers to an article by John Crabbe in the June 1990 edition of — dare I say it? — *Hi-Fi News*. Suitable resistor values are given.

Richard Dixon, Sheffield.

I have tried a device much like the one you describe called the Can Opener. It worked well with most of the less efficient headphones, but proved to be rather noisy with a lot of the models I tried.

Hole-y Hi-Fi Choice

I'm sitting here just about to complete the competition in the September edition of *Hi-Fi Choice* and I find myself getting rather angry.

WHY OH WHY does *Hi-Fi Choice* continue the practice of publishing competition entry forms on the back of contributor columns (in this case *21st Century Fox*) and then stating that it will not accept photocopies. This is bloody stupid! Surely it would not be difficult to take a little more care during the preparation of the magazine to ensure that the competition entry form is backed by an advertisement — or the editor's column — rather than an article or review which readers may wish to read at a later date.

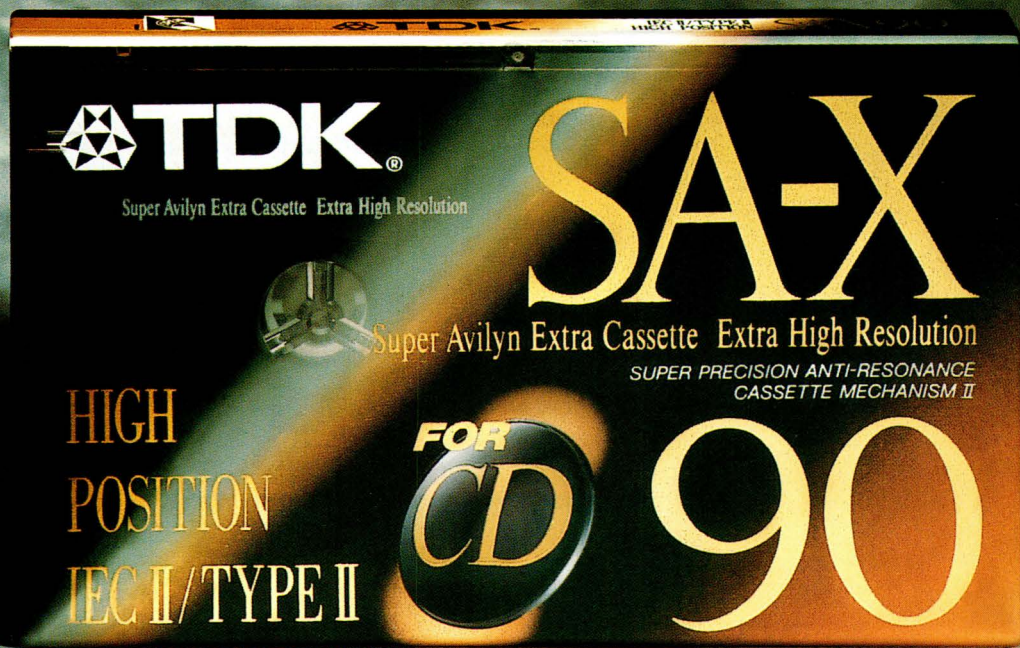
In all other respects the magazine is superb. Please keep up the high standard of reviews, columns, photography and layout to which we have now become accustomed.

Martyn Cadogan, Reading, Berkshire.

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Latest format FOUL-UPS

DCC and MiniDisc have both had a problematic month. Barry Fox reports on the latest hiccups to trouble the new formats.

Satellite broadcaster BSkyB is currently paying scores of two man teams of engineers to replace the 100,000 or so BSB squarial systems which will be useless after New Years Eve when BSB's Marcopolo satellite stops transmitting. Each home with a squarial bought before Sky took over the doomed BSB business two years ago gets a free system for receiving from the Astra satellite. This is the price BSkyB had to pay for government permission to broadcast.

Judging by past track records (Betamax or V2000 video for example) it is highly unlikely that Philips or Sony will give free home digital recorders to people who make the wrong choice between DCC and MiniDisc. Both sides have now stopped pretending that both can survive. One or both will fail.

The British Audio Dealers Association weekend in Coventry was supposed to help specialist dealers decide which system to stock and which to recommend. Both Philips and Sony were slated to stage seminars. Both took the event far too lightly and look sure to regret it.

Sony had nothing to demonstrate, and just showed inconsequential slides. Philips gave a daft answer on the risk of clogging DCC heads with analogue tapes ("there are separate analogue heads") and blew

an A/B comparison of DCC and CD. This showed CD the clear winner. Almost certainly the player was faulty but Philips lost credibility by blaming the room and loudspeakers.

By the end of the weekend many dealers were showing far more interest in the idea of recordable five inch CD than either DCC or MD. Meanwhile there is misinformation in the air and dirty tricks underhand.

Sony will launch MiniDisc in London, probably in November, but no date can be fixed because Sony does not yet have any final product; just the promise of portable player/recorders in the shops before Christmas. Anyone who expects these portables to be like cassette Walkmen is in for a disappointment. Appropriate for the winter launch, they will fit neatly in an overcoat pocket.

At the Cologne Photokina show Sony demonstrated MD portables with no batteries, and DC power lines instead. This neatly disguises the weight of the batteries needed to get even an hour or so's playing time out of the power-hungry first generation MD chips.

Shocking stuff

Although Sony describes MD as "shock-proof", demonstrators have for a year or



more refused to give the player a fair shaking while it plays. Now, quietly, comes the admission that before the launch the shockproof memory will be increased from one megabit to four megabits, giving the player up to ten seconds to get back on track.

Only if you ask is it revealed that the memory does not work during recording. This kills MD for serious recording.

Also, all the talk of MD being a 74 minute system is misleading. The only blank discs available until some unspecified time next year will run for 60 minutes maximum.

Dutch newspaper *Het Parool* recently published (7 October) a story of how Mini Disc was demonstrated to the Dutch press at the Firato hi-fi show in Amsterdam earlier this year. A dancer was demonstrating shock-resistance by jumping around with a portable player connected to the house sound system by a long lead. The lead fell out but the music continued



to play through the house loudspeakers. The logical deduction was that the music was coming from a backstage source, not the portable. *Het Parool* said that Sony later asked the press not to write about the incident.

Jack Schmuckli, Head of Sony's European operation, was clearly not pleased when I asked him for comment and whether other MD demonstrations, eg at Berlin last year, had been rigged.

Although Schmuckli admits that he was not present at the Firato event, he is nevertheless sure it was "not a fake demonstration". He also says the press were not pressured in any way. Sadly Schmuckli offers no explanation as to how the MD player managed to play without a connecting lead. So the mystery remains.

"I do not understand why you accuse us of having rigged the demonstration at the Berlin Fair. The source was definitely coming from the portable equipment" says Schmuckli, even though I only asked.

Plenty of new software to have a look at, but due to current problems it seems photography is about the limit of the fomats' capabilities to date.

I can well believe the Berlin demonstration was kosher, because the demonstrator in Berlin was only lightly shaking the player.

Leaking like a sieve

The music industry has recently been circulating an 18 page draft script for Sony's London. MiniDisc launch. The desk-top-published text contains stage directions for George Michael and a couple of Harley Davidsons. Jeff Baxter is down to say:

"We were told that rather than a dedicated Q and A session, you would prefer to ask your own questions on a one-to-one basis after the main presentation". There is then some more guff from George Michael and a jokey stage instruction.

"George Michael's *Freedom* builds up in volume, drowning out Barry Fox's cries

of complaint that he hasn't been able to ask a debilitating (sic) question in front of his peers. Catering staff enter with trays of champagne . . ."

I was puzzled. Surely a journalist can only ask a debilitating question if the product is inherently at risk of debilitation? If anyone is fool enough to ask a question simply for the purpose of showing off "in front of peers", it is the questioner who is debilitated, not the product.

We all know that ducking an open Q and A may well delay the wider recognition of any inherent flaws in a turkey project or product. (BSB used to play that game, and look where it got them). But I had never thought of MiniDisc as a turkey that needed protection. Also an open Q and A forfeits the opportunity to generate confidence with professional, honest responses to any serious questions. Much of "Sir" Akio Morita's strength comes from the way he answers awkward questions.

Sony was understandably upset that a

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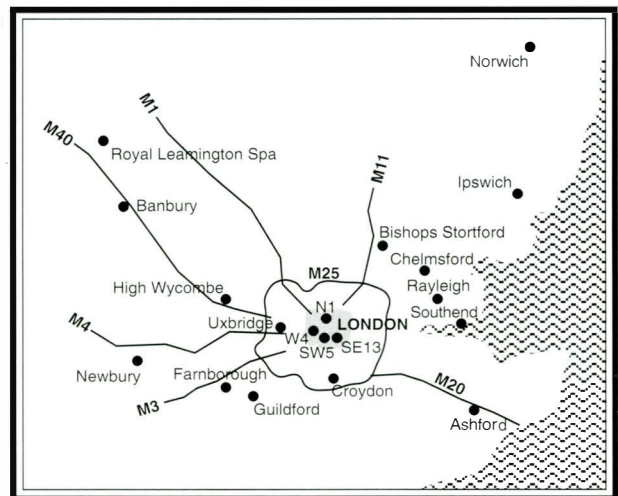
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private document had been leaked. But it was hardly surprising. The music industry always has leaked like a sieve. Virtually all the leaks on DCC and MD over the last two years have come from the music industry.

Sony says the script was only a draft etc etc. But both Brenda Jones of Sony UK and boss man Jack Schmuckli seem bent on a press conference without open Q and A. Others are having a re-think. We shall see. Most of all what I want to see is George Michael jogging with a portable that is provably playing what we hear.

Meanwhile . . .

However, Sony is not the only one having problems with its launch plans, as Philips has been making a mess of things, too.

The company had to withdraw all pre-recorded DCC cassettes, just as recorders went on sale in Japan and just before they were due to reach the shops in Europe and the US. The unprecedented move, to scrap all cassettes because some customers may later find some faulty, was designed to save the format's credibility. The decision was courageous, but fouled by a high level decision not to give any technical explanation for the withdrawal.

We now know why the tight lip decision was taken. Although the fault has now been cured, its cause is still uncertain. But what looked like a conspiracy of silence just made things worse.

Philips had promised a launch catalogue of 500 prerecorded DCC cassettes. In August, a month before the scheduled launch of DCC in Japan, tests revealed a baffling technical problem. Around ten per cent of the 200,000 or so DCC musicassettes duplicated ahead of the launch by Polygram's factory at Amersfort in the Netherlands, and by JVC at Mito in Japan, sometimes suffered from unpredictable sound dropouts and mutes. The problem was spotted in Japan by JVC and its parent Matsushita, which is making Technics DCC recorders.

All new technologies suffer bugs - remember how bad some of the first CD players sounded. But if suspect DCC cassettes had gone on sale and users had discovered the problem, the adverse publicity would almost certainly have killed DCC. Sony is currently running contentious adverts (eg in Holland) which argue that tape is dead and the future lies with disc recording. By the time people have the chance to start discovering whatever bugs are in the MD system, it might well have been too late for DCC to recover lost confidence.

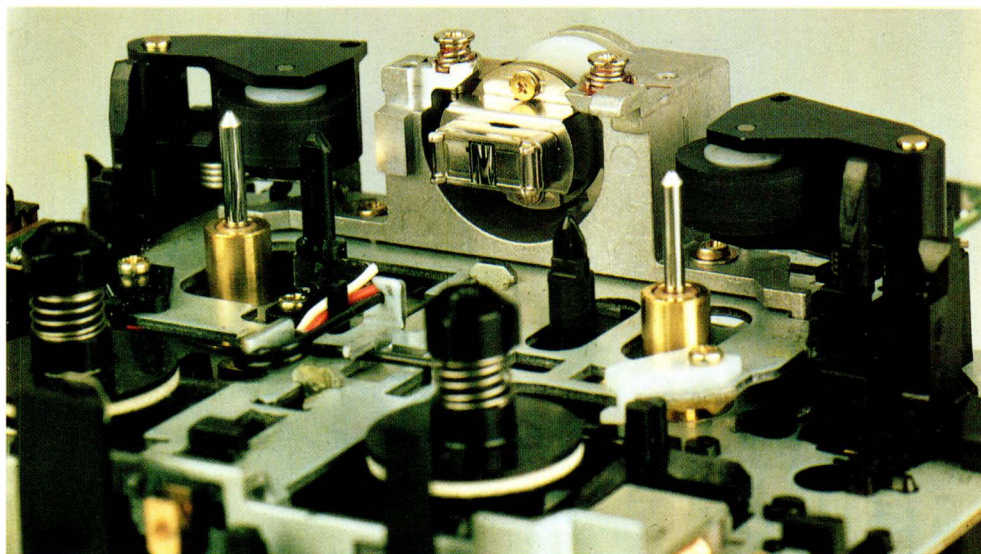
Through September DCC engineers in Japan and Europe worked flat out trying

to identify the cause. It still remains a mystery but Philips found that making a very simply change to the cassette housing cures the effect. In mid October Philips, Polygram, Matsushita and JVC signed an agreement on the cure. Philips took the pragmatic decision to start making a completely new batch of cassettes to sell in November. All the recalled stock is in a warehouse and will be analysed when commercial pressures are relaxed.

So far Philips makes all the DCC cassette housings or shells in Vienna and loads them with tape made by BASF. Early designs relied on the recording heads to

effect is difficult because the digital error correction used by DCC conceals signal loss until it suddenly becomes too bad to repair. But the practical solution proved simple, to kink the spring and make the area of wiping contact between the pad and tape very small.

Because the two halves of the DCC cassette are ultrasonically welded, there is no chance of modifying existing cassettes. Four factories round the world, owned by Polygram, JVC, EMI and BMG, are now working round the clock to duplicate new DCC musicassettes using new shells with the modified pads.



What a clog-up! Problems with the tape shell mean that dirt can build up and mute the tape.

wipe the tape clean of any surface dust, much as a gramophone stylus bulldozes dirt from the groove of an LP. In normal use the DCC heads just pushed any dust to end of the tape, and out of harm's way. But if users took a cassette out half way, this left a tiny pile of dust on the head. This caused dropouts when a cassette was next played. So in May Philips added two small cleaning pads, on sprung arms, to the inside of the cassette. These press the tape against guide rollers and keep any dust away from the heads.

In August tests carried out in Japan by Matsushita and JVC at high temperature and high humidity showed that if a cassette was removed half way through playing, the pads sometimes left a deposit on the tape which caused dropouts when the tape was next played. No-one has yet been able to identify the deposit or explain why it affects musicassettes. One of many theories is that pressure from the pad may release a chemical from the tape which binds any dust to the surface. Running the tape at high speed during duplication may in some way make it more likely to release chemical. Analysing the

Philips argues that there is no connection between the pad mystery and another problem which leading US hi-fi magazine *Stereo Review* has reported. *SR*'s reviewer found that in humid Florida the DCC machine muted on digital playback after it had been used to play analogue cassettes. Oxide shed by the analogue tape was clogging the tiny gaps of the digital head.

Philips says there is no mystery about this. If people play old, dirty or poor quality analogue tapes on a DCC machine, then the heads will clog just as they do on analogue machines. But whereas clogged analogue heads just make the music sound muffled, clogged digital heads stop working altogether. This, argues Philips, can be seen as an advantage because it gives users a clear warning that they must clean their heads. One accessory manufacturer has already developed a DCC cassette which contains wet cleaning material instead of tape.

Despite the problems, Sony and Philips assure us that both formats will be in the shops before Christmas. Then it's over to the public to decide the way forward.

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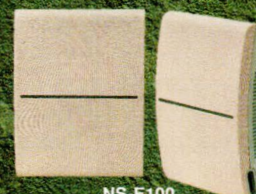
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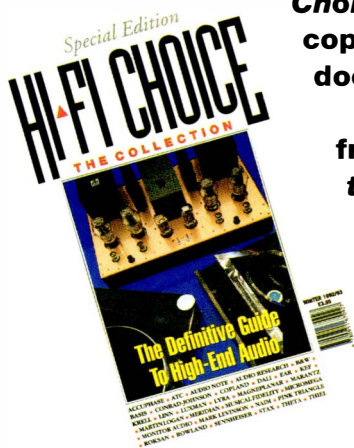
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Choosing and Using . . . DACs

Outboard DACs, add-on convertors, call them what you will but 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.

Furthermore, because the digital output of all CD players must conform to an agreed standard (called S/PDIF or Sony/Philips Digital Interface Format) then 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.

Choosing the best digital to analogue convertor for your system can be a tricky business. Paul Miller highlights some of the things to watch out for.

Meanwhile, back in the real world we find that nothing can be taken for granted. Sure, the format of the data is fixed yet 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 '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 ones and zeros 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. Sure, 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. 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.

Before our listening commenced every convertor 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 (Christy Moore) through jazz (Marty Paich's Big Band and Stan Getz), pop (Julia Fordham and Jennifer Warnes) 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 DAC's 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 Arcam D170.3 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 first-base for making your personal choice of outboard D/A convertor.

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Arcam Black Box 5

A&R Cambridge Ltd, Pembroke Ave, Denny Industrial Centre, Waterbeach, Cambridge CB5 9PB. Tel: (0223) 861 550



Our Far Eastern friends, by all accounts, go weak at the knees when faced with the number '4' so Arcam has prudently skipped from *Black Box 3* to *Black Box 5*! This sensitivity to the fickle demands of the CD market is also reflected in Arcam's switch from Bit Stream to a hybrid multi-bit/bitstream technology.

So the *BB5*, in common with budget CD players from Akai, Denon and Yamaha (issues 100 and 107), is equipped with Burr-Brown's novel PCM67P DAC.

Aesthetically the *BB5* is no departure from the *BBs* of yore but it does have an additional trick up its sleeve — the so-called Sync Lock. This is an optical feed that synchronises the activity of Arcam's *D170.3* CD transport with a master clock that also regulates the DAC.

One consequence is that clock data is not temporarily 'lost' across the S/PDIF interface. This reduces digital jitter which, in turn, reduces noise and distortion during D/A conversion.

Lab report

And here's the proof: with Sync Lock in tow the *D170.3/BB5* combination enjoys a reduction in THD from 0.018 to 0.0036 per cent (@ 20kHz) while local noise/jitter falls by 1.3dB (at the -90dB level). Nevertheless the overall 98-99dB S/N ratio is still some 8-10dB poorer than anticipated for this DAC.

Other oddities include the tilted noise floor of dithered signals (-70dB plot, black trace), its relatively poor low-level resolution and tight rippling evident on the -60dB frequency response. If this is a function of the YM3434 eight times oversampling filter then at least its stop-band rejection is more comprehensive (see 3D plot).

Otherwise the lurch in distortion from 0.01-0.04 per cent between 0dB and -30dB isn't as exaggerated as that of earlier players based on the PCM67P DAC.

Sound quality

Via the Teac *P-10* transport:

Benefiting from a matched 75ohm S/PDIF interface, this *P-10/BB5* pairing still sounded slightly busy or untidy with complex classical works even though its overall performance was described as both 'measured and complete'. Our pop discs sounded slightly closer than usual with extra emphasis of any 'nasal tone'. Yet the interplay between accompanying performers — Jennifer Warnes and her male harmonies for example — was accurately depicted. 'A very safe and undemanding sound' we thought, 'but not especially atmospheric'.

Via the Arcam *D170.3* transport:

Ironically this was not the preferred combination. Sure enough, one listener applauded the richness of its string tone, its resolution and 'live' ambience. The remainder, however, were distracted by its 'twangy, clanky, mechanical and generally very trying quality'. Julia Fordham was possessed of a 'dubious ambience' while busier classical and jazz CDs had the tendency to sound cluttered and stilted.

Via the Meridian *200* transport:

This was the most hi-fi and artificial of the lot, they said. It certainly grasped Christy Moore's natural lispiness but female performers, including Jennifer Warnes, were slurred in comparison. 'Good tonal shading, a reasonable sense of dynamics and quite dry in balance' they summed up 'yet there's no real sense of involvement'.

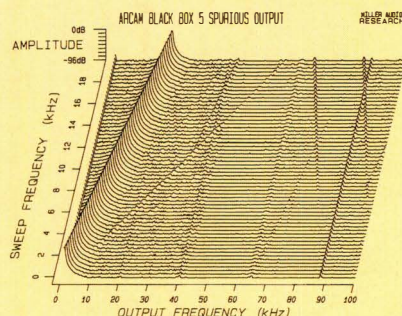
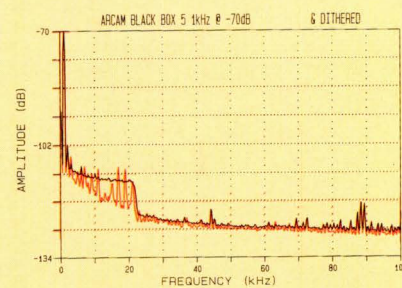
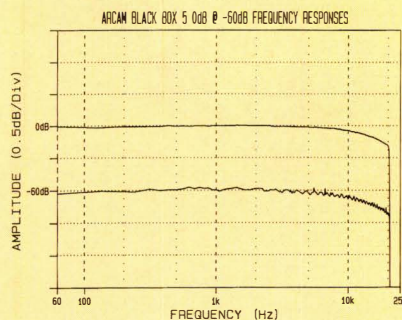
Conclusion

Rather surprisingly, Arcam's fifth *Black Box*, in common with the *DSM-M* from Audio Synthesis, turned out to be a less than perfect match for its new *D170.3* CD transport, Sync Lock or no. 'Very run-of-the-mill' concluded our panel. All's not doom and gloom, however, for the old *BB3* is still available at the knock-down price of £300.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.23dB	0.23dB	0.21dB
Channel Separation	96.7dB	92.2dB	93.6dB
THD vs Level, 0dB	-78.1dB	-80.0dB	-89.0dB
-30dB	-72.2dB	-67.8dB	-69.1dB
-60dB	-45.2dB	-42.6dB	-51.5dB
-80dB	-21.1dB	-21.8dB	-34.4dB
Dithered, -90dB	-15.8dB	-16.3dB	-24.5dB
Dithered, -100dB		-9.80dB	
Dithered, -110dB		+0.35dB	
Resolution @ -60dB		+0.01dB	-0.02dB
-80dB		+0.51dB	-0.02dB
-90dB		+1.43dB	-0.69dB
-100dB		+2.30dB	+0.60dB

Peak Output Level, L	2.333V
R	2.396V
Relative Output Level	+1.45dB
Output Impedance	46.3ohm
Radio Frequency Spurious	13mV @ 20-160MHz
0.34Hz Noise Modulation	+4.9dB
CCIR IMD, 0dB	-95.3dB
Suppression of stop-band IMD	100.4dB
De-emphasis Accuracy, 1kHz	-0.30dB
5kHz	-0.17dB
16kHz	-0.20dB
S/N Ratio (A-wtd), w emp, OLSB	101.2dB
w/o emp, OLSB	98.3dB
w/o emp, 1LSB	98.5dB
Digital Input/Output	Coax/Opt
Serial Number	DBB007055
Typical Retail Price	£450



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WHAT HiFi, SEPTEMBER 1992

"Ultimately, the Denon managed to generate a more sustained listener interest than most players in the group."

Hi-Fi NEWS OCTOBER 1992

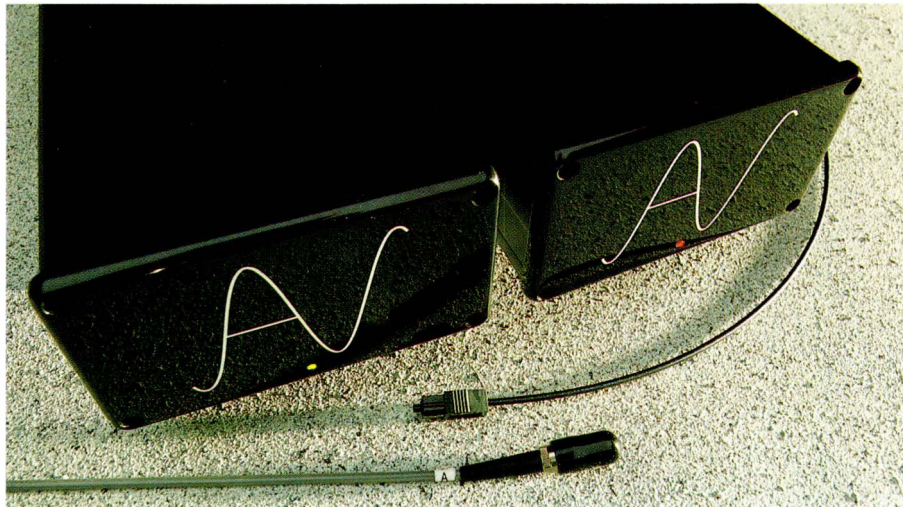


DENON

Enquiries to: Denon Freepost Enquiries, Chiltern Hill, Chalfont St Peter, Gerrards Cross, Buckinghamshire, SL9 9BS.

Audio Synthesis DSM-M

Wollaton Audio, 134 Parkside, Wollaton Nottingham, NG8 2NP.
Tel: (0602) 284 147



Ever poised to seize upon a new innovation, Audio Synthesis has incorporated Arcam's Sync Lock facility into its latest 'Digital Sources Module'. This fires up a stable master clock in the DAC which is used to synchronise the flow of digital data in both Arcam's *D170.3* CD transport and AS's outboard convertor.

The convertor itself is no technological slouch, reaping the benefits of Ultra Analogue's 20-bit D20400 (based on the PCM63P) together with the same Burr-Brown eight times oversampling filter found in ds/d's Decode-1. A sophisticated external power supply feeds both digital and analogue stages while WBT phonos are supplied for its outputs and coaxial digital input. A 'hard-wired' AT&T input is also available.

Lab report

The response to dithered signals (-70dB plot) is high-on perfect, the 3D plot is free of stop-band noise while its low-level resolution is little short of spectacular. Distortion is in the 'bitstream' class at -30dB but its excessive 3.5V peak output level will make a mockery of quick A/B demos.

Yet, beneath the surface there appear to be problems with the implementation of Arcam's Sync Lock. Importantly all S/N figures are compromised by what looks like demodulated RF interference manifesting as broad lumps around 3.7kHz and 7.3kHz. Noise on the right channel actually deteriorates to -95.0dB.

Of course this has the 'advantage' of reducing the expected +12dB noise modulation to just +4dB. Nevertheless, disengaging the Sync Lock produces the expected S/N figures of 109.4dB, 108.7dB and 108.6dB respectively.

Sound quality

Via the Teac P-10 transport:

Here the rough 75ohm impedance and

high circulating interference of the *DSM-M* found its best match. Once again the DAC was applauded for its smooth but exceptionally detailed sound, one that picked out subtleties without resorting to exaggeration or false colour. So its presentation is both neutral, weighty and highly calculated. Qualities that brought a renewed drive, a sense of haste and tension to Christy Moore's words and had everyone on the edge of their seats.

Our classical track was described as polished rather than spirited yet, within its very composed performance, there was no muting of the instruments' natural colour.

Via the Meridian 200 transport:

One listener praised this duo for its life and detailing. 'It exposed the counterpointing of vocals from both Jennifer Warnes' CD and also Stan Getz' rendition of *The Girl from Iponema*, he remarked by way of justification. The remainder of the panel were less impressed, suggesting that it 'suffers from an excess of good manners which leads to rather passive sound'.

Via the Arcam D170.3 transport:

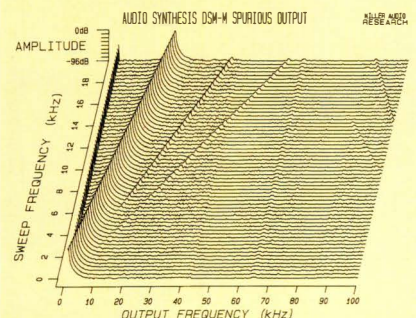
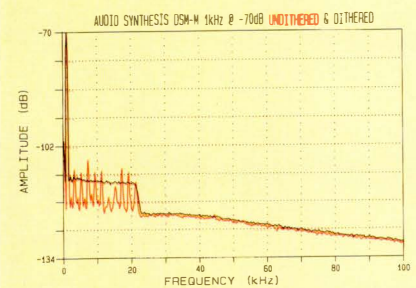
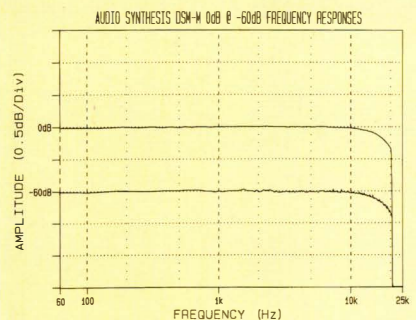
Now all were in agreement as the *D170.3* DSM-M ushered in a bland and uninspiring sound, one that lacked a grip of powerful dynamics despite being very 'quick and nimble'. So the Prokofiev *Symphony* sounded fresh enough but our pop selection was hamstrung by a fundamental lack of deep bass. 'Very digital' they commented 'with a topky and forward balance that emphasises strings and percussive detail'. And all this with its Sync Lock in service.

Conclusion

Audio Synthesis' basic 20-bit Digital Sources Module has already endured the test of time, so it's a pity this reputation is tarnished by a wayward Master/Slave (Sync Lock) circuit. Circulating RF interference is probably the culprit, but there's no reason why a slight re-think shouldn't rescue the goods.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.00dB	0.00dB	0.03dB
Channel Separation	144.5dB	124.6dB	106.8dB
THD vs Level, 0dB	-90.6dB	-90.1dB	-82.2dB
30dB	-87.7dB	-79.2dB	-79.5dB
60dB	-58.6dB	-52.1dB	-59.3dB
80dB	-27.9dB	-30.4dB	-38.1dB
Dithered, -90dB	-18.0dB	-20.8dB	-27.9dB
Dithered, -100dB		-17.3dB	
Dithered, -110dB		-7.90dB	
Resolution @-60dB		+0.01dB	-0.01dB
-80dB		-0.05dB	+0.05dB
-90dB		-0.19dB	-0.20dB
-100dB		-0.11dB	-0.22dB
Peak Output Level, L			3.532V
R			3.530V
Relative Output Level			+4.94dB
Output Impedance			100.6ohm
Radio Frequency Spurious		77mV @ 29-280MHz	
0.34Hz Noise Modulation			+4.1dB
CCIR IMD, 0dB			-95.9dB
Suppression of stop-band IMD			94.5dB
De-emphasis Accuracy, 1kHz			0.00dB
5kHz			+0.01dB
16kHz			-0.39dB
S/N Ratio (A-wtd), w emp, OLSB			103.5dB*
w/o emp, OLSB			102.7dB
w/o emp, 1LSB			103.3dB
Serial Number			33028/33029
Typical Retail Price			£1,234



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as God thinking he created speakers, perhaps.



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'What Hi-Fi' listened to the Maxims and promptly put them in their brochure 'Our top 50 loudspeakers.' Otherwise known as the Bible.

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nearly £3000. Ours cost £110.

Perhaps now after all this talk, it's time for a moment's silence to count our blessings. After all, a man will design them, sell them, deliver them even.

But thank God that a woman makes them. Amen.

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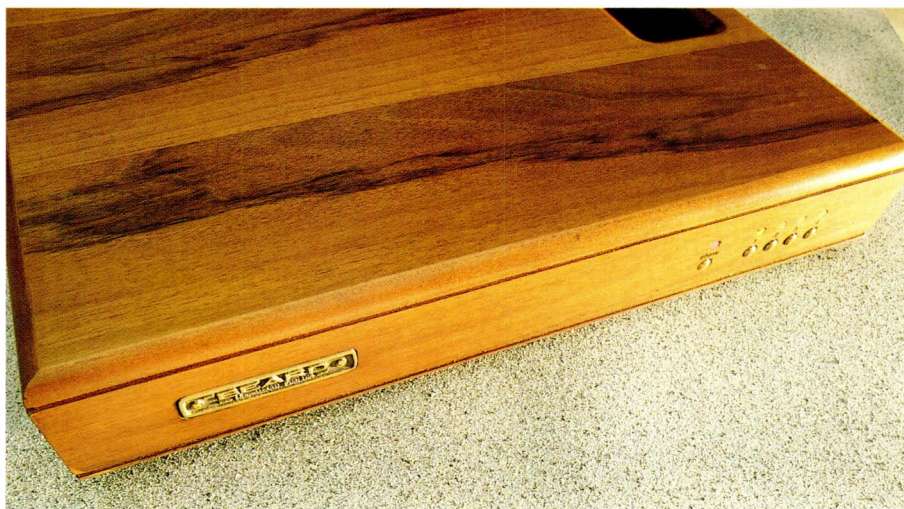
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Beard DAP-1

Hayley Audio Ltd, 328 Ware Road, Haley, Herts, SG13 7PG
Tel: (0992) 714 811



Unmistakably British, the *DAP-1* represents another attempt to marry modern digital technology with the euphony of a valve output stage. A series of brass selectors punctuate its wooden plinth, accommodating the four digital inputs and phase invert facility while, around the back, decent 20Mbit (Mitsubishi) optical inputs enhance its flexibility.

Inside we find the ubiquitous Yamaha interface chip feeding a reliable SAA7220P/B four times oversampling filter. This, however, is addressed to no less than three 16-bit DACs via a series of gate-arrays that offset the datastream by one-third of the four times oversample period.

This gives genuine 12 times oversampling, shifting the first main digital 'image' to 529.2kHz and permitting Beard the luxury of a gentle analogue filter. This is achieved using the natural first-order roll-off of the three ECC81 triodes which also perform the DAC's current-to-voltage conversion.

Lab report

Technically the *DAP-1* is some three-quarters of a Cambridge *CD3* (an old CD player which deployed four 16-bit DACs) though certain characteristics, like the 0.37 per cent distortion and vast 3.86kohm output impedance, come courtesy of the triodes. So never use the *DAP-1* with long interconnects or into any load less than 50kohm.

At lower levels the pattern of distortion and linearity is typical of the TDA1541 DAC though THD is uniformly three times lower on the right channel than the left! More importantly its internal ribbon cabling deviates from the 75ohm standard, reaching 110ohm at 20MHz and contributing to the high level of interference on all digital inputs.

Nevertheless the infestation of sampling images visible on the 3D plot (plus the anomalous 6th harmonic on the -70dB plot) is more likely caused by jitter on the digital

delay lines or during the analogue integration of the three DACs. Either way, it's got problems.

Sound quality

Via the Teac *P-10* transport:

Clearly at its best with this buffered 75ohm transport, the *DAP-1* offered up a light and fresh sound. Not especially lean or bright but still open and delicately detailed. It revealed subtleties in Julia Fordham's voice and in the orchestral strings that were routinely buried with the other two CD transport/*DAP-1* combinations. Nevertheless the agility and lightness of the *P-10/DAP-1* also stripped the husky resonance from Christy Moore's voice. So though this duo has an expansive presentation, it's generous-sounding rather than truly airy or atmospheric.

Via the Arcam *D170.3* transport:

Greeted by a disappointingly flat and uninvolved sound, our panel slumped into disinterest. Christy Moore was 'oddly matter-of-fact' and the Prokofiev *Symphony* as 'a flat mono effect with no dancing violins, just a poor sense of space and no grasp of orchestral dynamics'. Jennifer Warnes' bass, meanwhile, appeared both strong and solid though her voice was unusually dry. Boring and antiseptic, agreed the panel.

Via the Meridian *200* transport:

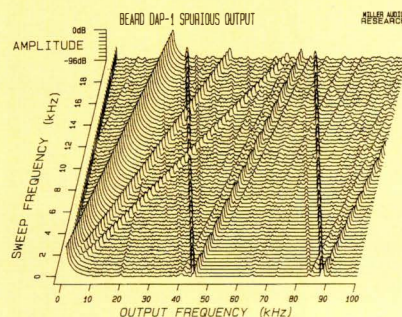
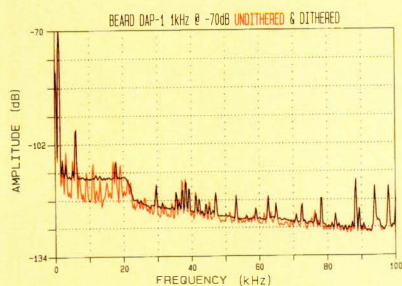
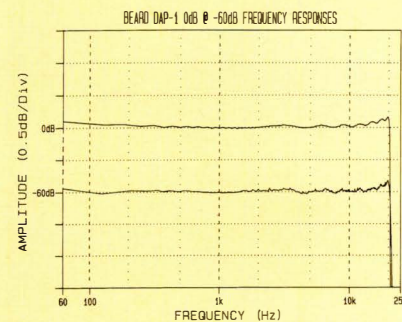
Another middle-of-the-road combination that gave off its best with simple acoustic CDs. It would quickly lose the flow of more complex works, leaving our listeners struggling to enthuse about any particular quality. The consensus? 'A bit of a yawn'.

Conclusion

Jaded by the stale and tedious sound of the *DAP-1* our panel were in no mood to justify its £975 price tag. 'Sorry and goodnight' they concluded. A pity because the basic design of the *DAP-1* demonstrates both flair and originality.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.03dB	0.05dB	0.05dB
Channel Separation	62.7dB	67.4dB	45.9dB
THD vs Level, 0dB	-49.5dB	-48.6dB	-48.5dB
-30dB	-66.2dB	-60.6dB	-61.6dB
-60dB	-49.2dB	-40.7dB	-34.6dB
-80dB	-19.4dB	-18.9dB	-23.2dB
Dithered, -90dB	-2.50dB	-9.70dB	-17.5dB
Dithered, -100dB		-0.55dB	
Dithered, -110dB		+2.50dB	
Resolution @-60dB		+0.02dB	+0.12dB
-80dB		-0.18dB	+0.26dB
-90dB		-4.49dB	-0.20dB
-100dB		-1.70dB	+4.65dB
Peak Output Level, L			2.093V
R			2.081V
Relative Output Level			+0.37dB
Output Impedance			3.86kohm
Radio Frequency Spurious		30mV @ 11-180MHz	
0.34Hz Noise Modulation			+3.3dB
CCIR IMD, 0dB			-46.4dB
Suppression of stop-band IMD			40.6dB
De-emphasis Accuracy, 1kHz			-0.12dB
5kHz			+0.07dB
16kHz			-0.55dB
S/N Ratio (A-wtd), w emp, OLSB			97.6dB
w/o emp, OLSB			93.1dB*
w/o emp, 1LSB			93.6dB*
Serial Number			920148
Typical Retail Price			£975



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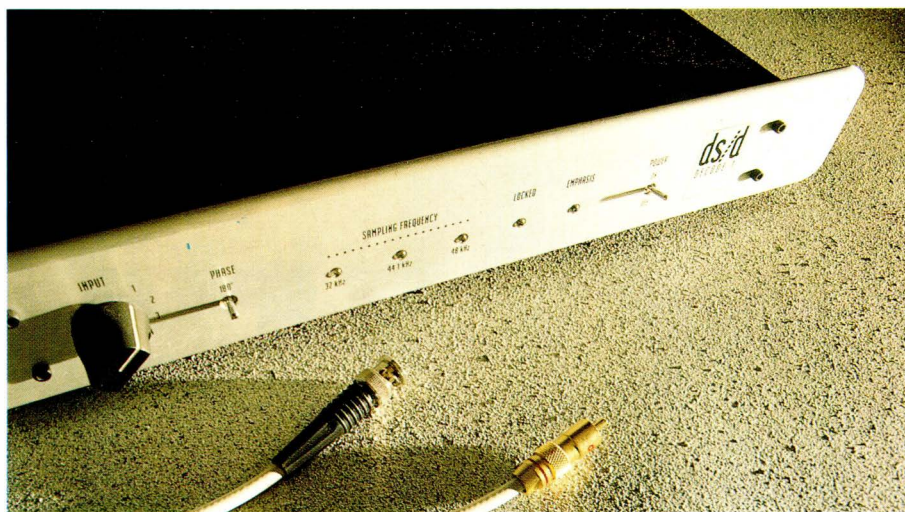
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ds/d Decode-1

MPI Electronic UK Ltd, Woodlane, Manchester, M31 4BP.
Tel: (061) 777 8522



Rumour has it that the both the ds/d *Decode-1* and Audio Alchemy *DDE* (issue 101) are sourced from a special-interest outfit in the US called LM acoustics. Ok, so the guts of both DACs might share a certain house 'style' but the choice of technology and external appearance of the *Decode-1* remains quite unique.

There's nothing special about the light alloy fascia, the four digital inputs (three BNC and one TOSLINK optical), phase invert and digital output facilities, but the Digital System/Design *Decode-1* sure is flexible.

Lift the lid and we uncover an unusual combination of chips that include Yamaha's popular YM3623B ADIC (Audio Digital Input Circuit) and Philips' equally popular SAA7350 BSDAC. But strung inbetween is a very new eight times oversampling filter from Burr-Brown. And this plus extensive power supply filtering, localised regulation and a surprisingly complex two-stage analogue section, are the foundations of its dependable if unexceptional sound.

Lab report

The -70dB plot is typical of Philips' SAA7350 DAC running with a 16.9MHz clock (192 times oversampling). However, the final (dithered) dynamic range is rather poorer than that achieved by other SAA7350 based DACs such as the Audiolab *8000DAC* (issue 103) or Deltec *Little Bit* (issue 101). The overall S/N ratio also lags some 2-4dB behind.

Nevertheless the 0.008-0.05 per cent distortion (@ -30dB) is textbook stuff, as is the relatively clean 3D plot, even frequency response and low 16ohm output impedance. Yet the +3.2dB compression in linearity (@ -100dB) is poorer than expected just as the +11dB noise modulation seems positively outrageous for a conventional bitstreamer. Oh yes, and the 94dB stop-band rejection is not quite the 110dB Burr-Brown would have us believe!

Sound quality

Via the Teac *P-10* transport:

This Teac/*decode* combination released a slightly bright and jangly sound with a distinct preference for string and percussive detail. 'It's all there', murmured the listeners 'but with little body to hold it together'.

As a consequence reverberant detail is sometimes overpowering, particularly with the likes of Julia Fordham where any electronic 'ambiance' can momentarily overwhelm her voice. A pity this, for the *Decode-1* offers a sharp and tightly-knit sound if one that suffers for its lack of 'musical interest'.

Via the Meridian *200* transport:

'There is a loudness and immediacy about this DAC', they suggested 'yet it's not irritating or intrusive'. So Fordham's voice was prominent and the accompanying guitar bolder than usual. The Stan Getz track was similarly well represented, its very deep and ambient sound engaging our attention despite what was described as a 'glossy sheen' on percussion and strings.

Via the Arcam *D170.3* transport:

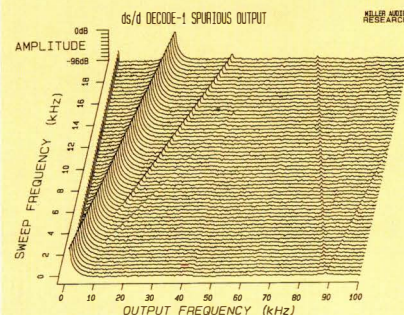
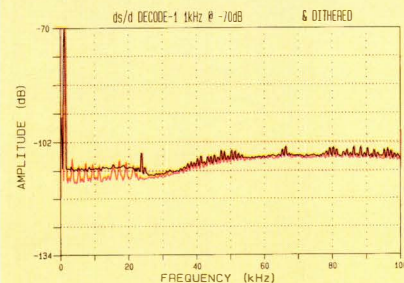
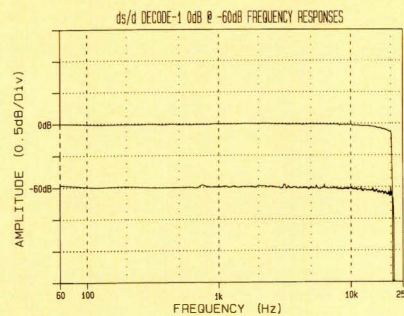
'Take it or leave it' muttered our panel in response to a sound that was unexceptional and boring rather than unbalanced or aggressive. They appreciated its evenhandedness but bemoaned its failure to get to grips with the innermost threads of the music. So, while it 'was doing most things right' our panellists were readily distracted, their lack of inspiration leading to a lack of listening notes!

Conclusion

At the very least the performance of ds/d's *Decode-1* is admirably consistent, a consistency that went hand-in-hand with the disinterest of our blind panel. This leaves us with an elegant design but one that's received more attention from a CAD/CAM system than fine tuning 'by ear'. Real potential then but disappointingly dormant.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.02dB	0.04dB	0.05dB
Channel Separation	118.2dB	101.1dB	97.0dB
THD vs Level, 0dB	-93.5dB	-89.1dB	-71.3dB
-30dB	-81.9dB	-76.5dB	-65.9dB
-60dB	-49.3dB	-45.1dB	-39.7dB
-80dB	-21.8dB	-24.1dB	-21.2dB
Dithered, -90dB	-14.4dB	-17.5dB	-12.5dB
Dithered, -100dB		-12.6dB	
Dithered, -110dB		-1.05dB	
Resolution @-60dB		+0.10dB	+0.02dB
-80dB		+1.03dB	+0.43dB
-90dB		+2.65dB	+1.14dB
-100dB		+3.23dB	+1.40dB
Peak Output Level, L			1.844V
R			1.838V
Relative Output Level			-0.72dB
Output Impedance			16.4ohm
Radio Frequency Spuria		4mV @	135MHz
0.34Hz Noise Modulation			+10.8dB
CCIR IMD, 0dB			-90.7dB
Suppression of stop-band IMD			94.3dB
De-emphasis Accuracy, 1kHz			-0.01dB
5kHz			-0.13dB
16kHz			-0.23dB
S/N Ratio (A-wtd), w emp, 0LSB			102.5dB
w/o emp, 0LSB			98.8dB
w/o emp, 1LSB			98.5dB
Serial Number			010316
Typical Retail Price			£495



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Micromega Microdac

Musical Design Company, PO Box 13, London, E18 1EG
Tel: (081) 989 0692



Cute, certainly, yet Micromega's *Microdac* remains a more substantial item than the likes of QED's plastic-cased *Digit*. Inside this sandwich of perspex and steel, for example, you'll discover no less than five separately regulated power supplies all sourced from a 4VA Schaffner mains transformer.

There's extra logic circuitry to cope with both optical and coaxial inputs while a ceramic resonator (not a crystal) kick-starts Yamaha's YM3623B interface chip. But this is not the 'original' *Microdac* for, soon after its introduction, Micromega switched back from Philips' SAA7323 Bit Stream DAC to the more predictable SAA7321. Home territory for Micromega then as it returns to *Duo BS*-style electronics.

Lab report

Micromega's circuit layout may look neat, electrically, however, it's rather messy. For despite the distribution of power supplies there remains a significant cross-coupling between digital and analogue domains.

This is the most likely explanation for its poor low-level resolution, high distortion, high noise modulation and rough treatment of dithered signals (see -70dB plot). Signals at -90dB, for example, actually pop-up at -99dB while lower signals disappear altogether, buried within the -95dB noise floor. Spurious idle tones at 8.3kHz and 13.8kHz are further evidence of interference.

At the crucial -30dB level, distortion is about five times higher than expected, its spectrum dominated by very 'un-bitstreamy' odd-order harmonics. However, it's worth noting that this distortion remains fairly constant across the audio band, a feature that could have some subjective significance.

Sound quality

Via the Arcam D170.3 transport:

Described variously as 'totally unremark-

able and yet very enjoyable', the sweet and warm balance of this combination was seldom 'phased' by difficult recordings. It certainly mollified the acerbic edge of Julia Fordham's voice without diluting her emotive impact. If anything vocals were not exactly hard or forward but were slightly 'wispy' at the extremes of their range.

Neither was there the 'snap and punch' of the Roksan nor the spaciousness of the Audio Synthesis, yet it handled our classical selection with easy-going confidence. 'Rather like listening in a hall full of people rather than half-full' they concluded.

Via the Meridian 200 transport:

Another fairly expressive sound but one that was locked into the speakers, prompting remarks like 'this wants to break out' and 'a middle-of-the-night DAC'. So this is a relaxing rather than thrilling combination, one that's slightly flat in spatial terms yet is both richly coloured and fluid in tone.

Classical dynamics can sound impressive, its bass deep and solid. Yet, if there is a handicap, then this usually surfaces with strong vocal material which is coloured by a slightly close but hollow quality. 'It flows' they ventured 'but does not always sing'.

Via the Teac P-10 transport:

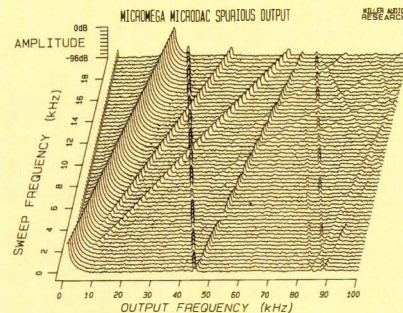
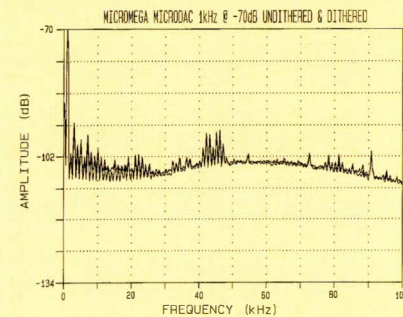
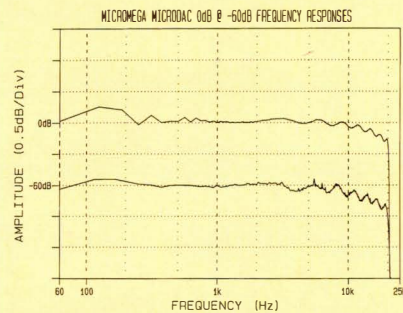
Here's a combo that picks out the strength of a rhythm line with boldness rather than subtlety. So both Julia Fordham and Jennifer Warnes thudded across with great gusto even if their voices were neither especially open or expressive. Similarly, there was little atmosphere to compliment the various instruments on our classical CDs.

Conclusion

'Sounds like a cheap DAC successfully covering its tracks' concluded our blind panel. Which is an appropriate summary of a modest but very entertaining performer, if one that earned its stripes with just one of the three test transports.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.00dB	0.00dB	0.01dB
Channel Separation	89.6dB	93.4dB	92.9dB
THD vs Level, 0dB	-83.2dB	-81.7dB	-60.8dB
-30dB	-67.7dB	-63.2dB	-68.7dB
-60dB	-33.9dB	-33.2dB	-37.6dB
-80dB	+15.6dB	-7.20dB	-3.05dB
Dithered, -90dB	+12.2dB	-1.55dB	+1.35dB
Dithered, -100dB		no signal	
Dithered, -110dB		no signal	
Resolution @ -60dB		-0.34dB	-0.49dB
-80dB		-4.42dB	-7.45dB
-90dB		-8.72dB	-9.81dB
-100dB		-3.20dB	-7.05dB
Peak Output Level, L			2.190V
R			2.192V
Relative Output Level			+0.79dB
Output Impedance			41.4ohm
Radio Frequency Spuria		9mV @ 176.4kHz	
0.34Hz Noise Modulation			+7.6dB
CCIR IMD, 0dB			-83.5dB
Suppression of stop-band IMD			54.7dB
De-emphasis Accuracy, 1kHz			+0.02dB
5kHz			+0.06dB
16kHz			-0.03dB
S/N Ratio (A-wtd), w emp, 0LSB			100.5dB
w/o emp, 0LSB			96.6dB
w/o emp, 1LSB			94.9dB
Serial Number			2180953
Typical Retail Price			£325



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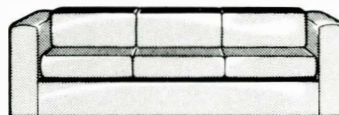
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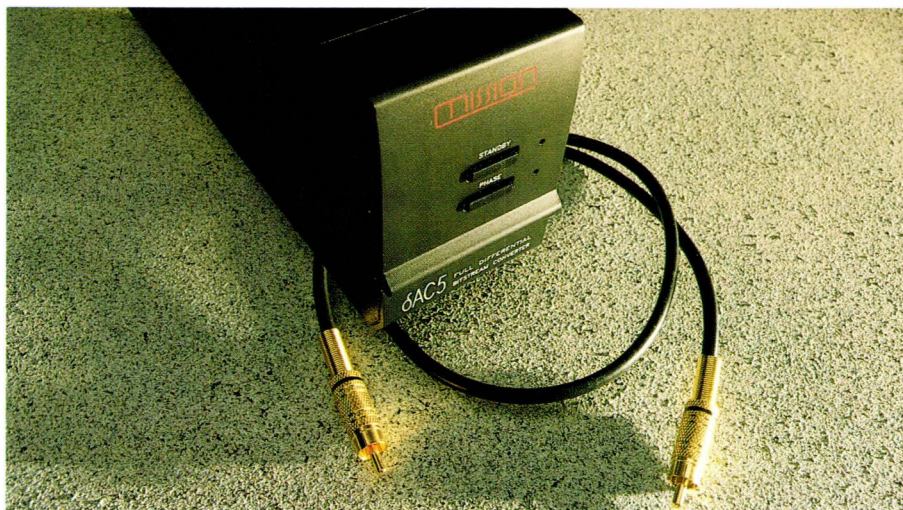
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Mission DAC5

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Fancy upgrading your *DAD5* CD player (issue 107)? Then look no further than Mission's partnering *DAC5*, a budget converter that boasts Philips' *DAC7* Bit Stream chipset. In this the familiar, if narrower, grey casework has a single coaxial digital input and a 'phaseinvert' facility.

Inside there are two separate PCBs. One supports the mains transformer and its six regulated supplies while the other marries-up a Yamaha YM3623B interface chip with Philips' SAA7323 (used here as a four times oversampling filter), an SAA7350 (employed for additional oversampling and noise-shaping) together with the fabled TDA1547 or DAC7 switched-capacitor network.

Then there's Mission's proprietary analogue filter, optimised for the DAC7's differential output. Quality stuff, it's just a pity that the digital input runs the board's length before termination by a 75ohm chip resistor.

Lab report

Technically the *DAC5* combines aspects of both the Meridian, Deltec and Forte *DAC7* implementations (issues 101 and 103). So the limited 54dB stop-band rejection, the rippled V-shaped images on the 3D plot and similarly rippled frequency responses bear comparison with Meridian's efforts as they do with Philips/Marantz/Arcam CD players.

These latter features are all linked to the SAA7323 four times oversampling stage even though the -70dB plot, with its carefully controlled ultrasonic output, is very similar to the eight times oversampled Deltec, Forte and ds/d units.

This is because Mission runs the SAA7350's noise-shapers at the higher 16.9MHz clock (derived from the YM3623B) yielding a total of 192 times, instead of 128 times oversampling. Otherwise the mix of very low distortion (typically 0.00045 and 0.007 per cent at 0dB and -30dB respec-

tively), the wide 105dB S/N ratio and excellent low-level linearity are all entirely characteristic of the DAC7 system.

Sound quality

Via the Meridian 200 transport:

With a spring in its step, a coherent sense of rhythm but a lean foundation of bass, all agreed that this duo performed at its best with our classical CDs. Here its neutrality and sense of dynamics allowed the music to develop naturally.

The DAC is tonally even, vocals sound clear and suffer little from sibilance yet strong male performers, like Christy Moore, may still fail to 'growl'. Similarly the mouthpiece of a thrusting instrument like Stan Getz' sax is often accentuated in favour of the bell.

Via the Arcam D170.3 transport:

Comments like 'shrill, sibilant and lacking warmth' indicated they found it loud but detailed, especially with our pop selection which lacked a little richness and colour but still sounded admirably quick and alert. Other listeners suggested it was 'never bright nor hard' while its portrayal of musical ambience was 'very bitstreamy'.

Via the Teac P-10 transport:

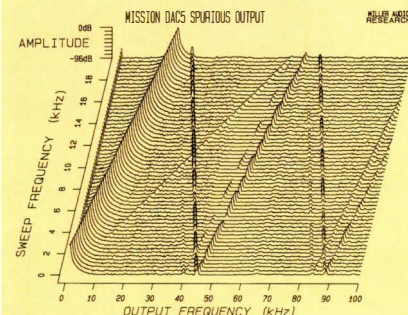
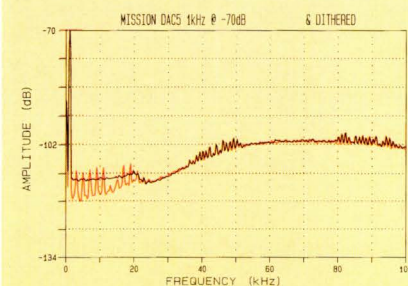
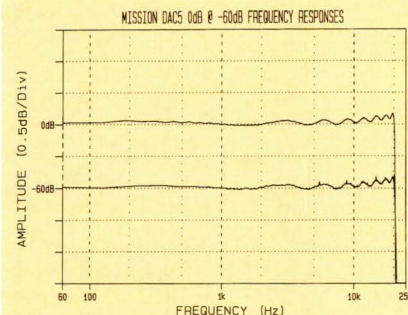
Shades of the Arcam/Mission pairing returned as the Teac/Mission combination was described as 'slightly lean and vague', qualities that failed to aggravate anyone yet, equally, failed to spark much in the way of passion. Julia Fordham sounded open but also lightweight, a promising start but one that never seemed to develop convincingly. 'No big deal' they concluded.

Conclusion

Plenty of well-executed technology for the price and a quick, lucid if fractionally lightweight sound to match. Not perfect, but Mission's *DAC5* is better value than many competitors (including the Micromega *Microdac*) and deserves Recommendation.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.02dB	0.01dB	0.00dB
Channel Separation	121.7dB	122.3dB	101.5dB
THD vs Level, 0dB	-111.3dB	-106.6dB	-87.8dB
-30dB	-95.6dB	-82.8dB	-67.1dB
-60dB	-59.5dB	-55.9dB	-36.8dB
-80dB	-27.8dB	-30.7dB	-16.6dB
Dithered, -90dB	-16.6dB	-22.4dB	-7.50dB
Dithered, -100dB		-19.2dB	
Dithered, -110dB		-8.50dB	
Resolution @-60dB		+0.01dB	-0.02dB
-80dB		-0.03dB	-0.06dB
-90dB		-0.37dB	-0.57dB
-100dB		-0.10dB	-0.40dB
Peak Output Level, L		2.099V	
R		2.101V	
Relative Output Level		+0.42dB	
Output Impedance		43.2ohm	
Radio Frequency Spurious		<1mV broadband	
0.34Hz Noise Modulation		+7.4dB	
CCIR IMD, 0dB		-102.4dB	
Suppression of stop-band IMD		54.2dB	
De-emphasis Accuracy, 1kHz		-0.05dB	
5kHz		-0.19dB	
16kHz		+0.11dB	
S/N Ratio (A-wtd), w emp, OLSB		112.4dB	
w/o emp, OLSB		108.9dB	
w/o emp, 1LSB		104.8dB*	
Serial Number		C611080	
Typical Retail Price		£299	



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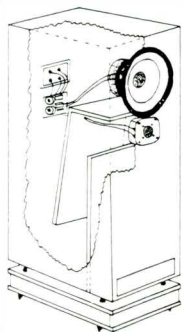
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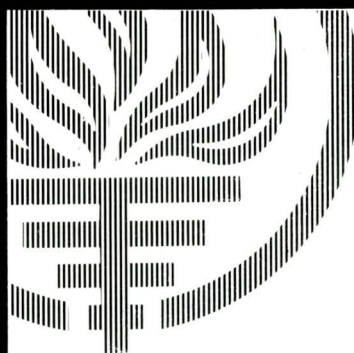
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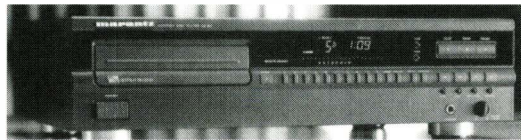
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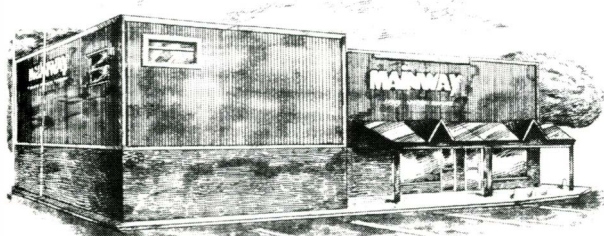
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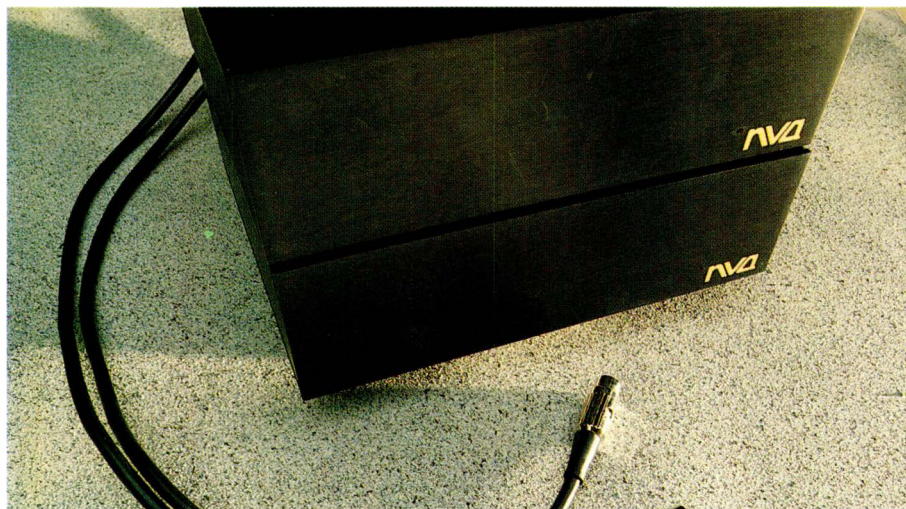
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NVA DAC-ON

NVA, 6 Watermill Industrial Estate, Aspenden Road, Buntingford, Herts SG19 9JS. Tel: (0763) 72707



So what is the secret of this particular black magic box? NVA remained resolutely tight-lipped, refusing to tell us anything about the technology that lies within. The *DAC-ON* consists of three anonymous black boxes, two of which contain substantial DC power supplies that hook to the third black box by flying DIN plugs.

One or two power supplies may be deployed (hence the £730-£960 price range) for greater or lesser isolation of the DAC's digital and analogue componentry. No phase inversion, digital input selection or other features — just plug it in and spin the CD.

However, what NVA was trying so hard to cover up is the fact that the *DAC-ON* is actually a QED *Digit* in drag. What we discovered, and NVA was eventually forced to admit, albeit with consummate bad grace, is the fact that its *DAC-ON* uses QED's £125 *Digit* circuit board, but with the benefit of decent external power supplies, all glued into an impenetrable wood and alloy case.

Lab report

It's Spot-the-Difference time on your favourite hi-fi gameshow. Just compare the three plots on this and page 75 for starters, all of which are wholly characteristic of the SAA7323 DAC and QED's board layout. It makes you wonder how NVA ever thought it could pull the wool over our eyes.

So what of NVA's heavyweight power supplies? Certain features like the reduced low-level distortion, the 1dB boost in S/N but worsened low-level linearity might be linked to a new power supply. Or has NVA changed the Signetics op-amp? Equally these differences might just as well be explained by the tolerances of mass production.

Sound quality

Via the Meridian 200 transport:

By majority verdict the 200/*DAC-ON* was voted the best of its day. 'This feels more

like real music' remarked one listener as Jennifer Warnes' track bubbled with a strong and infectious rhythm despite there being a rich colour, described as a 'cuppy ambience', about the piece as a whole.

The balance of body, breath and keys with the jazz sax seemed in perfect proportion, a brazen yet realistic performance. And, for once, our classical selection also sprang into bold relief, a 3D representation where individual elements of the orchestra were pulled smartly from the mix. A good 'un.

Via the Arcam D170.3 transport:

Funnily enough this duo was likened to the *D170.3/QED* combination, the sheer abundance and scale of its music becoming something of a hallmark. Nevertheless on this occasion the NVA gave a tauter sound, with images that were more focussed and with a crisper, more articulate presentation of vocals. Yet this combination still seized upon the basic elements of the music, placing less emphasis on its subtler qualities.

Via the Teac P-10 transport:

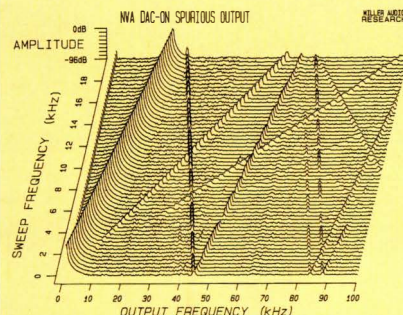
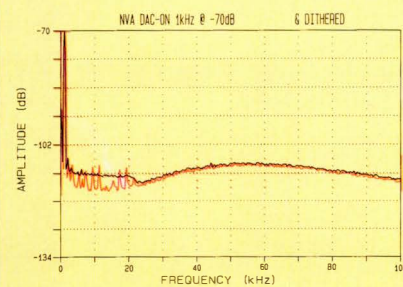
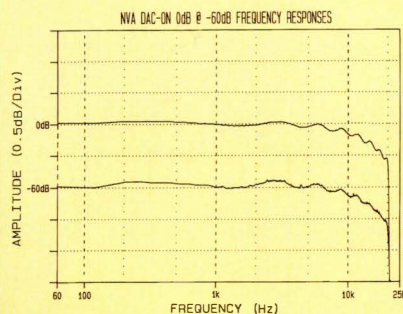
Initially very impressive, this *P-10/NVA* pairing complemented the expressiveness of Julia Fordham's voice with an equally eloquent sense of ambient detail. Christy Moore, by contrast, was slurred for though there was plenty of stage 'width' it lacked both depth and fine detailing.

Conclusion

Oblivious to the controversy, our blind listeners were forced to treat the *DAC-ON* as just another 'black box'. An unknown product that won them over with its slightly exaggerated but confident and attractively spacious sound. A product that, on subjective grounds alone, justified its high price. The judgement of value is another issue of course. Bearing in mind the nature of NVA's *DAC-ON*, there is a lot to be said for holding fire until QED's own £60 power supply upgrade hits the shops.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.02dB	0.02dB	0.02dB
Channel Separation	98.8dB	97.8dB	90.6dB
THD vs Level, 0dB	-98.0dB	-93.8dB	-72.5dB
-30dB	-85.8dB	-78.0dB	-71.3dB
-60dB	-57.8dB	-48.4dB	-41.7dB
-80dB	-24.5dB	-28.0dB	-20.6dB
Dithered, -90dB	-20.0dB	-17.1dB	-11.6dB
Dithered, -100dB		-13.5dB	
Dithered, -110dB		+2.50dB	
Resolution @ 60dB		-0.02dB	-0.06dB
-80dB		-0.33dB	-0.51dB
-90dB		-1.45dB	-1.80dB
-100dB		-2.00dB	-0.90dB
Peak Output Level, L			2.236V
R			2.241V
Relative Output Level			+0.98dB
Output Impedance			220ohm
Radio Frequency Spurious			5mV @ 85MHz
0.34Hz Noise Modulation			+3.7dB
CCIR IMD, 0dB			-96.8dB
Suppression of stop-band IMD			54.6dB
De-emphasis Accuracy, 1kHz			-0.06dB
5kHz			+0.07dB
16kHz			-0.09dB
S/N Ratio (A-wtd), w emp, 0LSB			101.8dB
w/o emp, 0LSB			101.2dB
w/o emp, 1LSB			99.3dB
Serial Number			None
Typical Retail Price			£730-£960



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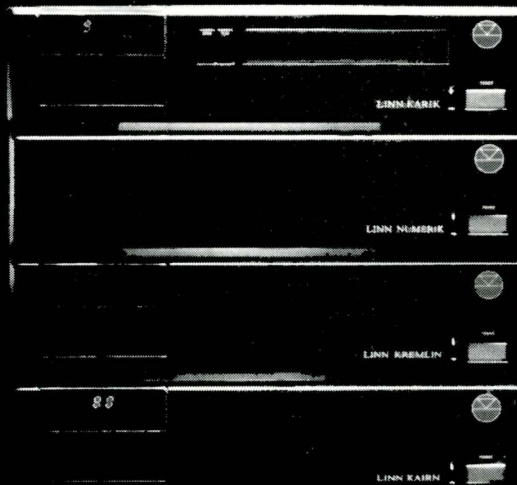
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QED Digit

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QED is synonymous with high value hi-fi, a reputation built and sustained by incredible products like the *Digit*. This is an example of cost-over-engineering par excellence, an injection-moulded match-box that supports and screens one of the simplest yet truly elegant implementations of Bit Stream technology.

The single unswitched coaxial digital input is accessed by a Philips ADIC (as used by Meridian and Audio Alchemy) though the clock signal is extracted using a tuned amplifier circuit rather than a crystal oscillator and PLL (see the Kelvin DAC in issue 103). This means the *Digit* will tolerate the most wayward of digital outputs (Class 2 and beyond) while still enjoying immunity from RF 'spikes' on the mains supply and signal lines.

Demodulated data, meanwhile, passes to an SAA7323 PDM DAC and a single dual-channel op-amp. A simple affair but stringently decoupled and filtered of all RF interference. The end result is a highly compatible DAC with a faithful 75ohm digital input impedance. QED's encapsulated 12V DC power supply is the only fly in its otherwise remarkable ointment.

Lab report

Everything about the *Digit* screams 'SAA7323', the latest version of Philips' 256 times oversampled PDM DAC with 2nd-order noise-shaping. Features like the V-shaped stop-band images and 3rd/5th harmonics on the 3D plot, the rippled frequency response (-0.58dB at 20kHz), high 3rd-order IMD (0.011 per cent) and spurious idle-pattern noise at 13.78kHz.

Nevertheless the performance of both SAA7274 and SAA7323 has been stretched when compared with like-minded implementations including the *DDE* from Audio Alchemy (issue 101). Its handling of dithered signals (black trace) is superior, distortion (0.00063-0.027 per cent) is lower and —

importantly — its low-level linearity is kept within far tighter 1.6dB limits. Similarly, the overall 99-100dB S/N ratio is close to the theoretical maximum for this DAC, a full 3-4dB ahead of the *DDE*. No unnecessary tricks, just competent no-frills engineering.

Sound quality

Via the Meridian 200 transport:

An unlikely combination but one that was likened to the *200/NVA* for its 'musical' qualities. There wasn't quite the scale, weight, speed and articulation of the *NVA* yet its presentation was less superficial than many pairings with the 200 transport.

'Pleasantly expressive', they remarked 'but also very civilised and forgiving'. So Jennifer Warnes' bass line sounded taut if a tad lightweight just as her vocals were too silky smooth and not entirely realistic.

Via the Arcam D170.3 transport:

'Big, blowsy and a little diffuse' was their immediate reaction. Plenty of ambience then but too liberally represented. Jennifer Warnes, for instance, sounded wonderfully rich and deep but the 'image' of her voice was simply too big to be credible. Once again, attractive but not always plausible.

Via the Teac P-10 transport:

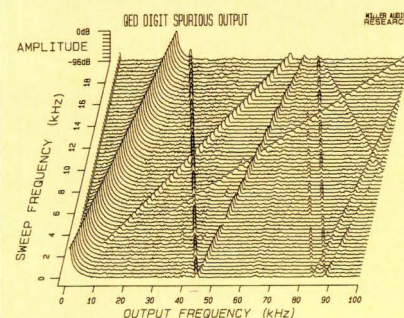
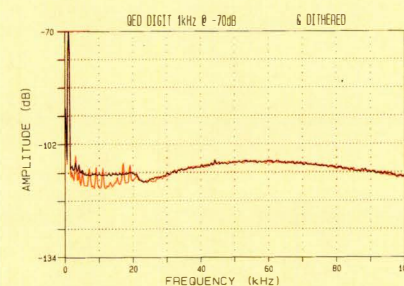
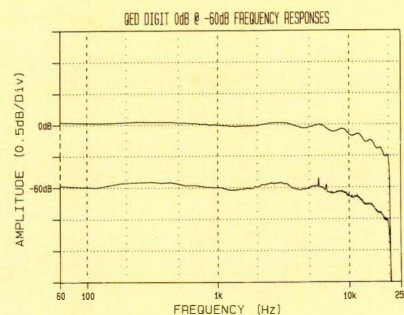
Here the *Digit* sounded loud (ish) and intrusive with Julia Fordham shouting rather than singing. Christy Moore's story, meanwhile, was as compelling as ever but his accompanying instruments sounded recessed and lacklustre. 'Enough detail', they remarked 'but lacking body and weight'.

Conclusion

So QED's *Digit* might not be perfect but it is free of the silly oversights that blight many of its top-priced competition. At £125 it is embarrassingly good, an unexpectedly versatile upgrade that could extend the lifetime of your ailing CD player without breaking the bank. This is what Best Buys are all about.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.02dB	0.01dB	0.00dB
Channel Separation	103.0dB	100.9dB	91.5dB
THD vs Level, 0dB	-103.9dB	-93.2dB	-71.3dB
-30dB	-76.4dB	-76.7dB	-70.6dB
-60dB	-55.8dB	-47.9dB	-42.0dB
-80dB	-23.0dB	-24.4dB	-20.7dB
Dithered, -90dB	-13.4dB	-16.5dB	-9.95dB
Dithered, -100dB		-10.8dB	
Dithered, -110dB		-3.65dB	
Resolution @ -60dB		+0.01dB	-0.03dB
-80dB		+0.15dB	-0.34dB
-90dB		-1.22dB	-1.62dB
-100dB		-0.90dB	-0.10dB
Peak Output Level, L			2.149V
R			2.145V
Relative Output Level			+0.62dB
Output Impedance			225.1ohm
Radio Frequency Spurious			<1mV broadband
0.34Hz Noise Modulation			+3.0dB
CCIR IMD, 0dB			-95.3dB
Suppression of stop-band IMD			54.6dB
De-emphasis Accuracy, 1kHz			-0.06dB
5kHz			+0.09dB
16kHz			-0.06dB
S/N Ratio (A-wtd), w emp, 0LSB			100.3dB
w/o emp, 0LSB			99.0dB
w/o emp, 1LSB			99.2dB
Serial Number			None
Typical Retail Price			£125





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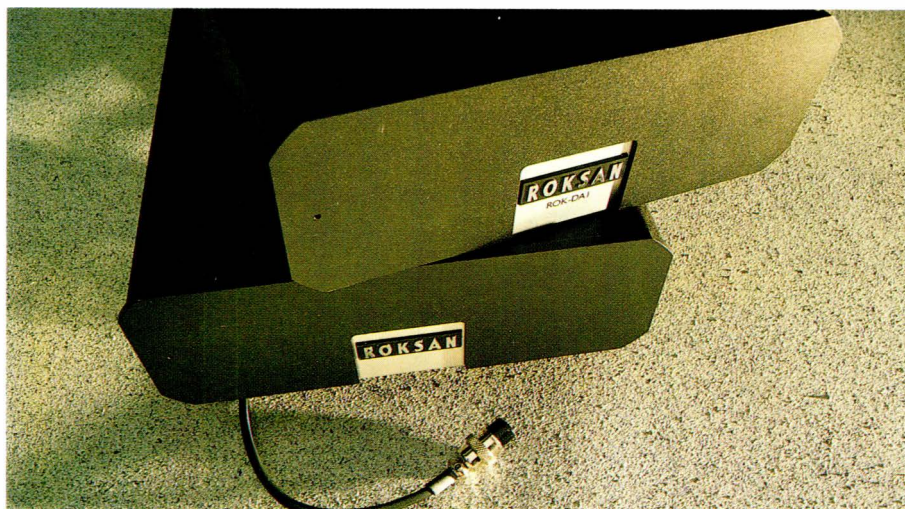
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Roksan ROK-DA1/ROK-DS4

Roksan Engineering Ltd, 21 Dole Road, Llandrindod Wells, Powys LD1 6DF. Tel: (0597) 824 911.



Having earned its colours on the analogue battlefield it's gratifying to discover that, when Roksan finally embraced CD, it decided to adopt a radical approach and employ the relatively unknown Crystal bitstream DAC.

Open the *ROK-DA1* and you'll be faced with plenty of fresh air. Look a little closer, however, and you'll find this 1-bit DAC is married-up with a Crystal ADIC (Audio Digital Interface Circuit) plus a variety of peripheral surface-mount components on a weeny back-mounted PCB. Roksan even uses the same Burr-Brown op-amps found in Creek's *CD60* player (issue 107). In fact the bulk of Roksan's *ROK-DA1* is occupied by its toroidal mains transformer, sidelined in our tests by the optional *ROK-DS4* outboard power supply. A worthy upgrade, though costly.

The CS4328 DAC incorporates both eight times interpolation and eight times sample-and-hold filters (a total of 64 times oversampling) together with an unprecedented 5th-order noise-shaping.

Lab report

New chips yield a new 'fingerprint' for the *ROK-DA1/ROK-DS4* combination. Distortion, for instance, can be as low as 0.003 per cent at -30dB even though strong 3rd, 5th and 7th harmonics burst onto the scene at higher levels (see 3D plot). Odd-order IM distortion climbs to 0.063 per cent while stop-band noise radiates in from the 3rd oversample frequency (132.3kHz or far RHS of plot).

Meanwhile, due to the DAC's relatively low upsampling (just 64 times), its dynamic range is reduced by some 7dB at high frequencies. Just look at the -70dB plot where the DAC's re-quantisation noise climbs away to a peak at 75kHz. Then there's the 'cheat mode' which mutes its output when a steady stream of digital zeros are detected. The 'real' S/N ratio is an uninspiring 97dB; about 10dB short of the best bitstreamers.

Sound quality

Via the Arcam *D170.3* transport:

Our first impressions of the *ROK-DA1* lasted to the end of the session as its lean, nimble but light and fresh balance became something of a trademark. Christy Moore lost a little of his customary 'grunt' but the natural pace and excitement of the music was still unavoidable.

Prokofiev's *Symphony* evoked a similar reaction. 'Pure and airy' they remarked, 'with plenty of attack and no feeling of roughness'. Nevertheless its overall performance could certainly be more fluid or expansive with instrumentally 'dense' CDs.

Via the Teac *P-10* transport:

Once again the nimble, fleet-of-foot character was revealed for all to hear. However, along with the lucid instrumental detail there was also a noticeable slurring of vocals, a bleariness that took the edge off their articulation without really adding to the natural sibilance. A big and welcoming sound then, but one lacking precise focus.

Via the Meridian *200* transport:

'Slightly lightweight but expressive nonetheless' they began. Strings were all but etched into the soundstage while Jennifer Warnes sounded bold and forward, slightly cold perhaps yet doing nothing to deter the husky resonance of the male harmonies. 'A good communicator' our panel decided 'but not as full, rich or melodic as possible'.

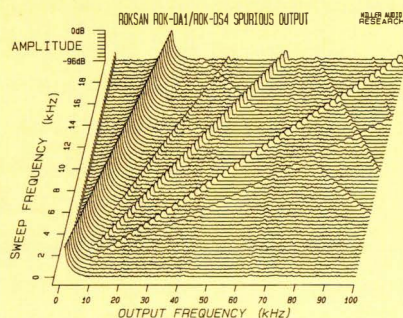
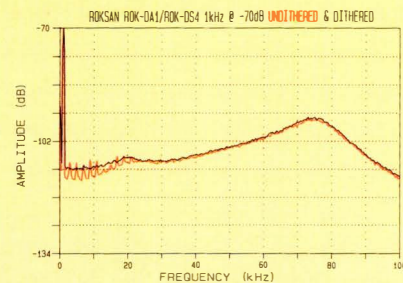
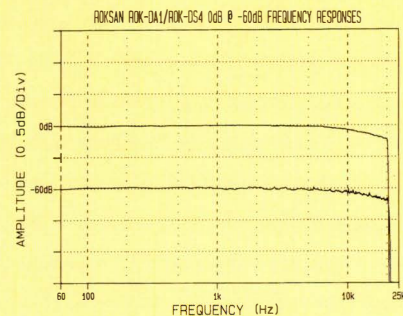
Conclusion

Of all the DACs in our survey the *ROK-DA1/ROK-DS4* was undoubtedly the most consistent thanks, in no small part, to its immunity from RF interference and strict 75ohm digital impedance.

So it may err on the light side of neutral but its expansive and expressive character is all but impervious to your choice of CD transport. A smidgen short of Recommendation, but well worth a listen.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.02dB	0.02dB	0.01dB
Channel Separation	109.5dB	108.3dB	87.8dB
THD vs Level, 0dB	-101.9dB	-86.3dB	-63.0dB
-30dB	-90.0dB	-78.4dB	-66.0dB
-60dB	-59.2dB	-50.4dB	-36.1dB
-80dB	-34.0dB	-27.6dB	-15.2dB
Dithered, -90dB	-25.4dB	-19.4dB	-6.55dB
Dithered, -100dB		-11.5dB	
Dithered, -110dB		-6.25dB	
Resolution @-60dB		0.00dB	+0.04dB
-80dB		-0.22dB	-0.18dB
-90dB		+0.02dB	-1.02dB
-100dB		-0.20dB	-1.20dB
Peak Output Level, L			2.056V
R			2.061V
Relative Output Level			+0.25dB
Output Impedance			24.4ohm
Radio Frequency Spurious			3mV broadband
0.34Hz Noise Modulation			+1.2dB
CCIR IMD, 0dB			-82.7dB
Suppression of stop-band IMD			80.9dB
De-emphasis Accuracy, 1kHz			0.00dB
5kHz			+0.34dB
16kHz			+0.47dB
S/N Ratio (A-wtd), w emp, 0LSB			118.8dB
w/o emp, 0LSB			118.8dB
w/o emp, 1LSB			97.2dB
Serial Number			47660
Typical Retail Price			£495/£500



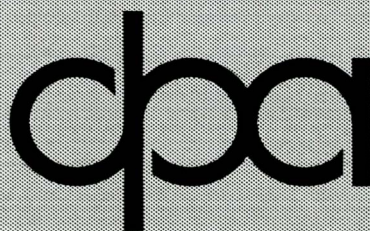
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However, rave reviews are not just the exclusive domain of DPA's PDM2. Hi-Fi World, on the PDM1 S3 said "Any enthusiast who wants the best from CD at a reasonable price should consider (the PDM1)." What Hi-Fi, Nov '91 said ..."the Bigger Bit is set to destroy all its competition." Our amplifiers are equally well respected with Hi-Fi Choice saying of the 50S pre-power ..."unmatched detail resolution, control and transparency."

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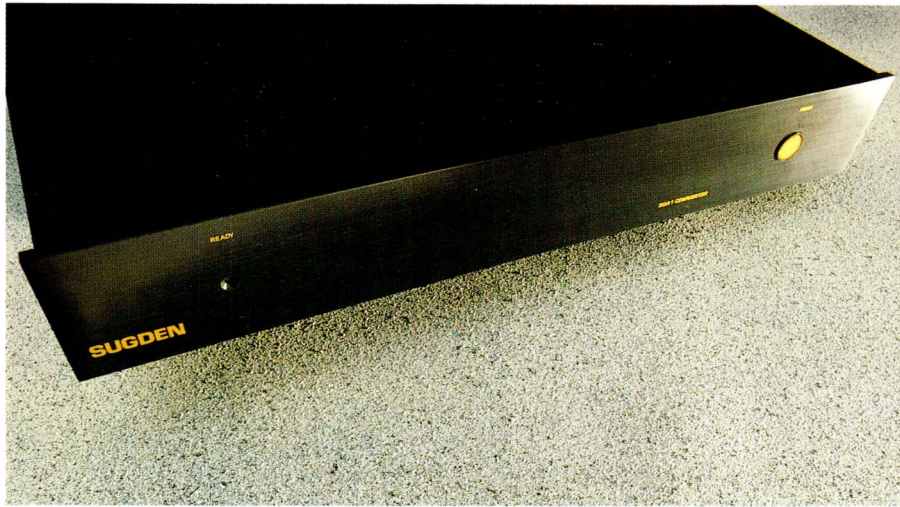
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JE Sugden & Co Ltd, Ballyworks, Station Lane, Heckmondwike, West Yorkshire WF16 0NF Tel: (0924) 404 088



Do you think Sugden is a fuddy-duddy amplifier manufacturer stuck in a Seventies time-warp? Then prepare to be stunned, for not only has it come up with three outboard DACs, it's also working on a matching CD transport. And if 90-odd per cent of business wasn't destined for overseas markets, perhaps we'd hear more from this enterprising outfit.

So the *SDA-1* is no mere re-hash of the 16-bit applications manual. Sure enough, Philips' evergreen SAA7220 fourtimes oversampling filter and 'Crown' TDA1541A DAC are present, but the layout is unusual. Separate boards are used to isolate the digital input, demodulation and oversampling stages from the main power supply, DAC and analogue filters. The latter is based around a mix of discrete devices, National and Signetics op-amps — the basis of Sugden's distinctive sound.

Lab report

The specs and plots yell 'Philips 16-bit four times oversampled chipset' loud and clear. Just compare them with the likes of Woodside's *DAC2* (issue 101) or the Arston, Cary, Creek and Rotel players in issue 107.

The 3D plot depicts the familiar rippled stop-band images released by the digital filter while the 1kHz/70dB trace highlights strong 3rd and 5th harmonics caused by zero-cross distortion in the traditional 16-bit DAC. The +0.85dB boost in its response is Sugden's doing, however, as is the high -72dB 2nd-order and -53dB (0.11 per cent) 3rd-order IM distortion.

The de-emphasis routine is a little inaccurate but the 4dB hiccups in low-level resolution and huge +13dB noise modulation are both throwbacks of the multi-bit DAC.

Sound quality

Via the Teac *P-10* transport:

Right from the outset, Sugden's *SDA-1*

bowled us over with a sound populated by 'masses of high-resolution detail and complemented by very quiet, dark backgrounds and tremendous dynamics'. Importantly this is a sound that remains totally stable, a feeling of confidence that's retained regardless of the style or complexity of its music.

Prokofiev's *Symphony* was praised for its dynamics on this occasion, a rarity made all the more believable by the kick of its tympani. Neither was this buzz of energy lost to our pop and jazz selection, the music thudding across with great enthusiasm.

Via the Arcam *D170.3* transport:

By now the very positive yet articulate and compelling character of this DAC was becoming familiar, an 'electricity' achieved without throwing different instruments out of kilter. The edgy resonance of Christy Moore's guitars were still in perfect harmony with the throaty quality of his voice, for example, each sharp and positive without becoming overbearing.

Not all was predictable, however, as the fiercest of vocals became tinted with a spitty sibilance just as string-dominated classical CDs were criticised for sounding 'too refined and polite'.

Via the Meridian *200* transport:

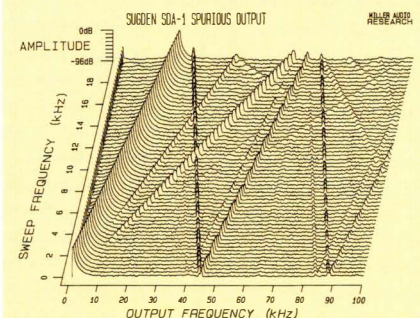
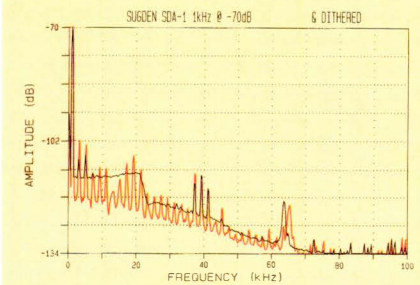
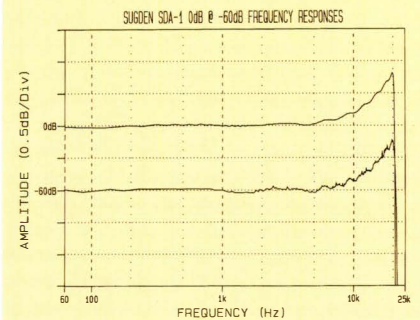
Crisp, precise and dynamic once again but the sibilance heard before was now taking a stronger hold. Its imagery was solid enough and the relationship between different instruments still sufficiently maintained yet the likes of Julia Fordham also began to sound too forward and, well, fierce. 'Just too loud' complained one listener.

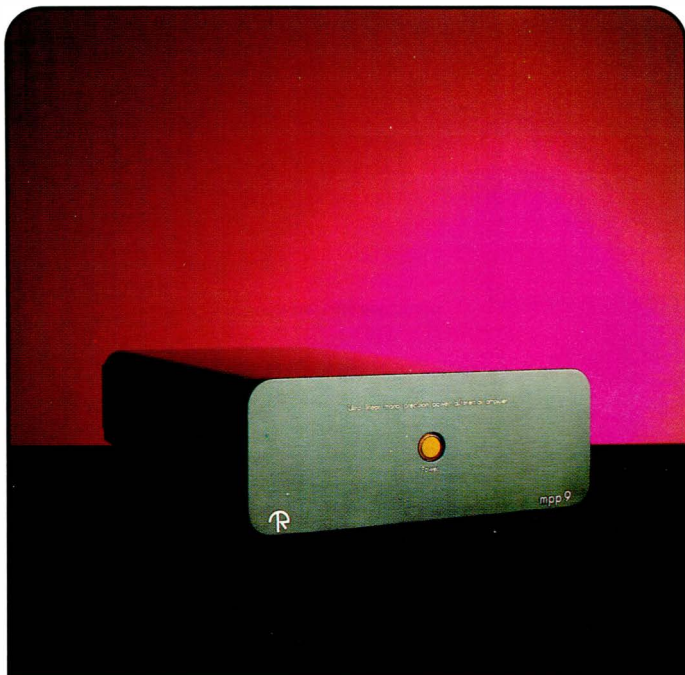
Conclusion

With no knowledge of this DAC's origin our panel concluded that the *SDA-1* was 'a top-flight and distinctly multi bit performer with a likely price to match'. It's a star performer all right but the price is far from the realms of high-end fantasy. Heartily Recommended.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.08dB	0.08dB	0.05dB
Channel Separation	123.2dB	88.9dB	67.7dB
THD vs Level, 0dB	-100.0dB	-92.7dB	-62.0dB
-30dB	-71.5dB	-67.3dB	-61.5dB
-60dB	-49.5dB	-52.0dB	-36.3dB
-80dB	-20.0dB	-25.9dB	-34.1dB
Dithered, -90dB	-7.55dB	-16.5dB	-25.9dB
Dithered, -100dB		-14.5dB	
Dithered, -110dB		+3.40dB	
Resolution @-60dB		-0.01dB	+0.20dB
-80dB		-0.45dB	-0.27dB
-90dB		-4.89dB	-0.90dB
-100dB		-2.06dB	+4.13dB
Peak Output Level, L			2.374V
R			2.354V
Relative Output Level			+1.45dB
Output Impedance			51.5ohm
Radio Frequency Spurious			8mV @ 45MHz
0.34Hz Noise Modulation			+13.0dB
CCIR IMD, 0dB			-71.5dB
Suppression of stop-band IMD			40.4dB
De-emphasis Accuracy, 1kHz			-2.09dB
5kHz			-1.36dB
16kHz			-0.41dB
S/N Ratio (A-wtd), w emp, 0LSB			114.4dB
w/o emp, 0LSB			111.0dB
w/o emp, 1LSB			111.1dB
Serial Number			0176
Typical Retail Price			£650





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Sugden Stemfoort PDA-10

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For the price of two *SDA1s* you gain entry into what Sugden calls its esoteric or 'Stemfoort' range. This, I'm assured, is Dutch for 'strong voice', an unfortunate tag as there's little to shout about. For though the *PDA-10* looks unique, its guts are clearly based on the *SDA-1*.

Same digital processing board, with the same SAA7274 ADIC (kick-started by a ceramic resonator) and SAA7220 oversampling filter. Yet the hex inverters and Schmitt triggers are now put to greater use in selecting the three digital inputs. Incidentally five sockets are provided, one for its digital (monitor) output and four others, including a 75ohm BNC, for the digital inputs.

Never hook-up its phono 1 and BNC inputs to separate digital outputs as the two sockets are joined inside the DAC. I also suggest that someone actually connect the 'phase invert' switch to the digital processing board. I wonder if anyone's heard a difference in phase invert mode?

Lab report

Differences do exist, however, on the analogue board which employs the same circuit layout and TDA1541A DAC but features higher quality silver mica coupling caps and a new current-mirror op-amp in the current to voltage stage. This latter revision is crucial because it prevents the premature slewing suffered by the *SDA-1*, reducing 20kHz distortion from 0.08 to 0.0017 per cent, just compare the 3D plots.

Intermodulation distortion is reduced by a similar amount though other built-in quirks, like the +0.85dB treble boost and 2dB de-emphasis error are retained. Meanwhile the rippled stop-band images, the wide 110-111dB S/N ratio, the -70dB trace and 3.5dB jumps in low-level resolution are preserved because these relate to the digital performance of Philips' classic 16-bit four times oversampling chipset.

Sound quality

Via the Meridian 200 transport:

What was initially lambasted as 'thin and sharp' won us over with its renewed instrumental and dynamic separation. Christy Moore's slyricisms were compelling, the story reinforced by a firm growl in his voice. Subtle string and percussive detail would sound vigorous and spritely rather than polite yet, with our classical offerings, would also seem reduced in scale. Detailed, but neither heavy-weight nor particularly 'airy' in presentation.

Via the Arcam D170.3 transport:

So this costly version of Sugden's DAC also has a very characteristic sound and one that prompted a split in opinion. Some listeners were obviously impressed by its emotive power, one that held the tension in Fordham's voice while providing a real insight into the natural gruffness of Christy Moore. Our classical selection also sounded spacious enough but there was not the 'dynamic swing' we'd enjoyed with other combinations. 'A bit squashed' suggested those who were less enthusiastic, 'with a thin and grubby quality added to strings'.

Via the Teac P-10 transport:

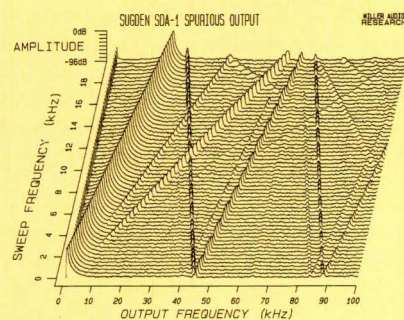
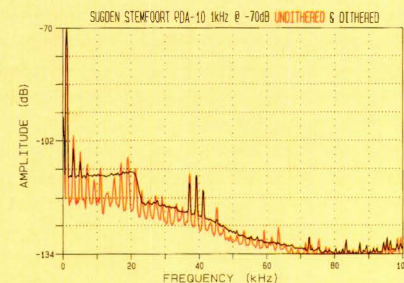
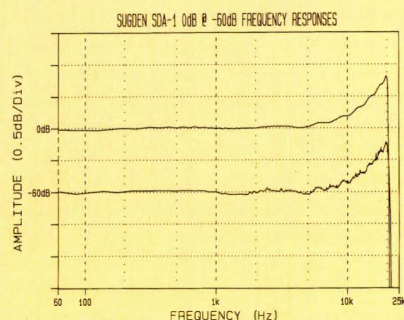
'Busy, occasionally fierce and strangely sat-on' they began. Either way, it was difficult to relax in its presence. To compound this unpredictability the Teac/*PDA-10* combo sounded 'very sonorous' with the classical selection. Gone was the bunched-up soundstaging, the restricted bass and stifled sense of atmosphere. But switch back to pop and the sound takes a nosedive.

Conclusion

Though the sound of Sugden's Stemfoort DAC is somewhat less than predictable, one thing is for sure: the *PDA-10* is certainly no great advance on the cheaper *SDA-1*. Technically it's superior but such numerical niceties are clearly abandoned when test tones are exchanged for real music.

TEST RESULTS

	20Hz	1kHz	20kHz
Channel Balance	0.13dB	0.13dB	0.02dB
Channel Separation	122.8dB	88.2dB	67.3dB
THD vs Level, 0dB	-99.0dB	-94.5dB	-95.3dB
-30dB	-75.1dB	-69.9dB	-62.4dB
-60dB	-51.3dB	-47.2dB	-35.4dB
-80dB	-20.8dB	-27.8dB	-36.5dB
Dithered, -90dB	-7.45dB	-15.1dB	-29.1dB
Dithered, -100dB		-14.0dB	
Dithered, -110dB		+3.50dB	
Resolution @60dB		-0.02dB	+0.21dB
-80dB		-0.05dB	+0.14dB
-90dB		-3.19dB	+0.24dB
-100dB		-0.36dB	+5.60dB
Peak Output Level, L			2.322V
R			2.288V
Relative Output Level			+1.23dB
Output Impedance			44ohm
Radio Frequency Spurious		8mV @ 45MHz	
0.34Hz Noise Modulation			+11.9dB
CCIR IMD, 0dB			-98.9dB
Suppression of stop-band IMD			40.4dB
De-emphasis Accuracy, 1kHz			-2.08dB
5kHz			-1.37dB
16kHz			-0.34dB
S/N Ratio (A-wtd), w emp, OLSB			114.3dB
w/o emp, OLSB			110.2dB
w/o emp, 1LSB			110.3dB
Serial Number			0124
Typical Retail Price			£1,200





SUPERCHOICE

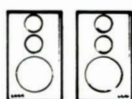
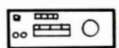
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Conclusions, Best Buys and Recommendations

One year on and this collection of 11 new outboard DACs brings our running total to 31. A vast range that begins with products as affordable as QED's *Digit* and concludes with pure fantasy from the likes of Wadia, Audio Research and Threshold (issues 101 and 103).

Furthermore this outing also marks the initiation of many new members to the digital fold. Companies such as QED, Sugden, Beard, NVA and Roksan who had not previously been associated with the technology of zeros and ones. Interestingly only Roksan has had the wherewithal to produce a matching CD transport, a reflection of the fact that outboard DACs now outstrip outboard transports by a ratio of 3:1.

After all, you're required to pay Philips a handsome royalty before building your own CD player or transport unless, of course, you simply tinker with and re-badge an existing model. Outboard DACs, by contrast, may be designed and produced without owing a penny to the inventors of Compact Disc. So, bearing in mind that most CD players already have a digital output, an add-on DAC is often seen as a convenient 'back-door' into the digital market.

So which DAC will change your life? Paul Miller offers a summary of this month's 11 reviews, pointing out the ones that impressed the panel most.

Enthusiasm is one thing, but in practice it's very easy for the small outfit with limited resources to find themselves knee-deep in the digital quagmire. None is more enthusiastic than Beard, for instance, yet the *DAP-1* is a classic example of good intentions going awry in practice (see *Tech Talk*). Silly oversights, like the gulf in distortion between left and right channels, also smack of poor quality control.

By contrast, quality control is clearly top of the agenda as far as ds/d (digital system/design) and Roksan are concerned. Indeed, both the *Decode-1* and *ROK-DA1/ROK-DS4* combination came very close to an official flag with their gratifyingly consistent performances. Reliable, certainly, but while the former was criticised for its blandness the latter suffered for its lack of deep, rippling bass. Perhaps the matching *ROK-DP1* transport was the missing ingredient on this occasion?

Nevertheless even old-timers like Arcam, Micromega and Audio Synthesis have their off days. Arcam and Audio Synthesis are each employing a compatible 'Sync Lock' facility that enables a single Master Clock to control the movement of digital data in both DAC and *D170.3* CD transport. This regime certainly reduces noise, jitter and distortion in the

Black Box 5 but it still falls short of the transport's own potential.

Oddly enough both the *BB5* and *DSM-M* fared rather better when partnered with Teac's conventional *P-10* transport. So the *DSM-M* is a more sophisticated piece of 20-bit kit but the application of 'Sync Lock' technology is something of a mixed blessing. With its Sync loop engaged the *DSM-M* is freed of any discrete jitter but this is traded for a large increase in circulating interference and noise. 'Can't argue with the technical presentation' our listeners' concluded, 'but its music has lost its soul'.

Meanwhile the aptly-named *Microdac* was attracting comments like 'good rhythmic and dynamic shading but the 'presence' of individual instruments is rather weak'. Not a high-resolution performer then, but one that builds upon tried-and-tested Bit Stream technology first seen in the *Duo BSII* (issue 101). There's scope for improvement though, in distortion, noise and linearity that just might free-up its sound.

And talking of tried-and-tested technology, NVA has evidently decided that improving someone else's DAC is rather easier than starting from scratch! The DAC in question is QED's *Digit*, plucked from its plastic box and secreted inside NVA's robust alloy case where it benefits from extra screening and a couple of very hefty DC power supplies.

So, depending on your viewpoint, NVA's *DAC-ON* is either a smart piece of marketing or an example of what's nifty in 'UK hi-fi'. Mission's *DAC5*, by contrast, provides a neat example of Philips' *DAC7* technology at a very realistic price. A DAC that sounds, well, not unlike a slightly diluted version of Roksan's *ROK-DA1*. A similarly light, frisky and atmospheric sound that successfully undercuts the *Microdac* for the £300 crown.

Then there's Sugden whose classic 16-bit *SDA-1* convertor proceeded to wow the panel with its 'Teutonic precision'. A frothy, dynamic but tightly controlled sound that masters the huge scale of an orchestra as effortlessly as it does those flickering embers of music left dancing in the vaults of the hall. A 'very correct-sounding DAC' that knocks the Stemfoort *PDA-10* off its high-end perch.

Unfortunately neither the *SDA-1* or any other outboard jobbie comes within half a mile of besting QED's *Digit* on grounds of value. This is a cracking little DAC that profits from a remarkably elegant application of Bit Stream technology; no frills, just the bare minimum required to keep its two digital chips beating reliably.

This plus its accurate 75ohm digital input and very low levels of RF interference add up to a typically big, slightly forward and over-enthusiastic sound but one that remains both exciting and attractive. That it could represent a classy upgrade for half the cost of a new CD player seems too good to be true.



Tech Talk: Outboard DACs

Broadly speaking the lab tests follow in the wake of those I've already outlined for CD players (issues 95, 100, 107 and 112) with the addition of extra measurements detailing the DAC's digital input impedance and both dithered and undithered distortion spectra for a 1kHz/-70dB tone.

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 a several dB's edge in A/B listening tests. Bear this in mind when auditioning the likes of Audio Synthesis' *DSM-M* for example.

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 level of diligence peculiar to *Choice* reviews. So, though 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. Remember, the loudest DAC is not necessarily the best DAC.

Paul Miller explains how the tests were performed for this month's DAC reviews, and details what the figures and plots can tell you about your chosen model.

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 achieved with the highest (loudest) signal level where more, or all, of the 65,536 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 Synthesis' *DSM-M* or the *DAC5* from Mission. 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; just compare the *DSM-M* with Micromega's *Microdac* for instance.

All mod cons

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 65,536 quantisation 'steps' or, failing this, by 'jitter' (an uncertainty in the timing of the digital transitions). Here a 0.34Hz (one-third of one hertz) tone is used, forcing the DAC to step up or down just one of the 65,536 LSBs per 44.1kHz sample period.

Any difference in the magnitude of these LSBs (Least Significant Bits) transpires as an increase in background noise, but a figure alone tells only part of the story. Just look at the 3rd-octave plots showing the Noise Modulation suffered by Sugden's *Stemfoort* (+11.9dB) and the *Decode-1* from ds/d (+10.8dB). Numerically both are pretty poor though the distribution of this dynamically-changing noise is clearly biased towards different parts of the audible spectrum. Any influence on the DAC's sound will be similarly unpredictable.

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 both transmitter (digital output), receiver (digital input) and connecting cable must all be matched. And this characteristic impedance, according to the IEC958 standard, is 75ohms. Incidentally our recent interconnect survey (with issue 108) uncovered three Best Buy 75ohm digital links: the *Video Z* from Audioquest, Deltec's *Digilink* and QED's *Digiflex*.

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. And of the 11 contenders in this survey, two clearly deviate from the accepted 75ohm trend. At one end of the scale we

have Micromega's *Microdac* (orange, graph 1) with a 'passive' 66ohm input load that falls to a minimum of 50ohms once powered-up. We saw a similarly low characteristic impedance with the Duo *BSII* in issue 101 though the *Microdac*, which already reflects up to 30 per cent of the incoming signal, also tends to slow the risetime of these signal 'edges'.

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. And this, in turn, will compromise both noise and distortion at the point of D/A conversion. Just what we saw, in fact, during the *Microdac*'s lab check.

Changing standards

In more general terms, only after the incoming data has run the gauntlet of a mis-matched line does it 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.

Beard's *DAP-1* (red, graph 2) has an alternative set of problems. On the one hand its internal ribbon cabling and active input forces the characteristic impedance to climb away from 75ohms to 110ohms at 20MHz. Couple this with a transport like the old

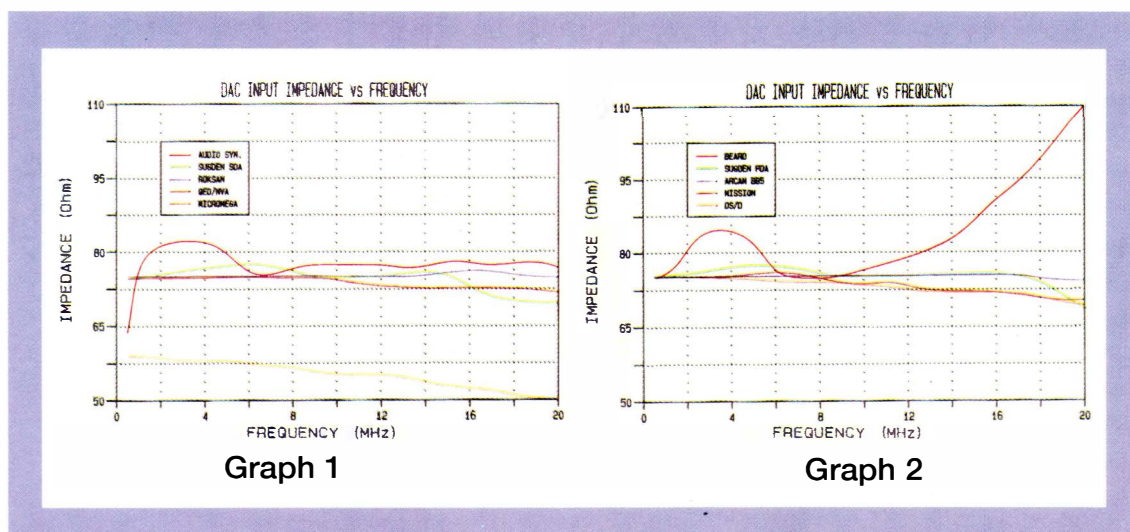
with its moderate 14.6nsec risetime and isolation from interference, proved a good partner.

The only other DACs to suffer detectable on-line RF hash were the *SDA-1* and *PDA-10* from Sugden (green, graphs 1&2). Both employ Schmitt triggers to clean-up incoming data from its accurate (ish) 75ohm input though interference between the inputs and outputs of these TTL devices is evidently helping to circulate background RF noise. Oddly enough, the *PDA-10* fared better with Meridian's *200* transport. A mis-match? Perhaps, though the differences in distortion between *SDA-1* and *PDA-10* could easily be offset by the subjective impact of a different CD transport.

QED, meanwhile, has achieved a very clean 'passive' 75ohm load for its *Digit* (brown, graph 1) but has taken a leaf from Kelvin's book (issue 103) in suppressing extraneous noise via an input coupling transformer. Neat idea but one that also slows the risetime of incoming digital transitions. With its 8nsecrisetime, however, the Meridian *200* has the fastest 'edges' of our transport trio and is consequently the best match for the diddy *Digit*.

All of which leaves us with the precise 75ohm characteristic of Roksan's *ROK-DA1/ROK-DS4* (mauve, graph 1) and the acceptable 75-70ohm trend of the Mission *DAC5* (brown, graph 2) and ds/d *Decode-1* (orange, graph 2). Three DACs that should give the most consistent and reliable performance with an arbitrary choice of digital output.

Arcam's *Black Box 5* (mauve, graph 1) adheres



Wadia *WT3200* (whose line-driver output has a naturally fast risetime) and the data will suffer at the hands of overshoot, ringing and jitter (see issue 96).

Alternative transformerless outputs (including the Arcam *D170.3*) will be especially susceptible to the very high levels of circulating interference detected on the *DAP-1*'s digital input. Perhaps the extra isolation afforded by Teac's *P-10* transport explains the favourable outcome.

Similarly, Audio Synthesis' *DSM-M* was plagued by interference on its digital input (0-10MHz) and also employs an active input designed to accelerate the risetime of incoming digital 'edges', thereby sharpening the transition point and (theoretically) reducing jitter. Nevertheless this measure causes its impedance to rise from 64ohms at 500kHz to 84ohms at 3MHz (red, graph 1), a rapid increase that will stimulate both overshoot and ringing with naturally 'fast' digital outputs. And, once again, the Teac *P-10*

most closely to the 75ohm standard and performs wonders with the stalwart Teac *P-10*. Rather better, in fact, than it does with the Arcam *D170.3* which is particularly prone to circulating RF interference. This goes to show that two digital outputs with the same characteristic impedance (75ohms), the same voltage level (500mV) and the same risetime may still react unpredictably given the variation that exists between one DAC and another. As I've said time and time again, when dealing with ones and zeros, nothing can ever be taken for granted.

Finally, lest I forget, a big thank-you to all the participants who lent their time and ears for our blind listening sessions. Thanks to Alan Ainslie (Technics), John Bamford (Pioneer), Roger Batchelor (Hayden Labs), Richard Dunn (NVA), Mike Martindell (Arcam), Terry Murphy (Yamaha) and Guy Sargeant (Audio by Design). None of these reviews would have been possible without you.



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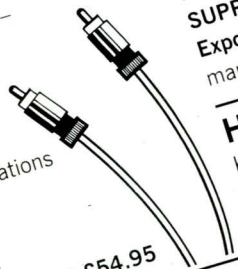
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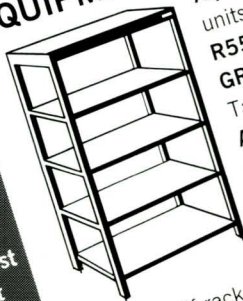
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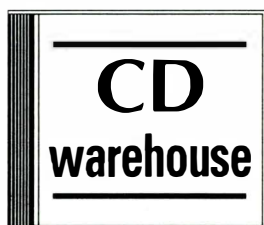
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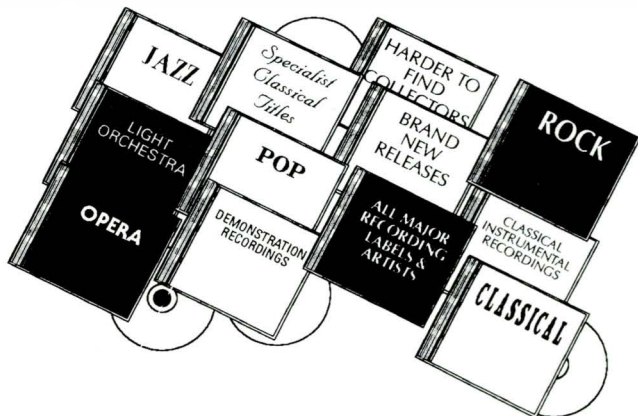


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Choosing and Using . . . CD Mini Systems

Mini systems began to come to prominence just as black vinyl records stopped being a live issue for the majority of buyers. Up to a year or so ago, any system designed to sell in real quantity had to be all things to all people. Although records had ceased to be a mainstream product, the legacy of the previous forty years meant there was plenty of black vinyl still in use.

Apparently this is no longer the case. At least as far as most system manufacturers are concerned, the black vinyl record is defunct, a relic of a bygone age. Sometimes it seems to me that the hundreds of millions of records that are still in users' hands are no longer meant to be played. The squeaky clean charms of Compact Disc have all but eliminated the need for scratchy analogue discs, and about the best you can expect of most systems is an input for a record deck, should you choose to buy one separately.

In case this sounds like a requiem for the LP, let it not be ignored that the demise of vinyl has had some

attractions of mini systems, but they have proved to be not the only ones, and for anyone who has not examined a mini system for a while, a typical model is likely to be something of a revelation - or a shock. Driven by such factors as the increasing availability of low cost computer logic, minis are fast acquiring features that were unheard of only a short time ago, though some of them are of dubious value.

The old-fashioned tone control network, designed to give a little boost and cut at the frequency extremes, has been largely usurped by a new generation of digital sound benders. The acoustic properties of different types of audio venue (RT time, wall reflectivity data, size and various other factors) are encoded as algorithms which can be used to 'process' the raw sound off disc, air or tape in a manner designed to emulate the venues concerned. These algorithms are found in varying levels of sophistication. Some of the less sophisticated examples use preset equaliser settings to achieve a similar effect, which in principle is a much less effective way of doing business.

What unites all these systems is that as well as altering the frequency extremes, these systems meddle with the most audible part of the audio spectrum, the midband, with the result that they tend to be very intrusive.

Mini systems retain most of the features of the past — dual cassette decks, an FM tuner, non-optional loudspeakers and so on. They now invariably come with remote control handsets, and as always speakers tend to be non-optional and unsatisfactory, a point that is addressed in the reviews that follow.

Several of these systems, however, have additional capabilities, of which the most interesting and potentially useful is an A/V or home cinema capability. At one end of the spectrum this can mean nothing more than a variation on a simple matrix circuit which derives the front difference signal (L-R) and feeds it to the rear speakers. This can be simulated on an ordinary two channel system by wiring rear speakers across the left and high hand positive speaker output, though some amplifiers don't like the electrical loading that results. This type of matrix can be fairly effective, but is heavily dependent on the nature of the music being reproduced. At the other end of the spectrum, there are mini systems with complete (or more or less complete) Dolby Pro-Logic systems designed to drive four or five speakers spaced around the perimeter of the room in a manner designed to emulate cinema type Dolby Stereo.

These systems also include circuitry for the video signals, allowing a complete audio/visual system to be assembled. Other systems include karaoke support, with microphone mixing and circuits to sock out centrally placed vocals, again with varying levels of success.

Thinking of buying a CD-based mini system but don't know where to start? Alvin Gold has been listening to nine of the latest models for this month's review project.

beneficial effects on system design. The mini system is arguably the first true child of the digital era. Hi-fi systems grew off the back of records, and the compact cassette gave rise to the personal stereo. Compact Discs fit in both these roles, of course, but they invented neither. Compact Disc has simply replaced records in traditional hi-fi systems and full size audio systems (which are modelled on hi-fi systems), and they slot only rather uneasily into the personal stereos where they may well be replaced in due course by DCC or MC. But without Compact Disc, mini systems couldn't have happened at all.

The idea of a mini size system is not as superficial as it sounds. Compact, highly integrated system design with a strong emphasis on on-board intelligence is the way of the future. Compact Discs are small enough to facilitate compact system design, but the suitability of the medium also derives from the fact that they can be operated automatically. Individual tracks can be addressed quickly and precisely, and as a result it becomes practical to build in such facilities as disc-to-tape editing under system control.

There is now plenty of evidence to show that minis are making the running in the systems market. People like them, and slowly but surely traditional style midi and floor standing systems are being eased out of their niches. Size and ease of use were the original



Akai MX-950

Akai (UK) Ltd, Haslemere Heathrow Estate, The Parkway, Hounslow, Middlesex TW4 6NQ. Tel: (081) 897 6388



The Akai *MX-950* is based on the idea that there is a worthwhile gap in the market that has not yet been adequately addressed. Akai argues that in the transition period before the world turns wholesale to mini systems there is a place for systems offering real quality. It says that people perceive — rightly or wrongly — that minis are incapable of the kind of sound quality that the best midis provide.

This then is one mini which has been designed with at least one eye on sound quality issues. This is apparent in general ways. The design pays a lot of attention to inter-component screening, which tends to suffer in minis where the circuitry is crammed into very small volumes. In the case of the amplifier this has meant that the low level preamplifier circuits are hived off into the tuner box where there is less chance of interference from the power amp.

There is, as you will discover, a raft of added features, including a variety of DSP derived sound modes (see later), but they can be completely bypassed using a 'source direct' switch (unusual in a packaged system), and the complex display which appears to be *de rigour* these days can be toned down considerably.

There is one rather surprising additional component to the quality theme: a record deck which will be available as an optional

extra. But this is no ordinary plastic mini system turntable, perhaps with a vestigial platter and an overhanging record. Instead, Akai is to supply a specially commissioned version of the renowned Rega *Planar 2*.

For those few readers who don't know this deck, it is a painstakingly constructed completely manual design which for many years has been one of the very few starter decks for those who take record reproduction seriously. Differences specified for the Akai version are a Medite platter instead of glass, and a fixed motor where the Rega uses a suspended version. The Akai turntable (labelled as 'Engineered by Rega Research') will be supplied prefitted with an Audio Technica *AT95E* cartridge and, partly because of the changes detailed above, should work straight from the box, without the need for special setting up. Unfortunately the first deliveries of the deck were not due until after this review was put to bed, and the combination could not be tested.

TP-750 tuner/preamplifier

In its off-air role, the slim and attractive *TP-750* uses quartz synthesiser tuning and has a memory capacity of 30 random presets on FM/MW and LW. Setting up the presets is a little fiddly in manual mode, and although presets can be assigned automatically, the selection made by this method is unlikely to

please many people. Control over the tuned frequency and presets is exercised by an attractive but confusing four key matrix. The two AM bands, MW in particular, give a near ideal blend of bandwidth and susceptibility to interference.

As a preamplifier, most of the interesting functions — auto source selection, auto start from power off by pressing the appropriate source button on the remote control etc — are handled invisibly. Manual input selection is available using two buttons with a toggle action, and is signalled by an appropriate display in the centrally mounted display panel. A two position (plus 'off') Super Bass switch and a Source Direct switch complete the list. Inputs available in addition to the internal ones include phono, a tape circuit (labelled video) and auxiliary.

Last but not least, the *TP-750* has a built-in timer for unattended recordings and wakeup purposes.

HX-950 cassette deck

This is a high spec design, with two independent record/playback auto-reverse decks featuring Dolby HX Pro, plus Dolby B and C noise reduction. Simultaneous and sequential recording is possible with this deck, and simple tasks which are often disallowed, such as rewinding one tape while listening to the other, are allowed. The control sys-

tem has been kept simple, with just one set of transport controls assignable between the two transports, and a single electronic tape counter. Various tape search modes are available, including intro-scan. Record levels are set automatically, but the action of the compressor is comparatively subtle, and it was possible to run what looked like an exceptional frequency response plot. Wow and flutter is very low, and would be more than acceptable in a £200 component cassette deck.

CD-750 Compact Disc player

Minis provide more surprises than midis ever did. Inside the CD-750's trim dimensions is a full width drawer with a motorised rotating platform that has positions marked for three discs. The deck is fairly straightforward operationally, but includes 30 track programming (from one, two or three discs), repeat and random play, a variety of display modes including a calendar readout and CD editing which allows discs to be dumped onto tape automatically.

It's worth noting that there is a fundamental difference between a multi disc player like this one, and a twin tape cassette deck. The CD player requires only one disc platform, clamp and laser carriage, where the cassette deck requires that everything be doubled up, to the inevitable detriment of sound quality at any given price level. The Akai three disc mechanism should sound no worse than an equivalent single disc player, and the extra cost should not be great, though inevitably there is some penalty to be paid. It is also self-evidently useful, allowing a two or three disc album to be loaded up together. Many operas and some symphonies are obvious beneficiaries, but the Akai also allows more complex CD to tape editing than can be easily accomplished with a single disc player. The Akai doesn't have any genuinely novel capabilities, but it does facilitate editing from multiple CDs in a much more natural and intuitive manner.

The CD-750 is equipped with a Burr Brown PCM-67 1-bit DAC.

PA-850 power amplifier

This unit is a little unusual in that rather than being a simple black box, the PA-850 is home to the large, prominently positioned system volume control, as well as the balance control and switching for two pairs of loudspeakers. The power output rating is 55watts per channel into 6ohms (the speakers supplied are 6ohm designs), and except at 20Hz achieves an impressive 50 + 50 watts into 8ohms.

EA-750 sound processor

The one component that will cause serious confusion with those new to mini systems is this tuner size component, which bills itself, mysteriously, as a sound processor. It can be switched in and out of circuit using

the preamps' Source Direct switch, and includes ten audio profiles which can be superimposed at one of several different levels over the music, giving the effect (says Akai) of listening in a stadium, jazz club, a church, a theatre stage or one of six other profiles, with additional controls giving added 'liveness,' a wider soundstage and simulated stereo for mono sources.

The processor also acts as a seven band graphic equaliser with a memory capacity for ten acoustic profiles. Various display modes are available.



SR-950 loudspeakers

An ostensibly straightforward system component which at first glance is both too large and has too many drive units (three per enclosure) to be fully convincing, these Hungarian made boxes feature injection moulded polypropylene bass unit cones, soft dome midrange and treble drivers and a crossover featuring film capacitors. The enclosures are filled with acoustic wadding, and the rear vented enclosure has 12mm walls. The response shape has a favourable energy trend, but becomes progressively more ragged looking at high frequencies.

How it performs

Although a genuine mini system, component width (at 27cm) is a little greater than the two cassettes width of some minis. The system can be stacked vertically, or two units wide, which gives a handy 210mm overall height.

Akai has gone to considerable lengths to get the electronics right, but has failed to do the same for the loudspeakers, or to make them optional, which would have softened the criticisms considerably. As it stands, and in the context of the rest of the system, the speakers are fit only for the trash heap. Their overall balance is quite acceptable, but they produce an artificial bloom around the upper bass and lower midrange frequencies, and they superimpose a wooden, boxy colouration on the music. The effect is that music ends up sounded compressed and muddled, and most of the more subtle ambient information is missing, giving the somewhat paradoxical effect of slackening the focus of the music whilst making its basic character drier and less ambient. Used with

alternative loudspeakers (Kenwood LS-500G) and with headphones (Sennheiser HD560II), the electronics sprang to life, and the test proceeded.

Ignoring the speakers, this is in essence a hi-fi system dressed up as packaged audio, with only a few rough edges occasionally giving the game away. One of those rough edges has already been mentioned: the auto-level control built into the cassette deck. This spoiled matters, for example when dubbing a recording of Rachmaninov's *Isle of the Dead* onto tape. The deck pulled up the quietly menacing opening, exposing the recording to system noise and hiss which even Dolby C couldn't completely resolve. Nevertheless, the basic standard of sound from the cassette deck was excellent: the menace was retained and the music felt large in scale and alive as it got into its stride.

The FM tuner gave me several hours of pleasurable listening to Radio 3, Classic FM, Jazz FM and other speech oriented channels, performance here being dominated (if that's the word) by the comparatively subtle sounding FM front end (which outperformed the tuner in the £850 Kenwood UD-900 system) and the crisp but well controlled amplifier. The CD

player was even better, its bottom end opening out with an authority neither the cassette deck nor the FM tuner could match, though FM showed signs of getting close.

Verdict

Akai's attempt to 'distinctify' this system (its word) has been successful as far as it goes, but why it stopped when it reached the loudspeakers is a complete mystery. The system is worthy of formal endorsement, but only if the loudspeakers can be replaced by something more worthy, which could cost as little as £100 to £130 a pair.

On balance the electronics are too good to withhold a Recommendation, but it is given on the basis that your £750 buys you a very nice system with a pair of starter speakers thrown in free. Get rid of them ASAP, and don't forget that Rega based phono option.

TEST RESULTS

Cost with speakers	£749
without	n/a
Options	Turntable (see text)
Size main unit	42x27x36cm (hxxwxd)
Size speakers	42x27x26.5cm (hxxwxd)
TUNER	
Sensitivity	average
Noise	average
CASSETTE DECK	
Wow & flutter (wtd)	0.12%
Signal/noise ref 0dB Type II	n/a
Distortion 0dB Type II	n/a
COMPACT DISC PLAYER	
Signal/noise (measured at amp Tape Output)	98dB
AMPLIFIER	
Power output/channel (80hms)	35/50, 50 watts
(20Hz, 1kHz, 20kHz both channels driven)	
LOUDSPEAKERS	
Sensitivity	average



Denon D-70/S

Hayden Laboratories Ltd, Chiltern Hill, Chalfont St Peter, Bucks
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Last year, Denon introduced the *D-100*, which had the effect of rewriting the rulebook for mini systems. It neither looked like, nor behaved like previous mini systems, and according to the distributor, Hayden Laboratories, the *D-100* (which remains available) has been an outstanding success. Now, inevitably, it is being joined by a cheaper version.

The *D-70/S* (with speakers) and *D-70* (without) is a visual dead ringer for the *D-100*, but it differs substantially under the skin. Where the *D-100* used independently powered components, making it conceptually similar to a conventional hi-fi system, the *D-70* has a single mains powered unit (the receiver) which provides a low voltage DC feed to the other satellite units. There are also fewer units. The *D-100*, for example, had a separate amplifier and tuner, where the *D-70* amalgamates the two functions into a single, compact box. Not unexpectedly, the components also generally have a slightly lower specification.

On the whole, though, Denon has been at pains to keep as much of the *D-100*'s character alive as possible in this more affordable design. The *UDR-70* is almost alone among system cassette decks in having just a single transport rather than the usual twin, and the loudspeakers are real hi-fi designs with proper high fidelity drive units and

enclosure construction. They are built in this country to a Denon specification.

Finally, it looks marvellous. The three electronics components are dressed in a dulled metallic finish with smoothly rounded top and bottom edges, and dark sidecaps set off by gold vertical feature lines. Visual clutter is avoided by the effective, if slightly inelegant, technique of hiding the secondary functions behind front panel flaps. The displays take the form of brightly backlit LCD panels. Finally the electronics are extremely compact, both in width and in height, the latter a result of specifying a horizontal loading cassette transport mechanism.

A rapid straw poll confirmed that most people seem to find the system very attractive, and the only negative comments are that the remote control is boringly conventional, the minor controls are actually rather fiddly, and the white front panel graphics have insufficient contrast under typical lighting conditions.

UDRA-70 receiver

Into a single box 17cm wide and 9.6cm high Denon has managed to cram a full FM/MW/LW tuner, an integrated amplifier and a timer, along with the power supplies for the other components. This unit is also home to the *D-70*'s system intelligence, and passes commands to the other units which are

received through its integral infra-red receiver within a receiver (as it were).

The tuner has a random pre-setting capability (ie, broadcasts from different wavebands can be mixed freely) of 30 stations, with selection most conveniently performed by remote control since the fascia preset keys are awkwardly laid out behind the front panel flap. AM sound quality was quite good, though not exceptional, and interference levels were about average.

The power amp section is rated at a properly qualified 30 watts per channel (8ohms RMS, both channels driven 40Hz - 20kHz), and facilities are by the book, bass, treble, super bass (rhymes with waste of space) being the main ones. Rear panel socketry is fitted for an external tape deck (or any line source) and a record deck. Unlike many mini systems, however, there are no equalisers and no DSP type effects. As system amplifiers go, this is remarkably straightforward.

The timer can be used to make unattended recordings within a 24 hour period (or everyday), and has a 'sleep' facility, and a clock which is displayed with mains power switched to standby.

UDR-70 cassette deck

The use of a single cassette deck mechanism is almost unheard of in recent package

system design, being anticipated only by Bang & Olufsen and by Denon's own *D-700*. Of course there are losses of functionality. You won't be able to dub from tape to tape unless you have another deck to plug in the back, and sequential play operations are also prohibited. On the other hand, the available resources have been concentrated onto the remaining transport, which should therefore be a good one.

It's certainly different. The deck has a horizontal drawer mechanism, making it similar in appearance to the CD player, and the tape is held horizontally, a design that reduces bulk and which, from inspection, should suffer less than usual from microphony. A ceramic composite tray and a cassette shell stabiliser are tangible signs of Denon's intent. The *quid quo pro* is that, once loaded, the tape is invisible, and there is no feedback mechanism to show you where you are. Denon's more costly drawer loaders have a time to go readout, and a similar device was sorely missed here, though a flashing light indicates when there is less than five minutes playing time left on either side.

The *CDR-70* has some excellent features, the most impressive being the manual record level adjustment. Most such decks have auto-level controls which, while being more granny proof, automatically produce compressed recordings as the record level tracks the input signal strength. The deck is additionally equipped with Dolby B and C, and has a simple track search device. A final button is used for dubbing CDs onto tape by cueing the two together, setting the tape to record and the CD to play, with appropriate handling of the disc at the end of tape side.

In common with the other components, the minor controls are fiddly and poorly signposted, but there are not too many of them, the remote control provides a handy alternative and the display is legible and attractive. The frequency response shape taken was benign, and the numbers were good, indicating a stable, accurate transport and noise/distortion broadly comparable to a low end component cassette deck. There is an auto-edit button which shuffles the track running order to provide a best fit to the tape length.

Electrically, however, the Denon is not quite what you'd expect. Rather than use one of the multitude of available flavours of one or low-bit D/A conversion, it uses a proprietary multibit convertor called SLC (for Super Linear Convertor) which aims to give multibit type dynamics and punch without the hardness sometimes associated with the technology, or the occasional fatal softness of low bit conversion.

SC-M1 loudspeakers

These optional speakers are made for Denon by a British supplier, and the design is typical of a budget hi-fi design from a few years ago designed to sell for about £80 - £90. The

reflex loaded enclosure is bulky looking but shallow, and is much heavier than usual for a system speaker.

The drive unit complement includes a pulp cone bass driver and a soft-dome tweeter. The frequency response is ultra-smooth, especially towards the treble frequency extreme.

How it performs

As well as being physically small, the system is also adaptable, as the three equal size components can be laid out side by side,



which makes a very sleek looking configuration.

Of course the *D-70* is fully remote controlled and has all the usual mod cons you've come to expect, including auto source selection and one-button dubbing from CD onto tape. A timer for making absentee off-air recordings which can also act as a wake-up timer is included.

The Denon system has some unusual abilities, but the pre-eminent one is simply balance. Rather than being exceptionally good in one department or another, it consists of five items, three source components, the amplifier and the loudspeakers. All are capable of pulling their weight, and none let the system down. The extent to which this is the case can be measured by the occasional difficulty in distinguishing one source from the next in the context of a basic audio character of sound that is quite sharp and analytical.

The amplifier is open, transparent, a little raucous in extremis, and capable of controlling speakers — those supplied and third party ones — with a much firmer sense of grip and control than was the case with most of the other eight systems. The bass is only moderately good, and tended to lack a really physical edge, but this merely reflects the fact that the speakers supplied for the system are not exactly heavyweights, and are optimised for mid frequency and treble reproduction. They are, however, notable in their ability to portray detail and to realise matters of expression, vocal inflection and the like. When new the treble generally sounded a little over the top — cymbals sounded very close for example — but there were signs that this was settling down to-

wards the end of the test period. This kind of running in symptom is not unusual.

The tape path is evidently well designed, and signs of cassette modulation noise were noticeable only by their absences. Instead the deck sounded open, airy and clean in texture even through complex passages. The wearing edginess caused by high levels of flutter was absent, but Dolby B noise reduction helped reduce an occasionally rather burnished treble quality.

My listening notes for the FM radio and CD player contained typical adjectives including 'well formed' 'fine grain string textures' and a rather lame 'detailed.' Both components were well into low end hi-fi territory, and wouldn't have been out of place in a reasonable components system. What more can you want from a mini system component?

Verdict

This is the only system in our test with a single cassette deck, and the only one also with no computer controlled equaliser or associated light show. It is also one of the very few that really makes music, not just with third party loudspeakers, but even through the ones supplied with the system.

There are some problems. I found the minor controls were not easy to get to grips with, in part because they are too small and too huddled together behind the flaps, and because the control legends were almost unreadable in many lighting conditions. I often found myself shielding the area I wanted to look at with my hand to avoid disturbing reflections. The remote control acts as a quite an effective antidote however. The missing equaliser was most certainly not missed, and although the inability to dub cassette may be a problem in some applications, the requirement is not one that is widely found in the sound-first community. For many people twin cassettes decks have become desirable only because they have become expected. Aside from this, all the Denon lacks is a touch of inspiration. At the price though, the system is an obvious Best Buy.

TEST RESULTS	
Cost with speakers	£600
without	£500
Options	SC-M1 loudspeakers
Size main unit	28.6x25x35.4cm(hxwxrd)
Size speakers	38x22x17cm(hxwxrd)
TUNER	
Sensitivity	good
Noise	good
CASSETTE DECK	
Wow & flutter (wtd)	0.09%
Signal/noise ref 0dB Type II	57dB
Distortion 0dB Type II	1.6%
COMPACT DISC PLAYER	
Signal/noise (measured at amp Tape Output)	>100dB
AMPLIFIER	
Power output/channel (80ohms)	35/32/35watts
(20Hz, 1kHz, 20kHz both channels driven)	
LOUDSPEAKERS	
Sensitivity	average



JVC MX-77

JVC (UK) Ltd, Eldonwall Trading Estate, 12 Priestly Way, Staples Corner, London NW2 7BA. Tel: (081) 450 3282

A typically astute design from one of Japan's premier consumer electronics concerns, the JVC packs a high features per inch quotient. The blend is distinctly contemporary, with extensive use of scrolling graphics running across a multi-function display panel, sometimes repeating legends simultaneously visible in other parts of the same display panel!

When switched off the system has a discreet muted time display, but when turned on and inactive, it goes into what can only be described as a kind of electronic fidgeting mode as it splashes intermittent messages in the form of a waterfall pattern from the main display.

The system includes a number of what JVC playfully describes as 'fun' features. These include, in no special order, a range of DSP sound effects, something called 'live surround,' a kind of Karaoke feature which attempts to suck out the vocals from recordings, and some still less explicable gadgets like 'fuzzy logic' CD recording. There is even a circuit that can associate events (eg playing a disc) with a range of control settings, and the time of day (quiet, with low frequency lift, for night-time use, for example). As for all the other things, and especially fuzzy logic, all will be explained . . .

The four separate electronics boxes are knitted together backstage with a web of

ribbon cables, with operating power supplied at low level from the component that also acts as the system amplifier. The back of the amp packs a surprise: a cooling fan, which is triggered thermostatically under high load conditions, though typically a well ventilated system will rarely cause the fan to be turned on. Except for the loudspeakers, the system is well built and finished, though a little more complex in control organisation than many competing systems.

FX-MK77TN tuner

The tuner has a massive memory capacity of up to 40 random FM/MW/LW presets, supported as usual by mono/stereo switching. The *FX-MK77TN* also serves as the system timer in which role it has an everyday and a sleep facility. AM performance is satisfactory, though a little lightweight.

TD-MX77TN cassette deck

This is a classic system design. It need hardly be said that there are two transport mechanisms, both auto reverse capable and only one of which is capable of recording. Noise reduction is by Dolby B and C, and Dolby HX Pro headroom extension circuitry enhances high frequency behaviour with low bias tapes. Record levels are set automatically, which makes the deck properly foolproof, yet which also defines its limita-

tions, since even the special JVC microprocessor used for peak detection can't avoid gain riding, compression and increases in background hiss with dynamic material.

In common with other system cassette decks, this one features high speed dubbing, which will dub a 60 minute tape in 30 minutes and so on. Strangely, however, there is no standard speed dubbing option, which makes this the first dual cassette deck I have encountered incapable of recording in the mode that inevitably gives the highest sound quality.

The fuzzy logic system scans the Compact Disc from which you want to record, and sets a recording level, taking account of the frequency spectrum of the music and the equaliser pattern selected. The system amounts to a rather complex way of achieving a modest gain. Equaliser patterns optimised for in-car and headphone stereo use are available when recording.

MX77TN Compact Disc player

This CD player is a showcase for JVC's PEM (Pulse Edge Modulation) convertor and noise shaping technology. The standard transport controls are fitted to the right of the centrally mounted drawer, and the more tricky bits are fitted on the left, including tape editing keys (for direct dubbing operations), fade, random, repeat and display mode keys.

AX-MX77TN amplifier

The AX-MX77TN amplifier is by far the most interesting part of the set-up. This is the core of the system, holding most of the on-board logic and the remote control receiver for a handset. This has rudimentary A/V capabilities in that it controls the basic functions of JVC brand videos and TV receivers; it is not, however a 'learning' remote. The amp is front-ended by a gloriously over the top display panel which defaults to show a spectrum type level display, plus the name of the acoustic profile selected from its 12 equaliser patterns, and the other eleven to show what you're missing.

The equaliser should not be confused with the more sophisticated DSP type digital effects which some systems use. Acoustic patterns built-in include disco, hall, rock, jazz, plus patterns described as car and headphone (for the use of). There are also some less obvious modes such as vocal (which emphasis the upper middle frequencies often associated with the voice) and game (which sounds like AM radio, coarse and dull). Up to six user defined equaliser patterns can also be stored. The equaliser itself covers the audio band in seven steps.

Vocal masking is supposed to strip out the voice for karaoke purposes, but in practice it usually does nothing of the kind, merely having the effect of remixing the music; usually to its detriment. To complete the karaoke support, a microphone input is available, with a mixing control. Other features include the aforementioned CSRP (COMPU-LINK Source Related Presetting) which associates a individual equaliser and volume control settings with each input and with specific periods during the day (on a six hour cycle). The settings memorised for this feature are averaged from the previous five times use.

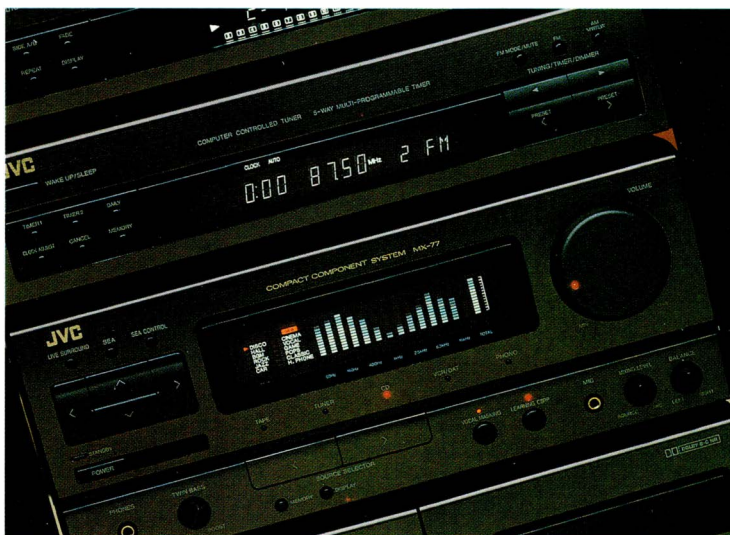
The amplifier is rated at 22watts per channel, and 28watts per channel for the subwoofer (see SP-MX77 loudspeakers), but the rating is a measured against five per cent THD, and therefore tends to overstate the actual output. Extra outputs are available for surround sound use; this circuit takes the difference between the two front channels and feeds them to a pair of speakers at the rear via the equaliser, which often has the effect of adding space and airiness to the sound, albeit of a rather random kind. But note that this has nothing to do with true Dolby Surround Sound.

Unassigned inputs available on the rear include phono and tape.

SP-MX77 loudspeakers

Although the accompanying instructions warn against relying on the fact, the SP-MX77 is a shielded design which can be placed adjacent (well, close) to a TV monitor, though this would give a very narrow stereo soundstage and is therefore not really recommended.

The SP-MX77 is unusual in one other way too. In addition to the 12.5 and 5cm drive units on the front panel, there's a third, also 12.5cm in diameter, fitted internally which is driven separately using a dedicated set of leads from its own dedicated power amps in the MX-77. The third unit drives most of the internal cavity of the speaker and resonates columns of air through two front facing ducts. The resonate effect, which is less direct but is otherwise analogous to plain 'ol port loading — indeed the labyrinth configuration adopted here is a type of port



— is designated as a 'subwoofer' by JVC. This is categorically inappropriate, in much the same way that describing a house fly as an aeroplane and offering to fly passengers across the Atlantic in one is inappropriate. The speaker is quite narrow, tall and deep, but of average internal volume (which ultimately determines the bass roll-off) and shoddily built (ditto). It is, however, heavier than usual for a system speaker this size, and that simple fact means there is some hope.

How it performs

In practice the speakers are not well enough built, and JVC is asking them to do things which they are inherently unable to achieve. The poor build quality resulted in buzzes and rattles which proved incurable, and which became manifest at anything above middle volumes when the music contained a bit of grunt. With any extra bass turned on using the so-called Twin Bass control or some of the SEA patterns, the deep bass was allowed to let rip at a level and at a frequency that no speaker the size of the ones supplied can hope to handle, mostly because the laws of physics say 'no'. The inevitable consequence is that the bass can't keep up with the musical changes, and the effect is detached and flat, combined with grossly excessive depth and even more buzzes and rattles. JVC is remiss in trying to pass this off as deep bass reproduction, not least because they excite expectations they simply cannot fulfil. For the record, genuine deep bass, which is a wonderful thing, can be had, but not from a mini or any other kind of packaged system, and certainly not at these price levels.

The story continues. If it had been possible to turn the LF down and continue with the rest of the speaker than this would have been fine, but there is a fly in the ointment, namely the midband and treble. The former lacks extension and 'air', and sounds gruffy and edgy. The midband also sounds crude and gruff in tone, and fine detail and expressiveness go by the board.

The cassette deck is poor. Tape sound was subject to intermittent dropout, the treble and bass were very soft, and the overall effect was one of added distance in front of the performers, and very noticeable coloration. Changing tape types did little good, and neither did Dolby noise reduction of either flavour.

FM sound quality is fairly good, and certainly doesn't let the system down, but the treble has a slightly feathery, congealed quality that simultaneously emphasised information yet made it hard to hear through the more complex textures. The sound has an overall electronic veil.

The SEA type effects were quite good of their type, except in the bass where any boost applied had a disastrous effect through the speakers for the reasons already given.

This caveat apart, they generally failed to make the sound worse, and in some ways actually helped somewhat with presentation, though when better speakers were substituted there was less to gain, and more to lose by making extensive use of the equaliser.

Verdict

The moral of the story is obvious. If you just want a system to play discs, tapes and radio, the JVC will probably seem hopelessly over equipped. If you have a taste for the more inventive forms of electronic skulduggery it could be a different matter. But this system is male jewellery first and foremost.

The speakers supplied, which are unfortunately non-optional, categorically don't work, and the electronics, though better, take advantage of the camouflage provided by those speakers.

TEST RESULTS

Cost with speakers	£650
without	n/a
Options	SP-ES5BK surround speaker system
Size main unit	35.5x18.3x27.2cm(hxwxdd)
Size speakers	36.6x18.3x27.2cm(hxwxdd)
TUNER	
Sensitivity	average
Noise	good
CASSETTE DECK	
Wow & flutter (wtd)	0.15%
Signal/noise ref 0dB Type II	n/a
Distortion 0dB Type II	n/a
COMPACT DISC PLAYER	
Signal/noise (measured at amp Tape Output)	>95dB
AMPLIFIER	
Power output/channel (8 ohms)	20 watts
(20Hz, 1kHz, 20kHz both channels driven)	
LOUDSPEAKERS	
Sensitivity	average



Kenwood UD-500

Trio Kenwood (UK) Ltd, Kenwood House, Dwight Road, Watford, Herts WD1 8EB. Tel: (0923) 816 444



According to a press release I've just pulled from my filing cabinet, the UD-50 system replaced the UD-3 back in August 1991. Here we are just a year down the road, the range has been changed again, and the model number has grown another '0'.

As mini systems go, the UD-500 has a lot in its favour, but the list does not include size. This system both looks and is chunky, and visually is not a lot smaller than many systems that are described as midis. Further, the four items of equipment come in three different depths. The equipment can be used in two adjacent stacks, and because the rear feet have been positioned appropriately, the equipment can be stacked in any desired order, but the effect is visually untidy when viewed from anything other than head on.

Ah yes, head on the Kenwood comes into its own. The fascia area is a mass of Art-Deco flowing curves and beautifully integrated controls, and from this point of view at least the system ranks alongside the best on offer. On the whole, clanky cassette door mechanism apart, the controls and the other moving bits feel as good as they look, but the displays look like a standard off-the-shelf item, of good visual quality but messy in organisation. In fairness Kenwood is not the only system builder guilty of this crime.

The UD-500 is supplied in two forms. The other, which rejoices under the name UD-500M, is £50 dearer and includes a multi-disc player which can accept a single disc plus a magazine capable of storing six discs. The two systems are otherwise identical.

X-A5 cassette deck

The Kenwood cassette deck is a more or less typical twin with one record capable mechanism, and auto-reverse all round. There is no Dolby HX Pro, and metal tapes are not accepted when recording, though they can be successfully replayed. High and normal speed dubbing are available, along with a number of search and auto-play modes, none of any great note and mostly rather awkwardly designed.

More interesting are two features, one of which, auto-bias, produces a close match of even oddball tape formulations (some of That's Type II metals for example, or Type II genuine chrome tape) to the deck in about 45 seconds. The other is a circuit that samples up to about 20 seconds of music and sets an appropriate record level, which is not subsequently varied while recording.

In common with some of the other parts of this system, the X-A5 has a host of minor controls and it can be a little confusing to the uninitiated. Control mode engagement also tends to be noisy. The frequency response

shape (Type II record/play) is seriously awry, the LF apparently being affected partly by a sharp increase in LF level of the system as a whole (see later). Its consequences on the sound can be imagined and ditto for the 0.29 per cent wow and flutter figure, with bells on.

DP-A5 Compact Disc player

Compact Disc replay is handled by what looks like and indeed is a perfectly conventional and largely gimmick-free player, with random access keys provided both locally and on the remote control.

A variety of CD to tape editing modes are available, including one that records tracks with crossfades rather than breaks, one that fades tracks out early if a CD is longer than the tape inserted, and one that dubs CDs at twice normal speed, inevitably at some detriment to sound quality (see below).

The 4dB high bass boost in the response plot is a characteristic of the electronics of the system amplifier when everything is set to 'flat' and 'off.'

A-A5L receiver

The tuner can accommodate 20 presets assigned randomly across three wavebands, which can be retrieved in the usual way, or with a pair of 'preset call' keys that toggle through all the presets. It is also possible to

input the station frequency directly, and presets can be individually programmed with an alpha-numeric labels (RAD4 for example, or JAZZ, NEWS and so on) up to four digits long. Off air performance is good, in line with Kenwood's reputation. The FM tuner had no problems receiving quite distant transmissions cleanly at the test site with good limiting and a minimum of interference and other undesirable side effects. The AM section was good too, being largely free of interference except under exceptional circumstances (and assuming a correctly oriented aerial) while remaining capable of a colourful, wide-bandwidth sound.

Like many recent systems, the Kenwood includes a bass control in addition to the equaliser. Described speciously by the manufacturer as an NB (= Natural Bass) Circuit, it produces a syrupy sounding concoction that the equipment is ill equipped to generate at any realistic level.

The amplifier is rated at 26 watts per channel, a figure that was confirmed on test. It has just one unassigned input (on the back of the equaliser), for linesources only. Record decks with magnetic cartridges cannot be used with this system.

Last but not least, the receiver is home to the system timer, which can make unattended recordings and has two wakeup times, one with increasing volume level, and one that plays two tracks from a CD and then reverts to radio. How about that - half a Brandenburg concerto followed by the news! There is also a sleep timer and a one touch timer, but it can't make coffee.

GE-A5 graphic equaliser

Equalisers have had a shot in the arm from the introduction of digital signal processing and control techniques, and the inventiveness of manufacturers in applying these new ideas knows no bounds, though the purpose served by some of these innovations is harder to detect. This is a case in point. At the core of the GE-A5 is a perfectly ordinary seven band equaliser, which by its nature imposes only a rather coarsely graduated control over the music. But the circuit has been dressed up to the point where it is almost unrecognisable.

There are 15 preset equaliser patterns with names like Rock, Jazz, Classic and Movie, five of which are user re-programmable, and separate flat (override), presence and loudness controls, plus the aforementioned Natural Bass control. In addition, the system can 'analyse' recordings on disc, and set an equaliser pattern taking due account of the frequency spectrum of the original music, which though superficially reasonable is about as sensible as Chanel No 5 in an abattoir.

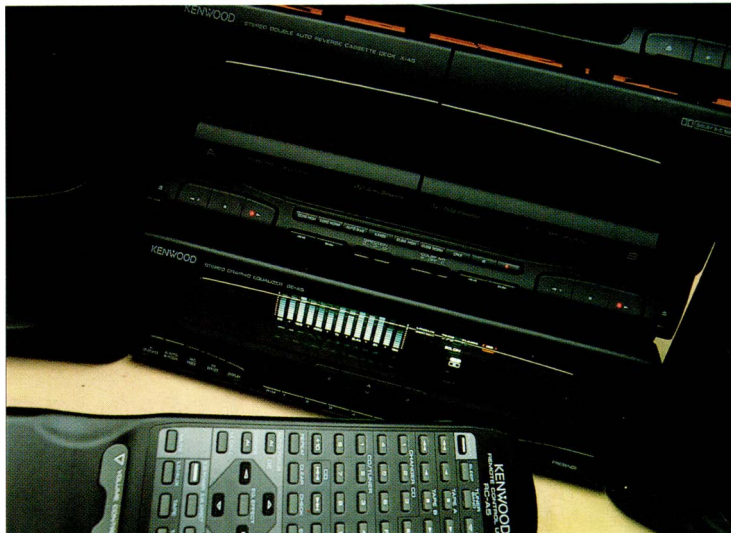
LS-A5 loudspeakers

The story here is a simple one. The LS-A5 is an anonymous looking two way front vented

design of standard size and proportions for a system in this class. The bass has clearly had a leg up around 50Hz, and this is certainly due to the system's built-in loudness contour. There is some serious peakiness higher up too, and the treble of this speaker is in effect limited to about 8kHz. This is not state of the art.

How it performs

One unusual feature is a preamplifier output terminal, which Kenwood suggests is used to drive a powered subwoofer to fill out the



bass. Here is a tacit admission that the effective bandwidth of the system 'as is' is limited, but although on paper subwoofers like this are the answer to a prayer, the everyday practical reality is that audio history is littered with examples of subwoofers which in practice don't quite deliver. Nevertheless I wouldn't wish to prejudge Kenwood's efforts in this direction, which is available in the form of the SW-700 (not submitted for test).

The measured results taken suggested a full and perhaps rather bright sound, although in practice the system sounded rather better than the numbers led me to expect, and on the whole the treble was free of the edginess and distortion I had expected. There was a certain amount of 'lispiness' with certain types of voice, especially harder female voices such as that of Angela Ripon (reproduced off air from FM radio), and sibilance was not entirely absent from the mix.

On the whole though the system covered its tracks rather well. One test piece — the old Solti/Decca Bartok *Concerto for Orchestra*, which has a wonderfully vivid and tactile orchestral sound — I played right through on the Kenwood, which is much longer than I would normally have been willing to tolerate from a packaged system. Although it didn't exactly sound wonderful, the essential ruggedness of the string section was present, and the weight and depth of the sound, and ripeness in the pizzicato basses (second movement) were retained. The system even made a good stab at retaining the dynamics of the original. During this and other tests, the system was shadowed by a hi-fi system using Pioneer CD player and amp driving Mission 753

speakers. This, if you like, was the immediate standard by which the systems were judged.

Switch to a cassette recording of the same piece (TDK SA/Dolby C) and you are transported to a different world. The basic sound character seems superficially similar, yet the tension has slipped from the music, and the timing of the piece seems slipshod. The low frequency end is a blur, though high frequency detail is quite well reproduced. There is little practical advantage or otherwise in this piece from switching to Dolby B, but true to form switching Dolby off altogether brings a suggestion of life back into the frame, except in the quietest passages or between movements when the sound is awash with a rather mucky version of tape hiss. More percussive forms of music, piano for example, showed other limitations in the cassette deck: a woodenness with powerful transients, and most obvious of all, poor pitch integrity with sustained notes.

FM reception was extremely good. The sound had body, depth and weight, yet it was surprisingly lucid and graceful with almost tangibly three-dimensional imagery given the right material. It also had a real hear-through quality, unusual in this class of equipment.

Verdict

The Kenwood is not quite all it seems. It looks really well designed, but those Daliesque curves do little to disguise an essentially unadventurous approach to ergonomics, reflected for example in the high control count and the lack of organisation or structure in their disposition across the front panels. There are other weaknesses too: this is not the system to buy if you have any ambition to play records since it is one of the very few minis even today that make no provision whatever for record decks.

Even the measured performance of the system was a little iffy, but when push comes to shove, the Kenwood sets a surprisingly coherent and likeable standard. Cautiously Recommended.

TEST RESULTS

Cost with speakers	£550
without	n/a
Options	Multi disc player - £600 SW-700 self-powered subwoofer.
Size main unit	40.8x26.8x33cm (hwxwd)
Size speakers	40.8x20.5x23.5cm (hwxwd)
TUNER	
Sensitivity	average
Noise	average
CASSETTE DECK	
Wow & flutter (wtd)	0.29%
Signal/noise ref 0dB Type II	n/a
Distortion 0dB Type II	n/a
COMPACT DISC PLAYER	
Signal/noise (measured at amp Tape Output)	77dB
AMPLIFIER	
Power output/channel (8 ohms)	25/30/30watts
(20Hz, 1kHz, 20kHz both channels driven)	
LOUDSPEAKERS	
Sensitivity	average

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DAT

MODEL	PRICE	FREE GIFT GIVEAWAY
SONY		
DTC750	449.99	10 DAT 120 min tapes
DTC77ES	999.99	Pioneer PD8700 CD player
TCDD3	499.99	10 DAT 120 min tapes

LOUDSPEAKERS

MODEL	PRICE	FREE GIFT GIVEAWAY
B&W		
ACT100	199.99	25% discount
DM570	169.99	—
DM600	149.99	15 metres Audio Quest solid core flat cable rec £1.99 mtr
DM610	199.99	Sennheiser HD480II headphones
DM620	299.99	TEAC TX3000 tuner
DM630	599.99	AIWA ADF410 cassette deck
DM640	799.99	Pioneer F449L tuner
SOLIDS	149.99	—
SOLID Bass Station	349.99	Mission 760i loudspeakers
OVALE	299.99	Sennheiser HD480II headphones

MORDAUNT SHORT

MS3.20	94.99	—
MS3.40	179.99	—
MS310	79.99	—
MS5.10	119.99	15 metres Audio Quest solid core flat cable rec £1.99 mtr
MS5.20	149.99	20 metres Audio Quest solid core flat cable rec £1.99 mtr
MS5.30	199.99	Sennheiser HD480II headphones
MS5.40	299.99	AIWA XT003 tuner
MS5.50	399.99	TEAC CDP200 CD
CLASSIC 20	399.99	Beyer DT990 headphones
CLASSIC 40	599.99	Pioneer A300 amplifier

MISSION

760i	P.O.A.	—
761	109.99	—
761i	P.O.A.	—
762	169.99	—
762i	P.O.A.	—
763	249.99	—
763i	P.O.A.	—
764 ex demo	299.99	—
764i	P.O.A.	—
765i	P.O.A.	—
780	P.O.A.	—

WHARFEDALE

410	99.99	—
5052 Mahogany	259.99	AIWA ADF410 cassette deck
515	259.99	AIWA ADF410 cassette deck
517	379.99	Pioneer F449L tuner
DELTA 30.2	99.99	JAMO speaker stands
DIAMOND IV	119.99	JAMO speaker stands

CASSETTE DECKS

MODEL	PRICE	FREE GIFT GIVEAWAY
AIWA		
ADF410	99.99	12 TDK SA90 cassettes
ADF810	199.99	Sennheiser HD40II headphones
PIONEER		
CT676	249.99	Sennheiser HD480 Classic headphones
SONY		
TCK420	99.99	—
TCK520	179.99	Sennheiser HD450II headphones
TCK570	169.99	—
TCK677ES	249.99	Sennheiser HD480 Classic headphones
TCK870ES	349.99	Sennheiser HD520II headphones
TCW370	99.99	—
TCWR770	249.99	Sennheiser HD480II headphones
TCWR870	299.99	Sennheiser HD480 Classic headphones

TEAC

V390	69.99	—
V3000	199.99	Sennheiser HD450II headphones
V5000	299.99	TEAC TX3000 tuner
V510	89.99	—
V7000	399.99	TEAC TX3000 tuner
V530R	169.99	Sennheiser HD450II headphones

TECHNICS

RSBX404	125.99	—
RSBX606	155.99	—
RSBX707	189.99	—
RSBX808	259.99	—
RSB965	299.99	—
RSTR212	129.99	—
RSTR232	134.99	—
RSTR333	159.99	—
RSTR515	215.99	—
RSTR555	259.99	—

AMPLIFIERS

MODEL	PRICE	FREE GIFT GIVEAWAY
AURA/B&W		
VA40	109.99	—
PIONEER		
A300	159.99	Sennheiser HD450II headphones
A300X	—	—
A400	—	—
A676	279.99	Sennheiser HD480 Classic headphones
SONY		
TAF420	169.99	—
TAF440	199.99	Sennheiser HD450II headphones
TAF540	249.99	Sennheiser HD480II headphones
TAF670ES	399.99	Mission 760i loudspeakers
TAF770ES	599.99	Mission 761 loudspeakers
TAF730ES	299.99	—
TAAV670	649.99	Mission 760i loudspeakers
TAE1000ESD	1299.99	2x pairs of B&W solid loudspeakers
2x TAN55ES	—	—
Surround kit	—	—
TEAC		
AX1000	99.99	—
AX5000	229.99	Sennheiser HD480 Classic headphones

TECHNICS

SUZ220	89.99	—
SUZ320	125.99	—
SUVX500	147.99	—
SUVX600	174.99	—
SUVX700	219.99	—
SUVX800	419.99	—

TURNTABLES

MODEL	PRICE	FREE GIFT GIVEAWAY
TECHNICS		
SLBD20	85.99	—
SLBD22	99.99	—
SLDD33	112.99	—
SLQD33	139.99	—
SL1210 MkII	289.99	—

TUNERS

MODEL	PRICE	FREE GIFT GIVEAWAY
PIONEER		
F449L	149.99	Sennheiser HD480 Classic headphones
F757	279.99	Pioneer A300 amplifier
SONY		
STS170	84.99	—
STS370	149.99	QED Pig Gold phono-plug lead
STS570ES	219.99	Sennheiser HD480II headphones
STS770ES	299.99	Sennheiser HD480 Classic headphones
TEAC		
TX3000	69.99	—

TECHNICS

STS610	89.99	—
STG470	119.99	—
STG570	155.99	—
STG70	199.99	—
STG90	279.99	—

CD PLAYERS

MODEL	PRICE	FREE GIFT GIVEAWAY
AIWA		
XC700	179.99	£30.00 worth of CD's of your choice
PIONEER		
PDS701	P.O.A.	—
PDS901	P.O.A.	—
PDS801	299.99	Sennheiser HD480 Classic headphones
QED		
Digit DAC unit	99.99	—
SONY		
CDP491	115.99	—
CDP397	139.99	£20 worth of CD's of your choice
CDP497	159.99	£25 worth of CD's of your choice
CDP597	179.99	£30 worth of CD's of your choice
CDP797	199.99	£30 worth of CD's of your choice
CDPX222ES	299.99	Sennheiser HD480 Classic headphones
CDPX339ES	449.99	Sony WMF20TB sports Walkman/radio rec £122.99
CDPX559ES	649.99	Sony STS370 tuner
TEAC		
CDP200	99.99	—
CDP3100	119.99	—
CDP450	249.99	Sennheiser HD480 Classic headphones
P500	649.99	With D500 together. 14" Sony colour TV
D500	329.99	See P500

TECHNICS

SLPG400	154.99	—
SLPG500	174.99	—
SLPG320	129.99	—
SLPG420	159.99	—
SLPG520	199.99	£15 worth of CD's of your choice
SLPS620	229.99	£20 worth of CD's of your choice
SLPS700	229.99	£30 worth of CD's of your choice
SLPS900	299.99	—

MISSION

DAD5	299.99	Sennheiser HD480 Classic headphones
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SUGGESTED SYSTEMS

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AURA A40	AIWA XC700	Mission 760i	319.99	Mission 761i or B&W DM600 or Mord Short MS5.20 add £30.00
Pioneer A300	Pioneer PDS701	Mission 760i	399.99	Mission 761i or B&W DM600 or Mord Short MS5.20 add £30.00
Pioneer A400	Pioneer PDS801	Mission 761i or B&W DM600 or Mord Short MS5.20	499.99	Mission 762 or B&W DM610 or Mord Short MS5.30 add £50.00
Sony TAF440	Sony CDP 597	Mission 761	399.99	Mission 762 or B&W DM610 or Mord Short MS5.30 add £70.00
Sony TAF540	Sony CDP797	Mission 762 or B&W DM610 or Mord Short MS5.30	529.99	Mission 763 or B&W DM620 or Mord Short MS540 add £60.00

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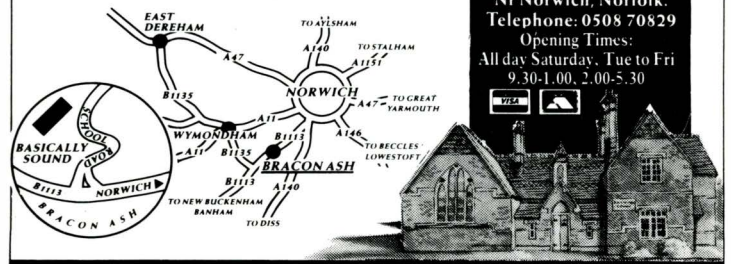
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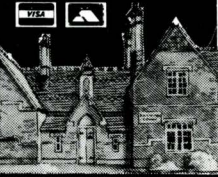
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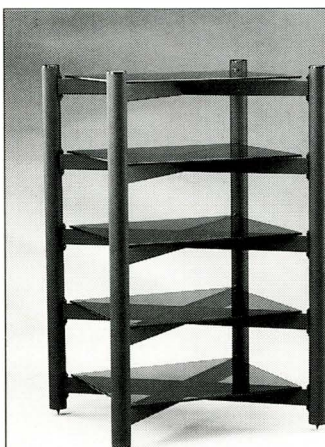
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Kenwood UD-900

Trio Kenwood (UK) Ltd, Kenwood House, Dwight Road, Watford, Herts WD1 8EB. Tel: (0923) 816 444

If you thought the *UD-500* was well endowed (see page 98), wait to you see what tricks this one has up its sleeve! The two systems are similarly styled and packaged, which means the *UD-900* is by no means an especially compact design by mini standards. But this is a more ambitious system than the *UD-500*. Paradoxically it has fewer controls, greater care having been taken over the ergonomics of the control system. This interest in ease of use doesn't, however, extend to the remote control which is about as button bound as they come and is downright badly organised and confusing to boot, even for the initiated. To add injury to insult (so to speak), many of the buttons have dual functions.

The key USP of this system, however, is neither its ergonomics nor its flight deck of Concorde remote control, but it's extensive A/V capabilities. The *UD-900* is first and foremost a Dolby Pro-Logic system. It will handle a range of video as well as audio sources, and will process suitable source material (primarily broadcast films and pre-recorded videocassettes) to produce a full cinema type soundfield through an array of two front and two rear speakers plus a centre dialogue speaker and a subwoofer in the maximalist configuration.

For those who have no desire to have speakers all round the listening room, the

Kenwood has an alternative way of doing business, and will attempt to get as close as possible to the same thing with a combination of extra omnidirectional transducers on the main speakers and digital signal processing within the system proper. Be warned though; these circuits have a more or less random effect: sometimes they sound momentarily pleasing, but usually they are a pig's dinner.

The *US-900* is available with a multi-disc player (six disc cartridge plus one drawer loaded disc), in which form the system costs a chunky £900 and is called the *UD-900M*.

C-A9L digital surround preamplifier/tuner

This is without doubt the core, heart and centre of the system, and by far its most interesting component. You will notice immediately that almost none of the controls apart from volume, balance, possibly mic mixing and the basic tuner controls — up/down tune, band and auto stereo/mono — actually make any sense without first poring through the fat instruction book.

The tuner section has a random 20 preset random capability on FM, MW and LW, with stations naming (four digits maximum) available. It worked well, the AM band sounding slightly lightweight but crisp and intelligible. Background noise levels tended to be moderate rather than low.

This unit is home to a range of DSP type effects (see loudspeakers) and equaliser functions, plus support for karaoke, including a filter to reduce the level of vocals, and a microphone mixing circuit.

An exhaustive range of timer options are available as per the *UD-500* system.

X-A9 cassette deck

Cassette deck capabilities are similar to those of the *UD-500*, and include one playback and one record/playback transport, Dolby B and C with Dolby HX Pro headroom extension circuitry, plus normal and high speed dubbing, all supported by a range of search and play features. Record bias can be set automatically (the circuit takes about 45 seconds to do its thing) and record levels are set by the Kenwood after sampling a section of the music to be recorded; a rather hit and miss method that does at least sidestep the worst effects (compression and excessive background hiss) associated with automatic record level circuits. Recordings can be made from CD with DSP modes active and in various other ways, including at twice normal play speed, or with cross-faded tracks, or even with tracks shortened so that a disc can be completely fitted in a shorter tape. The mind boggles as the music, so to speak, buckles.

Pitch integrity is a little disappointing, the

0.22 per cent wow and flutter being well within the audible range on sustained notes, and capable of affecting music adversely even when pitch variability wasn't directly apparent.

DP-A9 Compact Disc player

This 1-bit player is equipped for all normal play operations, including programmed play, random and repeat play with a full range of time and track readouts. It's intriguing to note that the top end of the audio spectrum shows a significant degree of roll-off, which may account in part for the usually sweet sound off disc, though transient impact and low level clarity are apparently unaffected.

B-A9 power amplifier

The power amp is almost devoid of gadgetry, but has digital power meters (which thankfully can be doused) and switching for an optional subwoofer, which is fed by a low level (preamplifier) circuit. Outputs are also provided for front speakers (2 by 35watt) and surround speakers (2 by 20watt). Fan cooling is employed to keep temperatures street-legal, though the fan is noisier than I'd like.



LS-A9L Loudspeakers

Although little bigger than the conventional speakers supplied with the UD-500 system, the mesh covered top section encloses an omnidirectional loudspeaker which operates independently of the main forward facing three way design. The non-directional nature of the omni speaker is used in conjunction with the forward facing section of the speaker and the main system's DSP capabilities to produce a range of hybrid modes which build on and enrich the equaliser and DSP (arena, jazz club, stadium, disco, church and others) modes available from this and other systems. The range of effects is impressively wide, and includes the facility to add 'presence' to the raw sound, be it stereo, Dolby Surround or whatever.

For 'casual, relaxed' listening (as Kenwood puts it) the omnidirectional part of the speakers can operate alone, or with the woofer to add body to the sound, and the omni speakers can be switched out of phase to give heightened feeling of stereo width; these are described as BGM mode, and Non-Directional 1 and 2 modes (see below). Dolby Surround processing itself can be performed without a centre dialogue speaker using a 'phantom' centre signal split between the main left and right hand speakers. The delay time for the rear speakers — a setting that depends on the layout of the main and effects loudspeakers — is adjustable, and a test tone for all speakers is available.

The frequency plots which were taken but not reproduced here showed that the basic response shape of the forward radiating component of the speakers was smooth and even from 50Hz to 20kHz. Other plots

run showed the effects of the various options involving the omnidirectional part of the speakers. BGM mode looked like a typical loudness curve, with a raised output at the frequency extremes, and this is how it sounded. The two non-directional curves gave a very peaky response. On the normal listening axis these peaks, which are due to phase addition effects, occur around 200Hz and 2kHz in both cases, and are fully 15dB high! Not surprisingly their influence was not a great success, and that's being very kind indeed!

How it performs

In some senses the UD-900 feels like a system that lost its way in the middle of the design process. My mental picture is as follows: Kenwood's engineers designed a very good system, in some ways not dissimilar to the UD-500. Having got this far, they then handed over to the marketing department which added all kinds of bells and whistles, entirely separate speakers on top of the original speakers for example. The speaker they've added works after a fashion, and when used with the forward facing bass driver it makes a plausible enough noise, albeit with a strongly elevated bass and treble. The forward facing speaker works too, and sounds quite decent. And here the good news endeth.

Any speaker designer with more than about five minutes experience will know that it is very difficult to make two such speakers in close proximity work at all, and the result is an unholy mess. It sounds phasy and coarse, with a hollow sandpapery treble audible from several rooms away. The person who decided this was a good idea should be forced to live with a pair for a month, because he certainly didn't before unleashing this monstrosity on an unsuspecting public.

Bad as the whole system is, I find it equally hard to get to grips with the fact that when used on its own, the front facing part of the speaker is actually quite good. The sound combines crispness, warmth and openness in roughly equal measure, and the combination is a delight with a range of material from Handel's choral music to EC's *Unplugged*. In some ways this part of the

speaker doesn't add up. It looks, feels, and, for a speaker this price, is rough and shoddy, yet it has a genuinely large-scale and generous quality — and it really makes music. The speaker is no handicap to the system as a whole, but I'm damned if I know what makes it tick.

These comments are based on the CD player, and it will be no surprise that it holds equally — or almost equally — for the FM tuner, though it is a little monochromatic and 'tight' in feel compared to the CD player. Nevertheless it worked well, making believ-

able music on good signals and weak, crummy ones alike.

Reproduction off tape was spoiled by the inherent instability of the transport which produced clearly audible signs of pitch instability time and time again through these tests, which is inexcusable for a system in this price range. This aside, the deck was a very decent performer.

The various DSP effects, although not to the author's tastes, worked well enough, and managed to avoid the trap that some other systems with DSP features fell into of offering excessively simplistic acoustics or of homogenising all the subtleties of the music.

The Dolby Pro-Logic system worked well enough too, though without the subtlety of a first rate processor.

Verdict

Here is the classic curate's egg: a system which performed much better than expected in some areas and which failed miserably elsewhere. The worst feature is the omnidirectional bit, which looks like a dog, behaves like a dog and so must be a dog, QED. Also high on my hit list are the sheer complexities of the DSP soundfield options, which are, in the final analysis neither necessary nor desirable, though they have a certain transient fun quality.

However, the cassette deck wow and flutter earns a severe black mark for a system in this price range, and makes a formal blanket recommendation unsafe. It's still an interesting system however, my advice is to play it by ear.

TEST RESULTS	
Cost with speakers	£850
without	n/a
Options	UD-900M system with multi disc player - £900
Size main unit	410x27x31.8cm(hxwx)D
Size speakers	43.6x20.5x28.5cm(hxwx)D
TUNER	
Sensitivity	high
Noise	fairly high
CASSETTE DECK	
Wow & flutter (wtd)	0.22%
Signal/noise ref 0dB Type II	n/a
Distortion 0dB Type II	n/a
COMPACT DISC PLAYER	
Signal/noise (measured at amp Tape Output)	>100dB
AMPLIFIER	
Power output/channel (80Ohms)	18/18/15 watts
(20Hz, 1kHz, 20kHz both channels driven)	
LOUDSPEAKERS	
Sensitivity	average



Panasonic SC-CH55

Panasonic UK Ltd, Panasonic House, Willoughby Road, Bracknell Berks, RG12 4FP. Tel: 0344 853 158

Panasonic is the mainstream brand name of Matsushita Electric which is also known under the Technics banner. Technics, of course, is well known for upmarket mini and packaged audio systems, including models reviewed in this issue. The Panasonic brand name is associated in the main with more downmarket equipment, of which the *SC-CH55* is typical.

There is an important difference between this particular downmarket system and the other kind which at one time dominated the systems list, and which remain an important force in the market even today. I refer of course to shoddily built and even more shoddily supported systems that you will see under a variety of second rank brand names. The phrase to keep in mind here is *caveat emptor*. For reasons which are not entirely clear, audio systems are almost uniquely variable in quality at any given price range, and the dogs are real dogs.

There's nothing wrong with the way this system is built. It is an acceptably solid piece of kit, simply but attractively finished and with well formed and smooth acting controls and a carefully sculpted fascia which looks surprisingly classy. The displays are not of top quality, but on the whole the system sustains quite close scrutiny without looking cheap or nasty, only those displays giving it a vaguely toy-like appearance.

Technics' styling department has been fairly aggressive in making the *SC-CH55* look like a vertically stacked system of separates with deep feature lines where the equipment breaks would occur, and a different gold Panasonic badge on the top left hand corner of each one. Don't be fooled. This is in fact a one-box system, with a single lead, no rear panel spaghetti and a single integrated lump of electronics internally. This system could be a music centre, and functionally that is what it is.

Compared to this system, some of the others tested in this issue look positively bloated. The equipment width is barely more than two cassettes end to end, in other words, the *SC-CH55* is a true mini.

Tuner

The tuner section of the system unit corresponds to the usual stereotypes (or monotypes, depending on the setting of the FM mode switch) with its total of 20 random access presets across three wavebands; FM, MW and LW.

Manual tuning is accomplished by a simple rotary control which feels a little rough and ready, but obvious and direct in a way that the usual up and down tuning keys are not. This control, which describes itself as AI Jog (I have no idea why), is a multi-function one which changes assignment

whenever the source is changed, as described below.

Off air performance is only moderate. The FM section is of relatively low sensitivity and selectivity, and is best suited to strong signal sites where a good quality roof-top aerial is fitted. Such an aerial will typically add £50 - £100 to the cost of an installation.

AM interference was all too audible under most reception conditions, and the sound quality had a hardness largely attributable to a loss of bass depth and warmth. Nevertheless, it will serve most purposes adequately, and it sounded quite intelligible with speech.

Cassette deck

This diminutive box of tricks houses two cassette transport mechanisms, one of which records and plays, the other being limited to playback purposes, and sequential play when the contents of one tape are played after the other without intervention. Naturally the two transports are fully auto-reverse capable, with normal and high speed dubbing modes on tap.

Control over the two mechanisms is exercised by a single set of assignable control keys, which gives a clean, uncluttered control layout. The two transports are not wholly independent: you can't (for example) rewind one tape while listening to another,

and mode engagement is extremely noisy. There is quite a lot of vibration through the system even in normal play mode which is surely relevant to the way it auditions.

Noise reduction is limited to Dolby B, and record levels are set automatically, which prevented noise or distortion tests being run. The lack of a line level output similarly made it impractical to run meaningful cassette deck (or CD player) response plots. Wow and flutter measured high at 0.21 per cent, and was audible as a rapidly shifting pitch on steady mid frequency tones.

Compact Disc player

The CD player could hardly be more straightforward to operate. It has very few controls other than play, pause and skip, though the display (which shares the tuner window) errs on the side of giving a surfeit of information, which includes a calendar style track readout. Random track access is available from the remote control, and the AI Jog control can also be pressed into action for rapid track selection.

One of the key features of most system CD players is assisting in producing tapes from discs. There are three such CD to tape editing modes. Album edit simply dumps the CD onto tape in the original running order. Fit Edit alters the track running order to minimise blank space at the end of the first side. Programme edit, finally, is the hands on mode where you choose the track running order based on a readout of the remaining recording time.

Amplifier

Power output is rated at 20watts per channel into 6ohms (the speakers have a 6ohm nominal impedance) I measured 15watts/8ohms). It is equipped with a five band equaliser with a variety of preset patterns with descriptive labels — clear, soft, vocal, heavy and so on — and a 'super bass' switch. Microphone mixing is included, and so is a karaoke switch, which reduces the level of many vocals, but which behaved unpredictably: where voice sounds remained they became curiously inarticulate, as though the singer had swallowed his/her tongue.

A record deck can be used, and the system can supply a line level feed to an external tape deck. There is, however, no line level input, which limits the flexibility of the system considerably, making it impossible to use it to reproduce the stereo feed from a hi-fi VCR for example. Less usefully, Panasonic does supply a simple matrix type surround sound facility for which the extra loudspeakers are not supplied.

SB-CH55 loudspeakers

Curiously enough, the pretty coloured brochure accompanying this system describes the SB-CH55 as a two way loudspeaker. In fact the model supplied is a three way design, built to standards perhaps slightly better than expected for a system at this price

level; ie poor instead of very poor! Styling is reasonably discreet.

The measured frequency response shape showed a rising trend over the high frequency area. The 10kHz response peak appeared to be the tweeter's main HF breakup resonance, a good octave lower than it would be with a proper high fidelity tweeter.

How it performs

In common with a number of other systems, the Panasonic system has various display modes which flash columns of LEDs



in arrangements that can be switched to produce different visual effects. My children really fell for this, and the youngest, aged five, twigged that the columns in some fashion represented the music — a remarkable discovery. I'm not at all sure I'd have made the connection, but the message is clear enough. If you have young children, the flashing display stops being an orphan and actually performs a useful function. Otherwise you might prefer the more restrained Pioneer, which disdains showiness.

The Pioneer is also a little cheaper. Well, £30 is enough to buy two or three CDs, even at the disgracefully inflated prices the music industry has awarded itself. And if the truth be told, the Pioneer is also the more musically accomplished of the two.

Musically the Panasonic has a certain flouncy charm with some material, but in the final, brutal analysis it is about as far from high fidelity as the Manchester Ship Canal is from the Côte D'Azur. Further really. It made a pleasantly full-sounding noise with some relaxed jazz guitar from Martin Taylor, but it was rhythmically slack and dynamically as squidgy as Mozzarella cheese. It was a lot less convincing with the final moments of Mahler's *First*, and I'd guess this system would not be a convincing advocate for the new or the unfamiliar.

One key objection to the sound of this system, however, concerned the treble, which was both coloured and terminally lacking in clarity. The coloration took the form of a nasal, almost honky delivery and a trace of edginess which detracted from intelligibility and which made many singers sound distinctly odd. The loss of detail was associated with a generalised blurring. Much

of the perceived weakness of this system was certainly attributable to the loudspeakers, and the coloration in particular turned out to be wholly the fault of the loudspeakers, and specifically the tweeter. The loss of information, however, was largely a function of the electronics, which, when monitored on headphones and using hi-fi speakers, had a characteristically rich and colourful but still very soft centred sound.

These comments were arrived at from listening to the CD player, and hold largely true when listening in other modes. The

tuner was electronic in character, and sounded nothing like as transparent as the CD player. The weakest source, however, was the cassette deck. Dolby noise reduction could be heard pumping behind piano transients, implying poor alignment with the tapes used (the latest TDK AD and SA formulations) and modulation noise was evident as a muddling and confusion with many types of sound. There was a sense of mutual dependency between the various parts of a mix when dubbing a piece for piano and cello (Poulenc *Cavatine* on Linn Records) where in the original the various components of the sound were much more independent of each other. Pitch

instability was sometimes audible, though its effect in reducing clarity and articulation was ever-present.

Verdict

There's no absolute rule that £400 systems have to sound like a million dollars before they get Recommended in *Choice*. It would help of course, but in this case the target was a little closer to home. The Panasonic was held up against the Pioneer *N-32* and found wanting. Even leaving the comparison aside, the Panasonic was a little too sloppy to pass muster, and while changing speakers might be recommendable with a £1,000 system where the cost would amount to say ten per cent of the purchase price, it is hardly practical with a low cost system where the cost penalty would be proportionately much greater.

TEST RESULTS	
Cost with speakers	£400
without	n/a
Options	none
Size main unit	31.9x21.5x33.8cm(hxwxwd)
Size speakers	31.9x18x25.1cm(hxwxwd)
TUNER	
Sensitivity	poor
Noise	poor
CASSETTE DECK	
Wow & flutter (wtd)	0.21%
Signal/noise ref 0dB Type II	n/a
Distortion 0dB Type II	n/a
COMPACT DISC PLAYER	
Signal/noise (measured at amp Tape Output)	>100dB
AMPLIFIER	
Power output/channel (8 ohms)	14/15/15watts
(20Hz, 1kHz, 20kHz both channels driven)	
LOUDSPEAKERS	
Sensitivity	average



Philips FW80

Philips UK Ltd, City House, 420 - 430 London Road, Croydon CR9
3QR. Tel: 081 689 4444

Philips has been involved in so many areas of audio technology, it is not surprising that the *FW80* acts as a kind of shop window for things to come. This sometimes provides some inadvertent fun, as was the case with the 'multi language user interface' which greeted me with the promise of 'SEX - 11:30' when first powered up. It was only after fiddling (hopefully) with the front panel language button that I discovered that this most famous of words is actually a shortened form of Friday in Portuguese. Why Philips doesn't simply adjust the system for its intended market isn't clear, but the system will at least appeal to Portuguese ex-pats living in the UK, and provides a convenient way of learning how to say 'Good Morning', 'Select Timer/News' and a few other essential phrases in as many as six different European languages.

The Philips has all the convenience features expected of a modern mini system; full logic operation using locally provided controls on the remote handset, auto source selection, comprehensive (and comprehensible) displays, auto tape editing from CD and more.

The *FW80* consists of a CD player, cassette deck, tuner/timer and amplifier plus speakers. Control feel is good, but assessed as a piece of industrial design, the front panel sends out mixed messages. The sys-

tem is a little button bound, which goes some way to contradicting the 'ease of use' brief that many manufacturers are finally addressing, especially given the rather artless minor control disposition. Ergonomics are partially rescued by using the remote control, and the system is fitted with Easy Bus terminals to allow linked remote control operation with other Philips components — eg a DCC deck — using the same serial interface.

FT-80 tuner

The 30 slot random access preset memory is standard fare, but some of the other features are much less so. They include automatic programming of the tuner presets (optional of course), the ability to programme station names of up to eight alphanumeric characters for the first 20 presets, the ability to assign equaliser settings for the same 20 presets (this could be really useful, for example in counteracting the forward, shouty balance adopted by some stations to attract your attention when flitting across a busy FM band), and a 'news' button which can be programmed with the frequency of your favoured news station. Philips has also arranged a special timer link which causes the news channel to 'wake up' at a preset time, overriding other inputs if necessary. Cue sales of thousands of

FW80s as executive toys *par excellence*, though it would also make a rather superior bedside alarm.

Although the system is well endowed with timers of various kinds, including two different wakeup timers with daily, weekend or weekday programming, the system is incapable of making its own unattended recordings off air, which is a silly and damaging limitation.

FC-80 cassette deck

This component packs few surprises. It has twin auto-reverse transports, one record-capable, and is equipped with Dolby HX Pro headroom extension circuitry (which comes into its own with ferric tapes), plus Dolby B and C noise reduction. The input level control is fully automatic, and track search and the usual tape editing modes are fully supported. Metal tapes, however, are not. Any metals you presently own will replay correctly, but the record circuitry and erase heads do not have the heavy duty capabilities needed for this demanding tape group. In fairness, practically none of the systems that do use metals do so in a way that justifies their additional cost. Indeed metals are a nonsense in any deck with auto level control, where the potentially lower noise floor of a good Type II (chrome bias) tape is much more important.

Electrically the deck is only a modest performer. It has little bass and a limited treble (there's little above 10kHz with Type II tape) but wow and flutter measured poorly at 0.22 per cent.

CD-80 Compact Disc player

Being a Philips player, this is of course a Bit Stream model. It is well endowed with FTS (Favourite Track selection) which recognises individual discs from their Table of Contents tracks, and applies previously assigned programmed selections, and in this system, individual nine digit alpha-numeric names and custom equaliser settings too if required. In this case, memory play, random play, intro-scan and repeat modes are all available, and CD to tape editing can be performed in a confusing variety of different ways.

FA-80 amplifier

This system has the distinction of being the first on the market with a dedicated DCC input, flagged by a prominent button on the front panel. It is only fair to point out that the DCC input is equally suitable for any tape deck, the audio part of a video deck or even a MiniDisc player, if such a mythical creature can be found. Ignoring the output side, the DCC input will also double as a standard line input. But the DCC support does not consist simply of a set of in and outputs as you might expect. There is also a digital (S/PDIF) output available from the CD player. The net result is that although the system will only play analogue sources (or digital ones which have been converted to analogue before they reach the system of course), digital recordings can be made in their native digital format from Compact Discs, which means more accurate recordings made bit for digital bit without any intervening digital to analogue or analogue to digital conversion, and also without the need to adjust record levels.

The Philips has line and phono inputs, a seven band equaliser with ten preset patterns, a separate bass boost circuit and a simple matrix type surround sound circuit. Power output, rated at 60 watts per channel, measures around 42 watts in practice. The amp also has DSP character modes, giving the effect of a stadium or concert hall, or additional presence or liveness, either through two or four loudspeakers.

Loudspeakers

The story is a simple one. Lightly built and with a surfeit of drive units — three per enclosure — these are gruesome looking designs which have the wavy, soft lines of many system speakers, and their usual scant regard for engineering integrity.

The measured response shape taken — and shape is an appropriate qualifier in this case — was a mess. The speakers measured abysmally. The bass was lacking, a rise below 200Hz was primarily due to wall rein-

forcement, and the treble was rough and peaky. Sensitivity was also lower than average. Let's move on . . .

How it performs

Scouting around for a succinct way of describing the sound of this system, I came up with 'grim,' which unfortunately fits the bill in more senses than one. The *FW80* was distinguished by a grubby, coarse treble which completely obscured whole classes of information, for example the consonants and sibilants of singers like Mary Black.



Vocal articulation on speech programming was a joke too. The bass end lacked depth (no surprise, and not perhaps the worst sin in the world), but what there was sounded boxy due to the presence of a severe uncontrolled resonance in the loudspeakers. It is difficult to overstate how awful the sound was, but I can perhaps illustrate the point by noting that more than once with speech and music programming alike I found myself checking that the radio programme I was tuned to was on FM and not AM. When a full band system like FM is indistinguishable from the peaky 5kHz response of AM radio, something is seriously awry, and CD sound quality was sadly little different.

Changing speakers to a pair of Celestion 7s (a simple £99 speaker of good performance) the main point noticed with the first formal test piece — of classical guitar — was how distant and reverberant the music sounded. With this recording (on CD), and the observation held during later tests, the sound picture was obviously compressed, lacking expression or convincing peaks and troughs. In addition the bass was thin and weedy — there was scant sense of image scale or of body and weight — and the treble coarseness remained on all inputs, indicating that it was associated with the amplifier. Rich tonal colours from woodwind and the larger orchestral basses sounded raw and fragile in tone or were completely inaudible, and the kind of kick in the gut you would expect from, say, Michael Jackson's *Thriller* came across instead as pale and insipid.

The DSP effects turned out to be very poor. They should have been able to convey something of the quality of the acoustics they claimed to reproduce without too much

loss of clarity or articulation, but this was not the case here. The effects were universally ill defined, and the qualitative losses were severe, to the point of homogenising fine detail. Neither the DSP nor the equaliser managed to overcome that initial surprising strangeness, the character that set the Philips apart from the first moment. They simply didn't change the character of the sound as much as you might have supposed, and the moral of this story I suppose is obvious enough. Once a Ford *Cortina*, always a Ford *Cortina*, however much bunting you use to dress it up.

The rest of the story is anti-climatic. The cassette deck worked well enough: it was limited at the frequency extremes and sounded less distinctive than the CD player in particular, but it didn't stick out in an intrusive way. The FM tuner is slightly dry and wooden sounding, but satisfactory. It was only the AM side that sounded seriously stilted and lacking in colour, auditioned on headphones by the way. The overall conclusion is that the speakers do the system no favours, but that a significant proportion of the problems with this system concern the amplifier. Both are clearly in need of urgent attention.

Verdict

Even operationally the system was an odd mixture. Critical controls are small and inconspicuous, and it's impossible to gain any idea about the current tape position without removing the tape for a look because there's no tape counter, and the observation windows are darkened, presumably for visual effect (in fairness this isn't the only system with this failing).

On the other hand, there aren't many systems whose CD players remember where they are following a temporary switch to another input, to cue a tape, say, or catch a news broadcast. If sound quality was to be summed up in a single word, it would be 'creaky'. The basic sound character is compressed and scrawny. The electronics are unevenly reasonable but the amplifier and speakers are a complete disaster.

TEST RESULTS

Cost with speakers	£550
without	n/a
Options	none
Size main unit	34.5x26x25.5cm(hxwxzd)
Size speakers	34.5x17x27cm(hxwxzd)
TUNER	
Sensitivity	below average
Noise	average
CASSETTE DECK	
Wow & flutter (wtd)	0.22%
Signal/noise ref 0dB Type II	n/a
Distortion 0dB Type II	n/a
COMPACT DISC PLAYER	
Signal/noise (measured at amp Tape Output)	96dB
AMPLIFIER	
Power output/channel (8 ohms)	44/42/42watts
(20Hz, 1kHz, 20kHz both channels driven)	
LOUDSPEAKERS	
Sensitivity	below average

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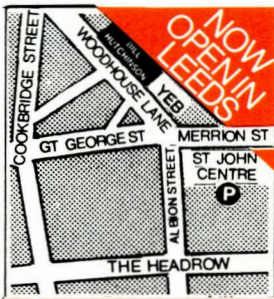
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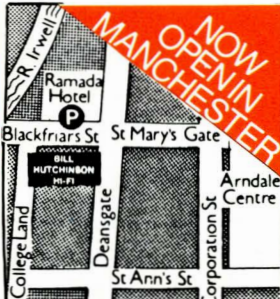
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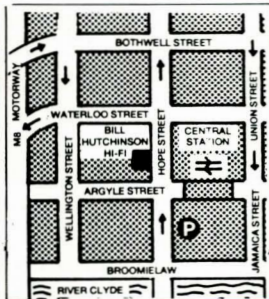
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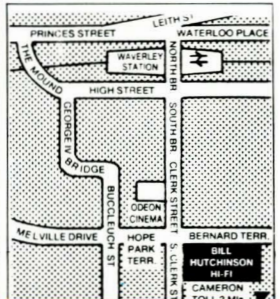
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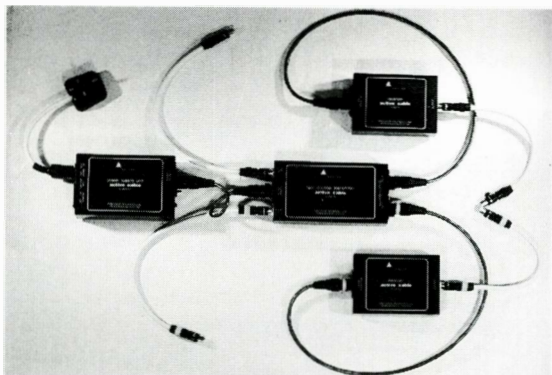


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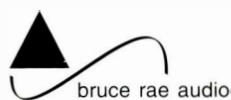


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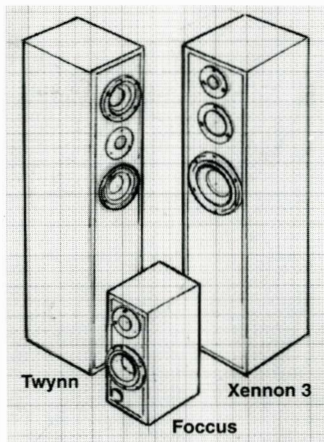
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Pioneer N-32

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At £370 (less 5p if you're being pedantic), this is the least expensive system in our survey. The nearest competition comes from the cute little Panasonic *SC-CH55* system, which I note is considerably slimmer than this one: the Pioneer, though short, is a full 4.5cm wider.

Notwithstanding the deep horizontal moulding lines and the surfeit of Pioneer badges on the front fascia, the electronics package is in fact in a single block, which has certain technical disadvantages, but certainly helps keep costs in check, and of course helps make the system much easier to install and set up. As usual, the *N-32* is supplied complete with non-optional loudspeakers and a rather dinky remote control handset, or if you prefer, palmset.

A record deck can be used with this system, but there are no other inputs, and in practice the *N-32* is more of a dead end than many who care about fidelity will be willing to accept. On the other hand, if you want something simple and cheap to make music, and if it must include all three major sources (CD, tape and radio) the Pioneer presents itself as a purposeful and sensible way of achieving this end. Even so, Pioneer's brochure scatters enough fancy technical sounding acronyms around to fill a punch bowl. One of these features, described as Smart operation, allows the user

to associate a volume level, equaliser and bass boost settings with each source. I'm not convinced this qualifies as smart at all.

Tuner

The tuner — or Tuner with Preset Stations as the coloured brochure has it in classic Chinese restaurant menu style — caters for up to 24 presets on AM or FM. In addition to the usual methods of tuning, the Pioneer has an auto-presetting mode; you press the appropriate key for five seconds and sit on your hands for several minutes while the tuner scours both bands. At the end of all this, the tuner accepted some unusable transmissions in my area, including an FM transmitter situated 85 miles away whose pilot wave only was just detectable and whose audio signal was quite inaudible. There is a scan facility which plays each preset for five seconds in turn, but there ain't no LW.

Long Wave used to be populated only by Radio 2, and therefore didn't matter. Now that its used by Radio 4, it certainly does matter.

The FM section of the tuner offers reasonable selectivity and sensitivity, though it still is best used with a good quality outside aerial rather than the ineffective ribbon dipole supplied with the system. The AM circuit was interference bound, but sounded

quite reasonable. Overall it's a serviceable enough design.

The timer function is a two stage circuit, with a sleep (timed turn-off) mode, and a separate timer which can be used as an alarm clock, or to make unattended recordings off air.

Cassette deck

The system cassette deck is a simple twin transport affair. One of the two transports is limited to playback duties and both have bi-directional (auto-reverse) transport mechanisms. All standard stuff.

Naturally at this price level, noise reduction circuitry is limited to Dolby B, and record levels are set automatically. Recordings can be made on Type I (normal or ferric) and Type II (high or chrome bias) tapes. The contents of a tape can be dubbed onto another tape in real time only: the low quality high speed dub mode has been omitted. CDs can also be dubbed onto tape, with tracks recorded across the side break restarted from the start of the second side.

The auto-level control prevented most of the usual measurements from being made, because the 0VU point varies with signal content rather than being fixed, and all the measurements and the frequency response plot are measured against this point. Wow and flutter was measured however, and

turned out to be rather better than expected at 0.14 per cent.

Compact Disc player

Driven by a 1-bit DAC, the CD player conforms to a conventional enough pattern. Selecting CD throws a calendar type track list into the display window. Track search modes include intro-scan (renamed as Hi-Lite by Pioneer), in addition to the usual random, repeat and track programming modes.

No output response plot is shown due to the lack of a line level output from the system.

Amplifier

Power output is officially rated at 28watts per channel for a high five per cent distortion level, which on test checked out at 18watts per channel. I found the minor features of this amplifier curiously obscure, and without a great amount of flexibility. The Pioneer includes simple bass and treble equaliser patterns and a stereo wide position, in addition to which there are three preset sound patterns: Disco which applies bass and treble boost, Hall which adds reverberation to the raw sound and BGM which adds a stereo wide effect to a response shape with reduced output at the frequency extremes.

Loudspeakers

The loudspeakers work hand in hand with the bass boost circuitry in the system amplifier to provide a larger, deeper sound than would otherwise be had from speakers the same size. Otherwise there's little of interest in this compact loudspeaker. To say it is not very well built is nothing less than the truth, but it is no worse than par for the course at this price level.

There is little in the way of real bass from this speaker, which is best used with its back to the rear wall, but the midband and treble show a more or less neutral energy trend, without any obvious signs of in-band nasties.

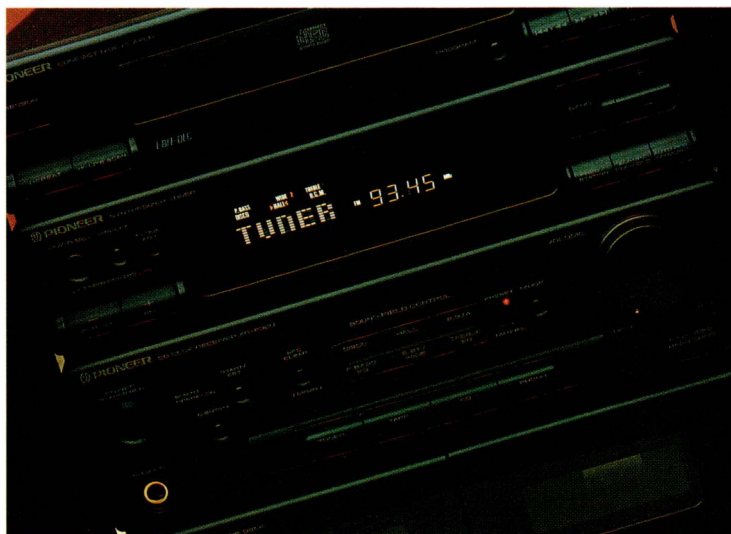
How it performs

Nice. This is a word that is often criticised for not having a well defined meaning, but it is wholly appropriate in this case precisely because of its overall blend of mild virtues. Objectively though, there isn't a great deal here to cause the heart of a dyed in the wool audiophile to beat faster. The system has an overall level of competence from each of its inputs that is both gratifying and even a little surprising for a model costing only £370.

This reflects particularly well on the cassette deck, which is traditionally the weakest of all system components. It was the weakest in this case too, but not quite to the usual extent. Of course there's only so much that any low end all-singing deck like the one fitted here can achieve. The use of an auto level control is not a good start (though it could be described as an inevitable one), but

the compressors work reasonably unobtrusively. You will notice the additional level of grunge and noise in quiet sections and between tracks as the input level is racked up, and the restraint during louder passages as the level is held back, but it is often done more crudely elsewhere.

More importantly, pitch integrity appears to be just good enough to pass without comment most of the time, though some rapid fluctuations were occasionally noticed. On the whole though, tapes dubbed from Compact Discs sounded pretty good, and



prerecorded tapes sounded — well they sounded as good as prerecorded cassettes usually sound.

The tuner and CD player worked well. Given a reasonable strong signal (over about 500µV tested with a laboratory FM generator) FM reception was strong and lively over a wide frequency range and gave good, strong dynamics. The tuner sounds comparatively unprocessed, and the odd Radio 3 concert sounded almost tactile, at least when auditioned on good quality headphones. Below 500mV, noise gradually built up, and so did the presence of synthesiser whistles and 'birdies,' but no more so than with most low cost systems, which are always at their worst with weak signals.

The system was at its best, however, with Compact Disc. This was no surprise; CD is a great leveller, and is adept at providing the lean, clean kind of signal that allows inexpensive systems to show their best sides, while using the shortcomings of such systems to disguise their inherent differences. The system has just the right degree of openness and warmth to work well with Compact Disc, and the CD player helped wake up a system that otherwise tended to sound a little too soft and lazy.

The speakers have been quite artfully designed. Without stepping outside their obvious limitations as defined by construction and size, they still sound warm, clean and involving, if somewhat undifferentiated in the midband and soft at the frequency extremes. Even so, their neutrality and relative transparency made them sound much less intrusive than usual. The contrast between these speakers and the ones supplied with the Panasonic SC-CH55 (system

cost £400 - see review on page 104) was striking. Both have roughly similar limitations, yet Pioneer has managed to disguise them more effectively, and simultaneously make the most of their strengths. As noted earlier, there may be little here to excite the audiophile, but there is little here to cause offence either.

The programmed equaliser modes failed to add anything useful to the system. In virtually every case the spectrum modes tended to add what sounded like coloration, and more importantly, made the system sound less airy and open. Even when used 'flat' the system lacked openness, and mucking around with the frequency response seems to be enough to spoil what little there is of this characteristic.

Verdict

At the price, the Pioneer is clearly Recommended. The N-32 meets any reasonable brief for a sub £400 system. Flexibility is not its strong suit, and it rarely rises above entertainment standard in its pursuit of the substance at the heart of the music it is playing. Compared to other low cost midi systems, however, the N-32 overcomes many of the rough edges. The treble isn't very

detailed, but it isn't aggressive or coloured either. Similarly the bass isn't deep, but it isn't obviously lacking, what's there is nicely controlled, and the overall frequency balance is attractive and reasonably neutral; or at least it doesn't overtly favour one part of the frequency spectrum over the others. None of the source components attains any great heights of fidelity to the original either, but they are reasonably evenly matched — which is a tribute to the cassette deck in particular — and in combination they don't grate.

There is one significant disadvantage to this system however: the lack of Long Wave. In any situation where the same programme is available on FM, LW should be regarded as third best, but there are times when LW carries its own programming, and if the Radio 6 new service happens as promised, LW will become of vital importance.

TEST RESULTS

Cost with speakers	£370
without	n/a
Options	none
Size main unit	31x26x29.5cm (hwxwd)
Size speakers	31x18x20.6cm (hwxwd)
TUNER	
Sensitivity	average
Noise	below average
CASSETTE DECK	
Wow & flutter (wtd)	0.14%
Signal/noise ref 0dB Type II	n/a
Distortion 0dB Type II	n/a
COMPACT DISC PLAYER	
Signal/noise (measured at amp Tape Output)	95dB
AMPLIFIER	
Power output/channel (8 ohms)	15/18/18watts
(20Hz, 1kHz, 20kHz both channels driven)	
LOUDSPEAKERS	
Sensitivity	average



Technics SC-CH900

Panasonic Consumer Electronics UK, Panasonic House, Willoughby Road, Bracknell, Berks RG12 4FP. Tel: 0344 853157

Here is a system with altogether greater aspirations than most packaged units, even when held up against others at the same price point. It starts life as a mini system like any other, with a built-in twin cassette deck, CD player and radio tuner, but its ambitions roam much wider. In common with an increasing number of packaged systems, the Technics has facilities for surround sound operation using extra speakers. However, this is no standard matrix (Hafler type) circuit which sprays the out of phase component of the normal stereo feed around a pair of speakers at the back of the listening room.

The Technics circuit is a full Dolby Pro Logic implementation, which makes this system a good starting point for those who are interested in home theatre. In a typical installation, the Technics will be fed the audio output of your stereo hi-fi video cassette recorder, and of your Nicam stereo TV, and will process them accordingly. In the case of most TV transmissions this will mean normal stereo of course, but in the case of broadcast movies which carry Dolby Stereo coding, and the majority of prerecorded video cassettes made since *Star Wars*, it will be processed to provide full wrap around sound.

To make this all work you will require some extra hardware. All the signal process-

ing circuitry is built into the system, but you will need a centre dialogue speaker, which reproduces speech from the centre front. The centre channel output is provided at low (line) level, and a self powered speaker with its own built-in power amp is required, and available in the smoothly countered shape of the *SB-AV30*, which is included in this test. In the absence of a dialogue speaker, a so-called 'phantom' centre channel can be generated and fed to the two remaining front loudspeakers.

Also required is a pair of rear channel (effects) loudspeakers, and I used a dedicated Yamaha called the *AST-SE10*.

The system is high tech down to the soles of its cute little feet, and makes sure you know all about it through an imposing control count and acres of complex readouts. The Technics must take some kind of record for the proportion of fascia 'land' given over to fluorescent displays.

It has a number of novel features, such as a CD player which is hidden behind the tuner display, but is not built for those shy about the more overt manifestations of modern technology.

Build standards are excellent of the type, and it is pleasing to find that all the electronics have been crammed into a stack measuring just 23cm wide. The *SC-CH900* can truly be called a mini among minis.

SL-CH900E CD player/tuner

Yes it does both, though after a very brief look you might reasonably conclude that it is just a tuner. In that role it receives on FM, MW and LW, and will store 30 frequencies, though not in true random order. As a CD player, the *SL-CH900E* operates strictly as a transport, feeding a TOSLINK optical output socket, which allows further digital signal manipulation without any further processing. A number of tape editing controls are also included on this unit's fascia.

RS-CH900E cassette deck

Like the CD player, the cassette deck loading door is disguised behind a single piece full width flap, and the design is undeniably pretty. Both transports have auto reverse mechanisms, just one of the two being equipped for recording, and noise reduction is Dolby B and C, with HX Pro headroom extension circuitry. These basic capabilities are supported by twin electronic tape counters, normal and high speed dubbing, track search and a full range of CD to tape editing capabilities. Much more unusual is the built in tape alignment, which in a funnily slow 60 seconds (approx) adjusts equalisation, bias and sensitivity to match the individual tape sample to the machine with some precision. All three tape groups — IEC Type I, II and IV — can be used for

recording. Record levels are set automatically, but stay constant when set. All the ingredients of a good cassette deck in fact, especially when account is taken of the well tailored frequency response. Well tailored, that is, apart from the region below 100Hz which suffers severe head contour (geometry) effects. The real problem, however, is with the unit's gross wow and flutter which measures no less than 1.4 per cent, and is quite unacceptable. The playback transport suffered more or less equally, which suggests this is not a sample related problem.

SU-CH900E amplifier

This unit has a power amplifier capable of 50 watts per channel, and a further five watts for the surround channels according to Technics; the measured figures for the front channels are in the right area. The preamplifier, however, is completely different, all processing being performed in the digital domain. Digital sources (the CD player, and any outboard digital hardware) can be accepted in optical form and processed by the SC-CH900E processor digitally, being converted to analogue at the input of the power amp. In principle this means a cleaner sound with more nearly ideal processing characteristics, but everything depends on the details of the implementation. Other inputs are converted into digital form first, and reconverted into analogue at the power amp, which is less than ideal because of the additional complication.

Additional inputs include phono and tape/DAT (or DCC, MiniDisc etc), plus three optical inputs and a monitor output. The analogue circuitry is paralleled by composite video in and outputs.

SH-CH900E stereo sound processor

This is the home of the Dolby Pro-Logic decoder, which has all the features expected of the breed except that the dialogue channel output is at low level, as explained above, and requires an amplifier and speaker rather than just a speaker. The only other departure from normality is that there is no subwoofer output. Subwoofers are not essential in surround sound systems, but the omission may prove restricting in the long run.

The SH-CH900E also functions as a digital equaliser and sound field generator. In the latter mode it will reproduce the effects of a church, stadium, theatre, hall, disco and a place called 'live.' As an equaliser it claims to be parametric, which means it should provide full control over the centre frequency and Q of the filter. In fact control over both is very limited, and there are only two discrete areas of action — the bass and treble — and a maximum of three points of action in any one spectrum shape.

Finally, the processor has a set of facilities for karaoke, with additional reverberation/echo to cover up any deficiencies in the added vocals. All processing is carried out in

the digital domain. Not a lot of attention was paid to the karaoke facilities, but of all the systems that had a karaoke facility, the Technics was the one that worked best and that offered the greatest flexibility. Even so what it did to the music was often unintentionally comic.

SB-CH900 loudspeakers

Impressively heavy and well built, this system employs three simple though highly finished drive units, which represents an unnecessary (and probably marketing-led)



complication. On test the speakers had a rather rough and ready appearance, though the overall frequency trends looked reasonable. Well that just shows what the numbers know . . .

How it performs

The amplifier was not wholly trauma free. During the test programme it became apparent that it could go unstable under certain conditions, producing sub-harmonics (lower frequencies) when fed certain test signals. At first it was hard to see what impact this would have on the music, but I subsequently discovered that the system behaves inconsistently as the volume level is changed, and that it really only came into its own at low levels, and especially when driving headphones (the standard Sennheiser HD560 Ovation II used throughout this test project). Under these conditions the FM tuner and to a slightly lesser extent the CD player had an exquisitely refined quality, with a tremendous amount of detail and a strong sense of imagery with layers behind layers of sound. The Technics gave a strong account of the complexity of real life music, and it was used for a considerable period in this form with very good results.

Open the taps, however, and the sound acquires a peculiarly distant tone and an unyielding quality that could be interpreted as hardness. This could be to do with the digital processing, and is certainly the kind of sound with which digits are popularly associated. In reality, however, plenty of digital hardware manages to overcome such limitations, and the explanation — though not the effect — remains open to question.

There are problems with the loudspeakers, which add considerably to the amplifier's woes. They lack openness and warmth, and their treble quality is a little coarse. But the speakers are not the weakest part of the system. That accolade goes to the cassette deck, which is simply unacceptable. Playing a recording of Handel's *Eternal Source of Light Divine* (Hyperion) made from the Technics CD player, I found that the exquisite trumpet part, which is played very straight, acquired a strong warble as though played through a Leslie on speed, and the spine

tingling effect of the music was killed stone cold dead. The second transport performed similarly, and although there was some variation along the tape (all new premium TDK samples by the way) and between the two directions of travel, the problem was always apparent to some degree. Even with music that didn't allow the flutter to show up in such an overt way, the coarseness and lack of fine structure to the sound off tape were all too obvious.

Only with prerecorded tapes did the sound begin to score a little more convincingly, and this only because the replay flutter is lower than the record/replay flutter. I suspect that the intrinsic quality of prerecorded tapes conceals a lot of otherwise damning evidence.

Verdict

There is some fine, innovative technology in this player which almost pays off. The Dolby Surround package is more than acceptable, matching and slightly exceeding the performance of the Kenwood UD-900 system when used with the same speakers (the self-powered dialogue speaker, on the other hand, sounded a little too coarse and intrusive to blend into the system seamlessly). The DSP effects were interesting, varied and largely effective if you like that kind of thing, but Panasonic has slipped up on the easy bits; the grubby sounding loudspeakers, and above all the cassette deck. A little more development and this system could fulfil its evident promise.

TEST RESULTS

Cost with speakers	£800
without	n/a
Options	Self powered centre speaker: SB-AV30 - £150 Rear surround speakers: SB-S30A & AB-S70.
Size main unit	83.2x23x29cm (hwxwd)
Size speakers	38.4x21.4x27.3cm (hwxwd)
TUNER	
Sensitivity	good
Noise	good
CASSETTE DECK	
Wow & flutter (wtd)	1.40%
Signal/noise ref 0dB Type II	n/a
Distortion 0dB Type II	n/a
COMPACT DISC PLAYER	
Signal/noise (measured at amp Tape Output)	>96dB
AMPLIFIER	
Power output/channel (80hms)	45/45/40watts
(20Hz, 1kHz, 20kHz both channels driven)	
LOUDSPEAKERS	
Sensitivity	below average

THE LISTENER

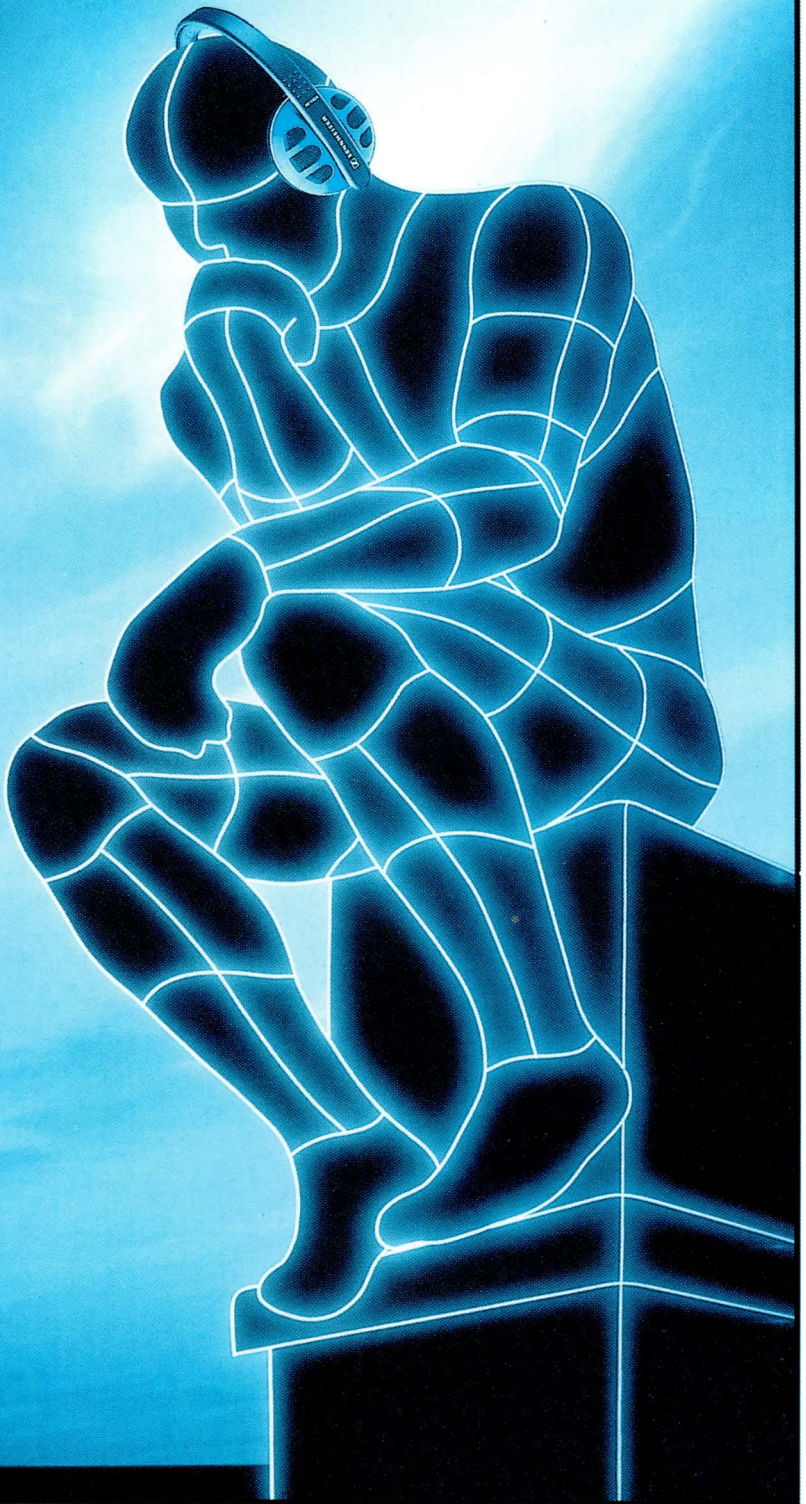
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Conclusions, Best Buys & Recommendations

Blanket judgements on a product category as broad and deep as mini systems are dodgy. There is too much variation in the market, and even with nine systems it is possible to be accused of not providing a representative cross section. Be that as it may, the conclusions seem to me to be mixed, with cause for cheer and discouragement in roughly equal measure.

Some general points did emerge. It seems as though shrinking the electronics has not done much harm to system performance, except in the case of the amplifiers. Some indication of the nature of the compromises involved is that more than one of them required fan cooling, which is an inelegant and messy way of dealing with the heat dissipation problem. The small diameter fans mini system makers are forced to use for space reasons run relatively fast and are not especially quiet. There are also potential reliability problems. In more general terms, the amplifiers used in these systems often had plenty of raw oomph, but in a relatively narrow band of frequencies, leaving

Still feeling unsure of which model to go for? Alvin Gold highlights the CD-based mini systems that impressed him the most from this month's collection.

the deep bass in the cold. In an apparent (and doomed) attempt at compensation, several of the systems had quite large speakers that made no concessions to the compact packaging of the electronics. Some of the systems also provided special bass boost circuits, but the combined effect of these measures was, on the whole, depressingly familiar. Bass output was boosted, but often the boost was applied to the upper bass rather than the real floor-shaking stuff below about 50Hz, with the result that the region sounded uneven, with clear reductions in tunefulness and control.

The elaborate 'character' tone or acoustic control circuits also turned out to be paper tigers on the whole, though there were important differences from one model to the next. These circuits are designed to work in the heart of the frequency band, which the ear is especially sensitive to, and their influence in reducing detail, and sometimes stereo image depth and dynamics, tended to be particularly obvious.

The A/V capabilities built into some of the amplifiers stands then in the same kind of relationship to full no-holds-barred home cinema as the audio side does to real high fidelity. It just isn't as good. Again, however, there was a range of abilities on offer, from quite good to barely usable. The models with Dolby

Pro-Logic worked well, but one of the systems used the older and less effective Dolby Surround (ie non-Logic) system, which is practically defunct in the larger market. Presumably the manufacturers involved have made the calculation that system buyers aren't discriminating or knowledgeable enough to distinguish axle grease from butter.

Easily the most satisfactory all rounder of the group of nine, and the only official Best Buy, was the Denon *D-70*. It scored in several ways, but above all it was because the manufacturer has resisted the pressure to include everything bar the kitchen sink. Driven perhaps by a need to stand out from the crowd, the Denon has a single cassette deck where others have two, it has optional speakers where others require you to buy speakers and then dispose of them if you want to extract anything approaching the maximum potential from the electronics. The Denon also lacks the superfluous electronic bells and whistles that characterise most of the remaining systems, contenting itself instead with a comparatively simple set of tone benders and other controls. Finally, it actually looked the part. It's smooth, svelte lines and clean, largely button-free facia will do much to alleviate technofear.

In addition to this solitary Best Buy, three solid Recommendations can be made, in ascending order of price, the Pioneer *N-32* (£370), the Kenwood *UID-500* (£550) and the Akai *MX-950* (£749). The Pioneer is a one box system (that is the electronics comes in one box, you still get a pair of speakers which as usual should be used well away from the main system unit). Although it hardly scales the summit of high fidelity achievement (how could it at this price?), it has several virtues, not the least of which is a degree of balance in the various sources. The Marantz *UID-500* offers more of the same, upgraded in line with its higher selling price, though I was a little perturbed to note the complete absence of support for those with records. You can't even connect your own record deck.

The Akai puts that to rights with an unusual mixture that included a twin recording cassette deck and good electronics all round, let down by another awful set of loudspeakers. Note the Rega record player option; this is real class!

Although cassette deck wow and flutter and poor loudspeaker performance preclude formal commendation, the Technics *SC-CH900* points the way to what can be achieved in certain areas. The DSP based preamplifier topology is going to become much more common, and provide yet more complex and probably incomprehensible means of tweaking the music, and the integration of audio and video capabilities is about as good as they come. If you're willing to trash the speakers and you're not too concerned about the cassette deck, you should lend it an ear; and an eye.



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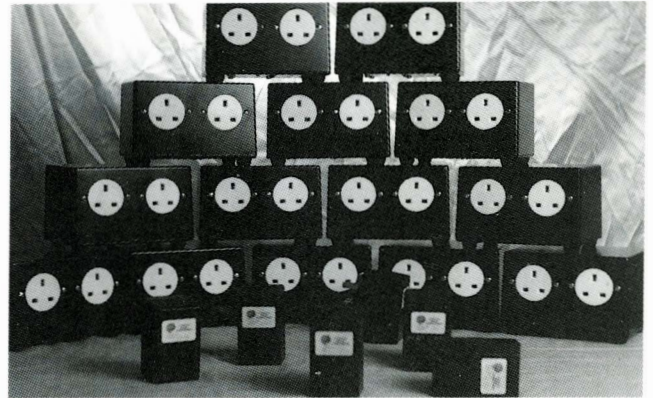


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The Purifier £16.90 per pair

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 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.

Nagaoka Anti-Static Record Sleeves no. 102 £6.99

Packs of 50 plastic record sleeves that can be used on their own or inserted into an existing card or paper sleeve.

The sleeves 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 you've got, after all there may never be a format to beat it!

Mk 10 Carbon Fibre Brush with Velvet Pad £9.99

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.

System Cleaning Kit 1 £15.99

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.

Milty Work Mat £7.99

The Milty Work Mat is a large rubber mat that has been designed to support records, Laser Discs and CDs when they are being cleaned. It's covered in 1mm long tentacles which gently grip the disc during cleaning. The nature of the material ensures that no static is induced and dirt falls between the tentacles. It's a real boon to disc cleaning and makes using cleaning brushes and solutions completely painless.

Technics Auto Compact Disc Cleaner £39.95

The Technics RP-CL300 is a powered wet/dry CD cleaner that can be run off batteries or the

Our Mail Order Section this month features, among the old favourites such as Furukawa 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.



mains. It works by rotating the disc and applying the wet cleaner first (cleaning solution is supplied), then reversing the direction of rotation and dry cleaning the disc. The whole process takes just 40 seconds and a set of batteries should clean 80 discs

Kontakt cleaning solution £19.90

Kontakt is a two stage contact cleaner for all audio and mains connections. All connections are susceptible to

oxidisation and dirt which impairs electron flow and thus affects sound quality. Here's what PM had to say when he tried some out; "The effect on the power amps was so astonishing I had to do the whole system. By the time I was finished it was utterly transformed. Timing and coherence were back with a vengeance; surface noise and coloration were both much less audible and the soundstage liberated itself from the boxes".



Newnes Audio and Hi-fi Engineer's pocket book (second edition) £10.95

This useful little book covers a wide range of audio topics with concise explanations to clarify the information.

It covers everything from turntables and cartridges to DCC and DAT with as much technical information as the mere mortal could wish for.

If you really want to know what makes your CD player tick and aren't afraid of the odd wiring diagram or equation this is the book for you.

The Art of Digital Audio - John Watkinson (revised reprint) £49.50

This book describes all of the essential theory of digital audio, and a good deal of practice, but it is not a history book. Nor is it a conventional textbook, largely because such things have to choose a target audience and stick to that academic level.

The need for understanding in digital audio is too wide and the subject is too interdisciplinary for that. As you can imagine this is a comprehensive tome that covers all aspects of digital technology including disc drives, rotary and stationary head recorders and even interconnects. It is a must for anyone wanting to get fully acquainted with the subject.

Audio Technica CD lens cleaner AT-6078 £16.95

The focusing assembly for the laser head of a CD player is a very delicate affair and yet it requires cleaning from time to time.

Rather than fumbling about with cotton buds we would suggest you employ an A-T lens cleaner. This is a standard size disc with eight tiny brushes set into it. To use, just apply a drop of cleaning fluid on one of the brushes, place the disc in your player and press play.

Ten seconds later, hey presto, a clean laser assembly, and cleaner sound from your CDs as a result.

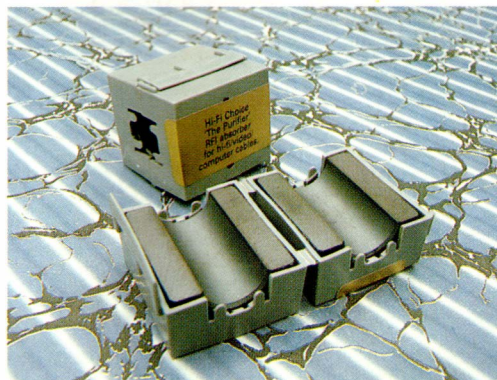
Gold plated 4mm banana plugs £7.95

Top quality solderless gold plated banana plugs for use with speaker cables. Simply push the speaker cable into the body of the plug and tighten for a perfect connection.

This Furukawa plug accepts cables up to 4mm in diameter. Sold in packs of four.



Top left: A selection of accessories from the Last range. Top right: The Hi-Fi Choice Purifier. Left: Furukawa banana plugs.



This month we are pleased to introduce the Last range of cleaning and protection fluids and accessories.

Last SF-100 Extra Strength Record Cleaner £19.95

Last SF-100 is designed to remove the compounds left over from the pressing process. Use for a first cleaning of new records as well as to revitalise older vinyl.

Last SF-200 Record Preservative £21.95

Without going too deeply into the technical details, Last SF-200 is absorbed into the surface of the vinyl and stabilises the vinyl to prevent gouging and fracturing of the groove wall that can occur during playback. A single

application can keep records sounding 'brand new' for 200 plays or more.

Last SF-300 All Purpose Record Cleaner £15.95

The one to use to for day to day cleaning after your records have been cleaned and protected with SF-100 and SF-200.



In order to let you try out the Last record cleaning and protection system we

have negotiated a special price to enable you to purchase a full size bottle of both the extra

strength cleaner and the preservative for just £34.95. We have also secured a limited number of trial samples of all three products which are available at only £21.95 but as stocks are limited we must restrict this offer to one sample kit per reader.

Last SF-500 Stylus Treatment £13.95

As the stylus is the point at which the music enters the replay system it is essential that it is kept clean. Last SF-400 will remove even the most stubborn deposits, yet, when used correctly, will not damage even the most delicate of stylus assemblies.

As well as products to protect and clean your record collection, Last also makes a range of products intended to perform the same service on your Compact Discs.

The SF-600 CD Cleaner and protection kit consists of a special CD cleaner/polish — to remove dirt, scratches and finger prints from CDs — as well as protective shields, an applicator, an application base and a brush. The cleaner/polish is also available separately.

**CD cleaner and protection kit £17.95
Cleaner only £13.95**

Improve the sound of your hi-fi 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.



Furukawa cables

We have a variety of interconnects and speaker cables on offer, all sourced from respected Japanese specialist Furukawa and all of which were rated as either Recommended or Best Buys in our comprehensive cable surveys in July and August. For those of you interested in reading more about these cables copies of our guides to both loudspeaker cables and interconnects are available from our back issues department. We are able to supply a variety of lengths, please see the order form for prices.

Speaker cables

Furukawa FS-2T14

Cheapest of Furukawa's Evencap range, this PCOCC cables was rated a Best Buy because of its "natural sense of dynamics and scale".



Furukawa FS-2T20P

Consisting of some 80 PCOCC strands 20P was praised for its "lively and engaging presentation" and was considered to be "taut, detailed and well controlled".



Furukawa FS-2T35P

Similar to 20P, but with 140 strands arranged in seven bundles, this cable was rated "a real corker".



Digital Interconnects

Furukawa FV-1010

75ohm PCOCC digital interconnect which earned Recommendation for its good sense of depth and quality of construction.



Furukawa FO-1110

Voted a "must for 'optical only' transports" 1110 employs a PMMA fibre. Glass and multi glass versions, the FO-1210 and FO-1310 respectively, are also available and both merited Hi-Fi Choice Recommendation.



Analogue Interconnects

Furukawa FD-1010

One of Furukawa's 'unbalanced' coaxial range, manufactured from PCOCC and intended for use between the analogue output of a CD player and the preamplifier.



Audiophile Recordings

This month you don't have to take our word for the quality of these recordings as you can listen to a selection of them on your free CD. If you like what you hear and want to explore further we are pleased to be able to offer a selection of recordings 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, Tubulung.

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 Tubulung.

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.

1987 Grammy Award nominee.

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.*

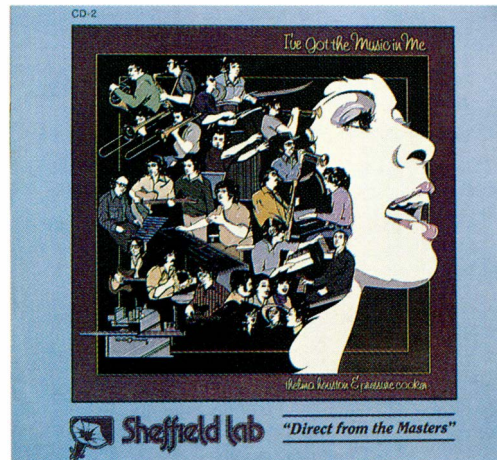
Jim Walker on flute and Mike Garson on piano from the jazz group 'Free Flight' offer something peaceful and soothing for those quiet moments. Surpassingly natural sound.

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, ingrating works by Vivaldi.

Featured solo artists are Japp Schroeder, Stanley Richie and Linda Quan.

Recorded at the John Harnes 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 - Neilsen: 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.

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.

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.

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* pushes dynamic range to its furthest limits.

C O P L A N D

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ORCHESTRATED BY THE COMPOSER - FIRST RECORDING - MARNI NIXON, SOPRANO

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KEITH CLARK - PACIFIC SYMPHONY ORCHESTRA

A PROF. JOHNSON DIGITAL MASTER RECORDING

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 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 Laceyfield, Michael Garson has put together a tasty program of exciting mainstream acoustic jazz.

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. 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, give a 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.

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.

Features the first stereo recording of a rare piece by Paul Bowles.

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.*

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.

Nojima: *Nojima Plays Ravel. Miroirs: Noctuelles - Oiseaux tristes - Une baroque sur l'ocean - 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 Nojima performances are simply incandescent.

Opus 3 test record 1: Depth of image.

Produced with the idea of analysing hi-fi systems and their ability to reproduce depth of image.

Opus 3 test record 2: Timbre.

Timbre or tonal accuracy is a crucial area of performance for audio equipment, this disc is composed of tracks designed to show up the timbral strengths of the components its played through.

Opus 3 test record 3: Dynamics.

Carefully chosen extracts to illustrate what is meant by musical dynamics with comprehensive liner notes to show you what you should be listening for. How good is your hi-fi system?

Opus 3 test record 4: Depth of image, Timbre, Dynamics.

Combining elements from all three Opus test discs to form a basis for completely evaluating all aspects of audio equipment performance.

Thelma Houston & Pressure Cooker: *I've got the music in me - To know you is to love you - Don't misunderstand - Got to get you into my life - plus four instrumental tracks.*

One of Sheffield Labs' most famous recordings. The original direct cut has been out of print for many years and is now highly collectable - but the recording sessions were of course taped, and this issue will still blow your socks off!

Eileen Farrell: *Sings Johnny Mercer Skylark - I remember you - Early Autumn - Laura - I thought about you - Too marvelous for words - and more.*

Arranged by Manny Albam and Loonis McGlohan, this album includes rarities and favourites from the vast catalogue of America's most poetic and prolific lyricist.

Jim Brock: *Tropic affair Pass a grill - Ladies of the Clabash - Tropic affair - Anya - Quo qui's groove - Side walk - Palm palm girls - O vazio.*

Vibrant, steamy and sensual, this stunning contemporary instrumental jazz recording contains more than just a touch of the tropics.

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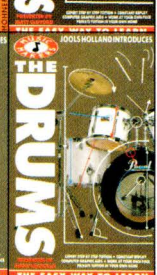
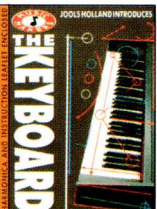
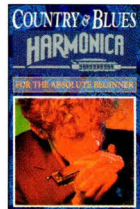
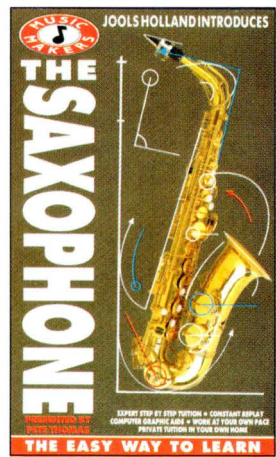
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R LEWIS & CO LTD, 45 High Str, Stroud, Gloucestershire GL5 1AW. (0453) 762485/9. Bang & Olufsen, Denon, Quad, Mission, Mordaunt-Short, Pioneer, Sony, Technics, Yamaha, Celestion etc. In store dems, free install, service dept. Access, visa. Open 8.30-5pm 6 days

HAMPSHIRE

AUDI O T, 4 Feathers Lane, Basingstoke, Hants. RG21 1AS. (0256) 24311, Fax (0256) 24430. Great hi-fi from Linn, arcam, Audiolab, Cyrus, Denon, Linn, Merideian, Mission, Rotel, Yamaha and many more. Mon-Sat 9.30-5.30pm. 3 yr gntee on Hi-Fi. Free del & instal. 30 day upgrade scheme. Home dems. PX. Single speaker dem room. Free del. and instal.

BADA
HAMILTON ELECTRONICS, 35 London Rd, Southampton, Tel: 0703 228622/3 Fax: 0703 332141. Hi-Fi and Surrouned Sound and theatre Specialists. Harman Kardon, Marantz, Denon, QED, Tannoy, Celestion, Thorens, B&O, Boston, Quad, Aiwa, Technics, JBL/Heco. Studio Demonstration. No appts nec, Free Install, Full service and installation facilities. Open 9-5:15pm Mon-Sat.

The Choice Dealer Directory

HAMPSHIRE AUDIO LTD, 2-12 Hursley Rd, Chandlers Ford. (0703) 252827/265232 Quality CD and analogue agencies. 5 dem studios. Large free car park. **BADA**

JEFFERIES HI-FI (Portsmouth) 29 London Road, Portsmouth PO2 0BH Tel: 0705 663604. 2 Dem Rooms, closed Mondays. Late night Wed, Free Parking Bus route. Credit facilities. **BADA**

TRU-FI SOUND & VISION, 10-12 Grosvenor Road, Aldershot, Hants. Tel/Fax: (0252) 26390/332424. Aiwa, Audio Technica, B&W, Nakamichi, Mission, Mordaunt-Short, Nagaoka, Sony, Technics. Dem fac. Free install. Service dept. 0% finance. Access, Visa. Mon-Sat 9.30-6.

HEREFORDSHIRE

ENGLISH AUDIO, 95 Whitecross Road, Hereford HR4 0DG. (0432) 355081. Musical Fidelity, Arcam, Pink Triangle, Denon, Marantz, Mission-Cyrus, Tannoy, Rotel, NAD, Nakamichi, TDL, and others. Single Speaker Dem room. Home trial. Free install. Service dept. Access, Visa, Credit arranged. Open Mon-Sat 10am-6pm

GOSPEL MUSIC AUDIO, 32A High St Kington, Herefordshire. (0544) 230254. New Shop open: Castle Video, 1 Spa Centre, Station Crescent, Llandrindod Wells (0587 824 0200) Alphason, Alison, Revolver, Luxman, Yamaha, QED, Audio Systemline, Wharfedale, Jamo, Micromega. No appts nec., home trial facilities, service dept. -5.30 +evening dems.

HERTFORDSHIRE

ACOUSTIC ARTS LTD, 101 St Albans Rd, Watford, Herts. (0923) 245250 Fax (0923) 230798 Absolute Sounds, Acoustic Energy, Audiolab, Denon, Marantz, Meridian, Quad, Ref Imports, TDL, Teak, Tues-Sat 9.30-6:00. **BADA**

RADLETT AUDIO, 141 Watling Street, Radlett, Hertfordshire, WD7 7NQ. (0923) 856497. Mark Levinson, Proceed, PRO AC, Magnepan, Albarry, Martin Logan, Tube Technology, Audiolab, Rotel, Rega. Home trial facilities, Free Install, Service Dept. Visa, Access 9-5:30 Mon-Fri 10-5:30 Sat

STUDIO 99, 82 High Street, Harpenden. ((0582) 764 246. Linn, Naim, Meridian, Rega, Nakamichi, Mission/Cyrus, Quad, Creek, KEF, Bang & Olufsen, Yamaha etc. Quiet single speaker dem room. Appts nec. Home trial, free install. Service Dept. Visa/c, Access/c & finance terms. 9-5.30pm (Mon/Sat). Closed Weds. **BADA**

THE AUDIO FILE, 27 Hockerill St, Bishops Stortford, Herts CM23 2DW (0279) 506576. 9.30-5.30 open 6 days. Dealer Of The Year 1988/89, Linn, Naim, Quad, Cyrus, Arcam, Roksan, Denon, Epos, Rotel, KEF, Pro-Ac. . 0% credit. **BADA**

NORTH HUMBERSIDE

JUST AUDIO, 2A Foston Lane, North Frodingham, Driffield. Tel 0262 488700, call for details. SUPERFI, 4 Dock Str, Queens Gardens Hull, HU1 3DL. (0482) 24051. See main entry under Nottinghamshire for full details.

KENT

CANTERBURY HI-FI, 50 Burgate, Canterbury, Kent, (0227) 765 315 B&W, Denon, Kenwood, Cerwin-Vega, Yamaha, Technica, Rogers, Musical Fidelity, Sony, NAD. No appointments necessary. Free Installation. Service Dept. Access and Visa Mon-Sat 9-5:30

JOHN MARLEY HI-FI CENTRES, 2 Station Rd, West Canterbury. (0227) 769329. Also at Dover - (0304) 207562. Arcam, B&W, Heybrook, Infinity, JPW, Pro-Ac, Pioneer, Rotel, Tannoy, Technics. Dem and home trail fac. Mon-Sat 9-5.30 closed Thurs. Free install. Credit to £1,000. Access, Visa, Credit charge. Service dept.

KIMBERLEY HI-FI, 193 Broadway, Bexleyheath, Kent. (081) 304 3272. Pioneer, Technics, Kenwood, Denon, NAD, Aiwa, Tannoy, Mission, Wharfedale, Castle. Separate dem room, no appt nec. Free installation. Service Dept. Instant credit facilities. 9.30-5.30. No early closing.

PANATEC SOUND & VISION CENTRE, 83b High Str, Gillingham. (0634) 5731141. B&W, Bose, Dual, Kenwood, Marantz, Pioneer, Philips, Sony, Tannoy, Technics. Dem room facilities. 0% credit, Service Dept. Free Installation. Pioneer Reference Point Dealer.

PANATEC SOUND & VISION, 17 Week Str, Maidstone. (0622) 661488 See above for details.

SOUNDCRAFT HI-FI, 40 High St, Ashford (0233) 624441. No. 1 in Kent for Linn, Naim, Rega, Roksan, Exposure, Onix, Epos, Royd, Creek. But before you choose equipment choose where to buy it. Dem room, appts necessary. Home trial and free installation. Visa, Access, Bada Chargecard. 9-5.30 mon-Fri (Wed & Sat to 5 only). Service Dept **BADA**

VOLUME ONE, 41 Upper Wickham Lane, Welling, DA16 3AD. 081 304 4622. Arcam, Dual, Epos, Exposure, Mordaunt Short, Monitor Audio, JPW, Marantz, Micromega, Nakamichi, Pink Triangle, Rotel, Royd, Ruark, Sony, Systemdek. Large demo room, no appt nec. Evening dems in shop by appt. Home trial & demo, free delivery & installation. Access & Visa, credit up to £1000. 9.30-5.30 Mon-Sat

V J HI-FI, 29 Guildhall St, Folkestone. (0303) 56860. Mon-Sat 9-6. NAD, Yamaha, Marantz, Sony, Tannoy, Denon, Kenwood, Rogers, Musical Fidelity, Quad, Dem and home trial facilities, free install, credit to £1000. Amex, Diners, Visa, Access. Service dept.

V J HI-FI, 119 High Street Margate. (0843) 226977. For full details see our above entry.

LANCASHIRE

NORMAN AUDIO, 216 Church Street, Blackpool FY1 3PT. 0253 295661. For details see Preston branch entry (below). Open 9-5.30. Closed Wed. **BADA**

ROMERS HI-FI CENTRE, 94-96 High Street, Rishton, Blackburn, Lancs, BB1 4LQ. Tel: 0254 887799. Musical Fidelity, Technics, Pioneer, Marantz, Revox, Tannoy, Celestion, Sony, Panasonic, Mission. Single Speaker Dem Room, Also wired for pro logic. No appts nec. Home trial fac by arrangement. Free Install. Service Dept. Access, Visa, Switch, Interest free on selected products. Open 9-5:30 Wed 9-1:00

LEICESTERSHIRE

MAYS HI-FI, 27/33 Churchgate, Leicester. LE1 3AL. (0533) 625625. Sony, Technics, Denon, Kenwood, Pioneer (Reference Point) Philips, B&W, Tannoy, Mission/Cyrus, Dual, Listening room, free install, service dept. Full range of credit facilities. Open Mon-Sat 9-5:30 Thurs 9-1:30 STEREO SHACK, 1-3 Guildhall Lane, Leicester. Tel 0533 530330. Aiwa, A.R., Denon, Kenwood, Jamo, Mission, NAD, Phillips, Pioneer, Rotel, A/V Speciality. Free Install Open 9.30 - 5.30 6 days. Credit available. **BADA**

LISTEN INN, 6 Hotel Street, Leicester. (0533) 623754 (Fax) 0533 623758. Linn, Arcam, Royd, Heybrook. Creek, Neat, Mission, Cyrus, Audiolab, Quad, Dewen, etc. 2 Dem Rooms. **BADA**

SOUND ADVICE, The Factory, Duke St, Loughborough LE11 1ED. (0509) 218254. Mission Cyrus, Rega, Naim, Linn, Meridian, Yamaha, Rotel, Arcam, Nakamichi, JPW. 3 demonstration areas, no appts necessary, free installation, service department. Lombard credit charge, Access, Visa. Mon-Fri 9.30-6.00, Sat 9.30-5.30.

LINCOLNSHIRE

BOSTON HI FI CENTRE, 65a Wide Bargate, John Adams Way, Boston, Lincs PE21 6SG. (0205) 365477. Quad, Nakamichi, Arcam, Marantz, NAD, Castle, JPW, Rogers, etc. Separate demo studio. Home trial. Free installation. Access, Visa. Tues - Sat 9-5 pm. **BADA**

STAMFORD HI-FI CENTRE, 9 Red Lion Square, Stamford, Lincs PE9 2AJ. (0780) 62128. Pioneer, Technics, Cyrus-Mission, Rotel, NAD, Yamaha, Kenwood, Marantz, Quad, plus all major speaker manufacturers. Expert advice, comparator demonstrations, on two floors, part exchange Hi-Fi purchased for cash. No appointments necessary, home trial facilities, free installation, service department. Mastercard, Visa & credit charge, finance available. Mon-Sat 9-5.30pm, closed Thursdays.

SUPERFI, 271A High Str, Lincoln LN2 1JG. (0522) 520265. See main entry under Nottinghamshire for full details.

LONDON

ANALOG AUDIO, 849 High Road, London N12. (081) 445 3267. Cambridge, Denon, Rotel, Yamaha, Marantz, Wharfedale, Teac, Mordaunt-Short, Cerwin Vega, Nad. Free install. Service dept. Instant credit up to £1000. Visa & Access. 9.30-6.6 days.

AUDIO T. 190 West End Lane, West Hampstead, London NW6 1SQ (071) 794 7848, Fax (071) 431 3570. Great hi-fi from Linn, Arcam, Audiolab, Cyrus, Denon, Meridian, Mission, Philips, Rotel, Proac, Micromega, Yamaha, and many more. Tue-Sat 10-6pm. 3 yr gntee on Hi-Fi. Free del & instal. 30 day upgrade scheme. Home dems. PX. 2 dem rooms. A/V Dept. **BADA**

BILLY VEE SOUND SYSTEMS, 248 Lee High Road, London SE13. (081) 318 5755. Arcam, Linn, Naim, Quad, etc. 2 dem rooms. Int. free credit. Access, Visa. Closed Thurs. **BADA**

CORNFLAKE SHOP, 37 Windmill St (just off Tottenham Court Rd), London W1. (071) 631 0472 (domestic) (071) 323 4554 (multiroom). Fax. (071) 323 4554 Fax. (071) 436 7165. Tues -Sat 10-7 Rega, Roksan, Naim, Monitor Audio, Arcam, Nakamichi, Rotel, Epos etc. 3 dem rooms. (incl. home cinema) Friendly, professional service. Home trial facilities. Appointments preferred. Full delivery and repair service. Multiroom specialists. Access & Visa.

COVENT GARDEN RECORDS, 84 Charing Cross Road, London WC2 (071) 379 7635, Fax (071) 836 1345. London's premier digital audio centre. Photo CD, DCC, CD, & 16X9 TV'S. Audiolab, B&O, Marantz, Mission, Cyrus, Philips, Pioneer, Rotel, Rogers, Quad, Sony, Technics, single speaker dem rooms, appointments suggested, installation service available. All major credit cards accepted. Mon-Sat 10am-7.30pm.

DOUG BRADY HI-FI, 14-18 Monmouth St. London WC2H 9HB. (071) 379 4010 Wide range of top specialist hi-fi from Britain, America and Japan. 3 dem rooms. Closed Monday. **BADA**

GRAHAM'S HI-FI, Canonbury Yard, 190a New North Rd, London N1 7BS. (071) 226 5500. Winner Sony/HFN Greater London Dealer Award 1986-1989-1990. Linn, Naim, Rega, etc. £400-£3000-£13,000. **BADA**

HI-FI COMPONENTS, 84 Battersea Rise, London, SW11 1EH.

Tel: 071 2231 110. Tannoy, Kenwood, Rotel, NAD, QED & Wharfedale, Dual, Shure, Ortolon, Celestion. Appts nec. Service Dept. Access, Visa, Diners, Amex. Open 10-6 Closed Wed.

KJ WEST ONE, 26 New Cavendish St, London W1M 7LH (071) 486 8262/63. Fax (071) 487 3452. Arcam, Audio Alchemy, Audio Lab, Audio Research, Croft, Deltac, Epos, Marantz, Meridian, Mission, Musical Fidelity, Pink Triangle, Roksan. Appts nec. Home trial. Free installation. Service dept. Major credit cards. Mon-Sat 10-6pm. (Late night Thur til 7pm)

MUSICAL IMAGES LTD. See under Middlesex & full page advert in the Product Directory.

MYERS AUDIO, 6-7 Central Parade, Hoe Street, Walthamstow, London, E17 4RT. Te 081 520 72777 Fax 081 5036677.

SOUND ORGANISATION LONDON, 4 Pickfords Wharf, Clink Street, London, SE1 9DG. Tel 071 403 2255. Audio Research, Aura, Creek, Epos, Exposure, Heybrook, Koetsu, LFD, Lyra, Martin Logan, Micromega, Naim, Nakamichi, Rega, Rotel, Roksan, Royd, SME, Sonus Faber. Interesting new equipment always under evaluation. 2x single speaker listening rooms. Appts preferred. Free Installation. Service Department. Open Tues -Sat. 10-6. Late dem by appointment.

SOUND SENSE, 350 Edgeware Road, London W2 1DX. (071) 402 2100. Alphason, B&W, Nakamichi, Celestion, Cambridge Audio, Dual, Denon, Monitor Audio, Marantz, NVA, Sony ES. Appts preferred. Installations available. Access, Visa, Standard credit facilities. Mon-Sat 9.30-6.30.

STUDIO 99, 79-81 Fairfax Road, Swiss Cottage, London NW6. (071) 624 8855 Naim, Rega, Quad, Meridian, Mission/Cyrus, ATC, Nakamichi, KEF, Yamaha, Arcam, Epos, Acoustic Energy, Bang & Olufsen, etc. 2 single speaker dem rooms. Service dept. Visa/c, Access/c & finance terms. 10-7 Mon-Fri, 10-6 Sat. **BADA**

SUPERFI, 2-4 Camden High Street, Camden, NW1 0JH (071) 388 1300. See main entry under Notts for full details.

LUXBRIDGE AUDIO - CHISWICK, 109 Chiswick High Road, Chiswick, W4 2ED (081) 742 3444 Fax (081) 742 3295. 2 Demo Rooms, Installations, 2 Year Guarantee, 7 day exchange. Major credit cards, Tues - Sat 10 - 6. See Middx entry for brands stocked **BADA**

VOLUME ONE, 41 Upper Wickham Lane, Welling. (081) 304 4622. For full details see entry under Kent

ZEBRA, 18-24 Brighton Road, South Croydon CR2 6AA. 081 688 2093. Audio lab, Arcam, KEF Reference, Marantz, Mission, Micromega, Pioneer, Rotel, Sony, Tannoy, and large range of AV equipment. S2 Air Conditioned Demo Rooms. in a more casual environment. Service department. Mon-Sat 9.30-6.00. Access, Visa & instant credit up to £1000 subject to status.

GREATER MANCHESTER

CENTRAL RADIO, 30-32 Shudehill, Manchester M4 1EY. Tel 061 834 67600. JBL, Mission, B&W, Wharfedale, Aiwa, Teac, Harman Kardon, Dual, Thorens, Pioneer. Service Dept. Free installation. Access, Visa, Switch. Interest Free and standard. Credit available. Mon-Sat 9-5.30.

THE AUDIO COUNSEL, 12 Shaw Road, Oldham, Manchester OL1 3LQ. (061) 633 2602. Linn, Yamaha, Rega, Rotel, Arcam, Micromega, EPOS, Creek, Nakamichi, Denon. 2 dem rooms. Free install. Visa, Access, Licenced credit brokers up to £1000 instant credit. 10.00-5.30 Tues, Weds, Sat; 10.00-7 Thurs & Fri. Closed Mon.

MURRAY HI-FI, 19 Middle Hillgate, Stockport. (061) 429 7666. Linn, Naim, Rega, Arcam, Yamaha, Royd, Epos, Creek, Nakamichi, Rotel. Full demo facilities, free installation & delivery, service dept. Full 2yr guarantee on all products. Access, Visa, Lombard Tricity, licensed credit broker. 10-6 Tue-Sat.

The Choice Dealer Directory

MIDDLESEX

AUDIO T, 159a Chase Side, Enfield, Middx EN2 0PW. (081) 367 3132, Fax (081) 367 1638. Great hi-fi from Arcam, Audiolab, Cyrus, Denon, Meridian, Micromega, Mission, Philips, Rotel, Yamaha and many more. Tue-Fri 10-6pm. Sat 9:30 - 5:30 3 yr gntee on Hi-Fi. Free del & instal. 30 day upgrade scheme. Home dems. PX. 3 dem rooms. A/V Dept.

BADA

HARROW AUDIO, 27 Springfield Rd, Harrow. (081) 863 0938. Mon-Sat 9:30-5:30. A&R, Audiolab, Cyrus, Denon, Epos, Monitor Audio, Musical Fidelity, Nakamichi, Quad, Rotel, Tannoy, Thorens, Yamaha. etc.

BADA

MUSICAL IMAGES LTD. 173 Station Rd, Edgware (081) 952 5535, fax (081) 951 5864 and 45 High St, Hounslow. Tel (081) 569 5802, fax (081) 569 6353. Most brands available - see full page advert in Product Directory. Interest free credit available, ask for details. Demo Room, Repairs & Service, Mail Order facilities.

RIVERSIDE HI-FI LTD, 422 Richmond Road, East Twickenham, Middlesex TW1 2EB. Tel. (081) 892 7613. Fax (081) 892 7749. A.R., Arcam, Audio Innovations, Castle, Dual, Denon, KEF, Luxman, Michell, Musical Fidelity, Micromega, Marantz, Nakamichi, Rotel, Spenhor, Systemdek, Tannoy, Yamaha. One demo room, in-car demo for car hi-fi systems. Appts not always necessary. Home trial facilities. Free installation, service dept. Lombard Tricity, Access, Visa, Amex, Diners Club. Mon-Sat 9.30-6, Thurs, Fri 9.30-7

SIGHT N SOUND, The Treaty Centre, Hounslow, Middlesex TW3 1ES. 081 572 5418, fax 081 572 5417. Sony, Kenwood, Finlux, Toshiba, Philips, Sanyo, Grundig, Pioneer, Technics, Akai. No appts nec, free intal, service dept. Access & Visa, financing available. 9-6pm Mon-Sat.

MERSEYSIDE

W.A. BRADY & SON, 401 Smithdown Rd, Liverpool L15 3JJ. (051) 733 6859. "Largest choice of specialist Hi-Fi in N.W. £100-£20K". All credit cards. 3 dem rooms. Closed Monday.

BADA

P & A AUDIO (BIRKDALE) LTD 31 Liverpool Road, Birkdale, Southport (0704) 68373. Arcam, Cambridge, Creek, Denon, Michell, Mission/Cyrus, Mordaunt-Short, NAD, Pink Triangle, QED, Revolver, Rogers, Rotel, Royd, Tannoy. 3 Single speaker demo rooms and Nicam surround sound dem room. Free delivery, installation (Merseyside) Service dept, Mon-Sat 9 - 5:30 Half day Tues, Access, Visa, Lombard

WEST MIDLANDS

AMADAEUS SOUND & VISION, 10 Boldmere Road, Sutton Coldfield, West Midlands Tel (021) 354 2311. Arcam, Audio Innovations, B&O, Carver, Castle, QED, Wharfedale, Yamaha, Cambridge Audio, Hafler. Single Speaker demo, appts preferred, service available, installations, B&O link install, home trials. Access, Visa, interest free credit available subject to status. 9.30-6pm 6 days.

FRANK HARVEY HI-FI EXCELLENCE, 163 Medieval Spon Street, Coventry (0203) 525200. All major agencies. Free inst. Service dept. Part ex. 3 dem rooms. Mon-Sat 9.30-5.30. Wed til 8pm

BADA

GRIFFIN AUDIO LTD, 94 Bristol Street, Birmingham. (021) 692 1359/(021) 6222230. Arcam, Castle, Cyrus, Denon, Linn, Marantz, Naim, Quad, Rega, Rotel. Tues-Sat 10-6.

BADA

MUSICAL APPROACH, 37 High Street, Aldridge, Walsall, W. Mids. (0922) 57926. Linn products, Arcam, Creek, NVA, Revolver, Onix, Epos, Marantz, Rotel, Quad & more. Dem facs. Home trial. Service dept. Credit facs available. Access, Visa. 9.30-5.30 Mon-Sat. 9.30-1 on Thurs.

MUSIC MATTERS, 351 Hagley Road, Edgbaston, Birmingham B17 8DL. (021) 429 2811. Roksan, Nakamichi, Arcam, Audiolab, Musical Fidelity, Mission/Cyrus, Meridian, KEF, Monitor Audio, Pink Triangle, 2 single speaker luxury demo rooms. Appts nec, home trial facilities, free installation, service dept. Access, Visa, instant credit up to £1000, interest free credit available. Tue-Thur 10.30-6, Fri 10.30-8, Sat 10.5-3.0.

NAAM HI-FI VISION, 122-123 New Street, Birmingham. (021) 633 4944 Pioneer, Akai, Aiwa, Panasonic, Toshiba, Hitachi, Bose, Wharfedale, Sony. Demo facilities available, appointments preferred. Access, Visa, 10 month interest free credit. Amex, Lombard Tricity Creditcharge. Mon-Sat 9-6.00.

NORFOLK

BASICALLY SOUND, The Old School, School Rd, Bracon Ash, Norwich NR14 8HE. (0508) 70829. Arcam, Linn, Naim, Denon, Sponder, Exposure, Audio Technica, Creek, Rega, Epos, etc. 2 comprehensive dem rooms. Home trial. Free installation. Visa, Access, HP facilities. Tues-Sat 9.30-1, 2-5.30.

MARTINS HI-FI, 5 High Street, Kings Lynn, (0553) 761683. Est. 1968. Making good vibrations for 20 years **BADA**
MARTINS HI-FI, 85/91 Ber Street. Norwich. (0603) 627010. Est. 1968. Making good vibrations for 20 years **BADA**

NORTHAMPTONSHIRE

AUDIO CRAFT 23-25 Derngate, Northampton, NN1 1TY. Tel: 0604 36291 Bang & Oulfsen, Kenwood, Technics, Marantz, Celestion, Mordaunt-Short. No appts nec, Free Install, Service Dept. Open Mon-Sat 9-5.30pm

CLASSIC HI-FI + VIDEO, School Lane, Kettering, Northants. (0536) 515766. Rotel, Musical Fidelity, Wharfedale, Yamaha, JBL, Cyrus, Nad, Pioneer, Marantz, Kenwood, Kef, Celestion, and many more. Home trial, free instal., service dept. Access, Visa, credit facs. 9.30-5.30pm

LISTEN INN, 32 Gold Street, Northampton. (0604) 37871 (Fax) (0604) 601430. Linn, Naim, Epos, Royd, Mission, Cyrus, Arcam, Audiolab, Neat, Creek, Quad, Denon etc. 2 Dem Rooms **BADA**

NOTTINGHAMSHIRE

CHANTRY AUDIO, Chantry Walk, 18a Eldon Street, Tuxford, Nr Newark, Notts NG22 0LH. (0777) 870372. Pink Triangle, Deltec, Rotel, SD Acoustics, Ruark, NVA, Michell, Ion Systems. Croft Acoustics, Kelvin Labs, and much more. 2 dem rooms. Home trial, free installation. Access, Visa & credit facilities and mail order. Mon-Fri 9:30-5:30pm Sat 9:30-5:30. Sun & evenings home dem by apt.

DEFINITIVE AUDIO, (0602) 813562. For a carefully considered approach to building a true hi-fidelity audio system with components derived from the following manufacturers; Audio Innovations, Snell, Wadia, Micromega, Deltec, Voyd, Systemdek, SME, Revox, Audionote, Ortofon, Pioneer. Demos by apt. Please phone for further details. Installation free of charge. Mon-Sat 10-7pm, Closed Wed a.m.

NOTTINGHAM HI-FI CENTRE, 120-122 Alfreton Road, Nottingham (0602) 786919. Over 25 years experience, superb demo rooms, extensive range, free parking. Mon-Sat 9-5.30.

PETER ELLIS AUDIO, 29 Kirkgate Newark, Nottingham, NG24 1AD (0636 704571) Quad, Castle, Arcam, QED, Sugden, Tannoy, Thorens, Marantz, Dennon, Teac. Demo Room, Free Install, Service Department. Access, Visa, Mon-Sat 9-5:30 Close at 1:00pm on Thursday.

SUPERFI, 15 Market Str, Nottingham NG1 6HY. (0602) 412137. Kenwood, Technics, Denon, Aiwa, Rotel, Wharfedale, Mission, Marantz, NAD < Celestion, and many more. 2 single speaker dem rooms. Free install on systems, service dept. Access & Visa, Amex. Open 9-5.30, 6 days

OXFORDSHIRE

ASTLEY AUDIO LTD, 3 Marketplace, Wallingford, (0491) 39305/34349 Technics, Panasonic, Pioneer, Kenwood, Sony, Yamaha, Denon, Dual, Mission, Tannoy. Home trial, free installation. Service dept. Access, Visa, Amex, Diners. Instant credit. Tue-Fri 9-5.30, Sat 9-5. Records & CDs stocked.

AUDIO T, 19 Old High St, Headington, Oxford OX3 9HS. (0865) 65961, Fax (0865) 60415. Great hi-fi from Arcam, Audiolab, B&O, Cyrus, Denon, KEF, Meridian, Mission, Rotel, Sony, Yamaha and many more. Open Mon Fri 10-6pm, Sat 9.30-5.30. 3 yr gntee on Hi-Fi. Free del & instal 30 day upgrade scheme. Home dems. PX. 2 dem rooms. A/V Dept.

BADA

OXFORD AUDIO CONSULTANTS LTD, Cantay Hse, Park End Street, Oxford OX1 1JE. (0865) 790879 fax (0865) 791665. NAD, Rotel, Musical Fidelity, Pioneer, Marantz, Rogers, TDL, Thorens, Audio Research, Proceed 2 Demo rooms. Service Dept, Home trial and free installation. Instant credit, Access, Amex, Visa. 10-6 Mon-Sat.

WESTWOOD AND MASON, 46 George Street, Oxford. Tel: 0865 247783 Arcam, Rotel, Rega, Epos, Tannoy, Royd, JPW, Mission, Nakamichi, Denon, Aiwa, Naim, Quad, Aura, Teac. Open 9:30-5:00pm. Dem room. Closed Thursdays.

WITNEY AUDIO VISUAL, 28 High St, Witney, Oxford. (0993) 702414. Aiwa, Akai, AR, Bose, B&W, Cambridge, Dual, Mordaunt-Short, NAD, Onkyo, Pioneer, Roberts, Sony & Sony ES, Tannoy, Wharfedale, Yamaha, Reference Point Dealer. Dem facilities. Mon-Sa 110-6 Free installation, credit to £1,000. Access, Visa. Service dept.

SHROPSHIRE

AVON HI-FI, 12 Barker Street, Shrewsbury, Shropshire SY1 1QJ. (0743) 55166. NAD, Quad, B&W, Arcam, Kenwood, Aiwa, Bose, Nakamichi, Revolver, Onkyo. Dem room. Home trial. Free install. Service dept. Access, Visa. £1000 instant credit. Mon, Tues, Wed, Fri, Sat 9-5.30.

CREATIVE AUDIO, 9 Dogpole, Shrewsbury. (0743) 241924. Linn, Naim, Roksan, Mission, Arcam, Rogers, Denon, Marantz, Rotel, Celestion, etc. Dem room. Home trial and free installation. Credit to £1000. Access, Visa. Tues-Sat 9.30-5.30. Service dept.

MID-SHROPSHIRE AUDIO, 4 Holland Court, Dawley, Telford TF4 2EX. (0952) 630172. Audio Innovations, Marantz (inc Music Link), Denon, Tannoy, Ortofon, Pink Triangle, Ion Systems, Systemdek, Ruark, Monitor Audio etc. 2 dem rooms. Home trial, service dept. Instant credit up to £1000 Access, Vsa, Amex.

SOMERSET

MIKE MANNING AUDIO, 110 Middle Street, Yeovil, Somerset BA20 1NE. (0935) 79361, Fax (0935) 32923, Mobile (0850) 325965. Naim, Roksan, Pink Triangle, A+R (Arcam), ION, NAD, Pioneer, Rotel, Denon, etc. Dedicated listening lounge, for relaxed and unpressured demonstrations. Appts not usually nec. but best to phone first. Home trial facilities on request, free installation, service department. Instant credit, Access & Visa, etc. 9-5.30 closed Mondays

STAFFORDSHIRE

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SUFFOLK

AVALON AUDIO VISION, 12 St Margarets Plain, Ipswich, Suffolk, Tel: 0473 281922. Pioneer, Mission/Cyrus, NAD, Rotel, Yamaha, Marantz, KEF, Mordaunt-Short, Mitsubishi, Wharfedale. Single Speaker Demonstration Room. No appts nec, Home trial fac, Free Install, Service Dept. Full HP fac, Interest Free Credit available on most components, Part exchange. Open 9:30-6:00 Mon-Sat.

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EASTERN AUDIO, 41 Bramford Rd, Ipswich. (0473) 217217. Quad Audio Lab, Denon, Dual, Marantz, Mission, NAD, Nakamichi, Technics, Arcam. Mon-Sat 9.30-6.

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RIVERSIDE HI-FI, 422 Richmond Road, East Twickenham, TW1 2EB. Tel: (081) 892 7613. Fax: (081) 892 7749. See main entry under Middlesex.

ROGERS HI-FI, 13 Bridge Street, Guildford, Surrey. (0483) 61049. Aiwa, Creek, Denon, Dual, JPW, Marantz, Philips, Pioneer, Systemdek, Tannoy. Demonstration facilities available, no appointment necessary. Free installation. Service department. Access/Visa. Instant credit up to £,000 subject to status. Monday-Saturday 9.30-6pm, later by appointment.

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SURREY HI-FI, 45 High Street, Godstone, Surrey RH9 8LS. (0883) 744755. Parking, easy access - just 2 mins off junction 6, M25. Tube Technologies, Rel Acoustics, Audio Lab, Quad, TDL, Nakamichi, KEF, Thorens, Rotel, Marantz, Denon, Michell, Tannoy, Top Line, Rel Acoustics, Single speaker demo room. Demonstration by appointment, free installation, service dept. Access, Visa, Mastercard. 0% Credit. Open 9-6, closed Wed.

TRU-FI SOUND AND VISION, 2 Central Parade, Redhill, Surrey. (0737) 767404/766128. Aiwa, Audio Technica, B&W, Nakamichi, Mission, Mordaunt-Short, Nakoaka, Sony, Technics. Dem. facilities. Free installation. Service dept. 0% finance. Access, Visa. Mon-Sat 9.30-6

TRU-FI SOUND & VISION, 10 Church Street, Leatherhead, Surrey. (0372) 378780. Sony, Technics, Panasonic, Mitsubishi, Ferguson, Aiwa, Pioneer, Sanyo, B&W, Mission. Free installation. Credit facilities. Access, Visa. 9.15-5.30 Mon-Sat. Closed Wed. Service dept.

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JEFFRIES HI-FI, 4 Albert Parade, Green Street, Eastbourne, East Sussex. Tel: 0323 31336. 2 Dem Rooms. Closed Mon. Late night Wed. Free Parking, Bus Route. Credit Facilities **BADA**

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BOWERS & WILKINS LTD, 1 Becket Buildings, Little Hampton Rd, Worthing. (0903) 2 64141. B&W, Nakamichi, Castle, Denon, Dual, JVC, Mordaunt Short, Philips, Quad, Sony, Technics. 3 dem rooms. Mon-Sat 9-5.30, Wed 9-1pm. Home trial facilities, free install. Credit to £1000, Access, Visa. Service dept. *

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BILL HUTCHINSON LTD, 87A Clayton Street, Newcastle-Upon Tyne. Tel: (091) 230 3600. A.R. Aiwa, Denon, Dual, JVC, Mission, Mordaunt Short, Omar, Technics, Yamaha, etc. Demo facilities. Free Install, Service Department, Instant Credit, Access, Visa, Mon-Sat, Late Tue till 8pm

RED RADIO SHOP AND HI-FI CENTRE, 11 Olive Street, (Off Park Lane), Sunderland. Tyne & Wear SR1 3PE (091) 567 2087. Castle, Carver, Denon, JVC, Kenwood, Mordaunt-Short, Michell, Teac, Tannoy, Monitor Audio etc. Dem room, large with comparator facility. No appts nec, Free install. Service dept. Interest free credit and no deposit 9am-5.30pm daily.

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NAAM HI-FI VISION, 78 Lower Precinct, Coventry CV1 1DX. (0203) 632086. Technics, Pioneer, Kenwood, AR, Akai, Aiwa, Panasonic, Toshiba, Wharfedale, KEF. Demo facilities. Access, Visa, Amex, Lombard Tricity credit charge. 9.00-6.00 Mon-Sat.

STRATFORD HI-FI, 25 Henley Street, Stratford Upon Avon, CV39QW. Tel (0789) 414533. Please call for further details.

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WEST MIDLANDS AUDIO, 158 Ombersley Road, Worcester WR3 7HA (0905) 58046. Nakamichi, Naim, Rega, Absolute Sounds, Meridian, Arcam, Ion Systems, Roksan. 3 dem rooms for budget & high end audio. Appointments necessary. Free installation. Service Dept. Access, Visa, Amex, Diners, Lombard/Hitachi. Mon-Fri 9.30-8.30 by appt Sat 9-5.30.

YORKSHIRE (NORTH)

THE AUDIO CLINIC, 22 Lord Mayors Walk, York, Yorkshire, Y3 7HA. Tel: 0904 646309. Mission, Revox, Yamaha, JVC, Audio Inovations, Celestion, NAD, Musical Fidelity, Allison, Thorens. No appts nec, Home trial facilities, Free Installation. Service Department. Access/Visa, Credit. Open 10-5:30 Mon-Sat.

SCARBOROUGH HI-FI CENTRE, 53 Dean Road, Scarborough, N. Yorks YO12 7SN. (0723 374547. Aura, B&W, Mission, Quad, NAD, Oxford, Alphason, Rogers, Nakamichi, Ruark, Voyd. Dem room, appointment preferred. Home trial facilities. Free installation. Service dept. Access/Visa/Credit charge/£1,000 instant credit/Amex/Diners. 10-6 Tues to Sat. HARROGATE HI-FI CENTRE, 15 Commercial Street, Harrogate, N. Yorks HG1 1UB. (0423) 504274. Aura, B&W, Mission, Quad, NAD, Oxford, Alphason, Rogers, Nakamichi, Ruark, Voyd. Dem room, appointment preferred. Home trial facilities. Free installation. Service Department. Access/Visa/Credit charge/£1,000 instant credit/Amex/Diners. 10-6 Tuesday to Saturday.

SOUND ORGANISATION YORK, 2b Gillygate, York YO3 7EQ. Tel: (0904) 627108. Linn, Meridian, Micromega, Naim, Rega, Roksan, Arcam, Mission, Denon, Epos, Rotel. 2 single speaker dem rooms. Appts preferred. Home trial. Free installation. Service dept. Credit facilities on request. Access, Visa. 10am-5:30pm Tues-Sat. Sony dealer. Award nominated '86, '87, '88. **BADA**

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HI-FI STUDIO, Sunnyfields, Doncaster. (0302) 781387. Heybrook, Monitor audio, Art Audio, TDL, Michell, Sugden, Ruark, Albarray, Alphason, Teac, Dual. Listening room demos. Home trial. Free installation. Licensed credit broker, 2 yr guarantee on all equipment. Service available. Access, Visa. 10-8pm 6 days. Phone for further info. & FREE fact pack.

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AUDIO PROJECTS, 45 Headingley Lane, Leeds. (0532) 304565. A&R, Audiolab, Creek, Heybrook, Linn, Musical Fidelity, Naim, Quad, Rega, etc. Tues-Fri 9.30-6, Sat 2.30-5.30. **BADA**

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DOUG BRADY HI-FI, The Forge Cottage, 19 Crossgate, Otley, Leeds, West Yorkshire LS21 1AA. (0943) 467689. Naim, Arcam, Rotel, Pink Triangle, Meridian, Epos, Castle. Two dem rooms, free install, service. Access/Visa. Open 10-6pm Tues-Sat. **BADA**

ERIC WILEY, 85 Beacroft Rd, Castleford. (0977) 553066/556774. Arcam, Cyrus, Kenwood, Marantz, Mission, Pioneer (Reference Point), Quad, Rotel, Sony, Technics. Car Audio specialists. Demo facilities. No appts nec. Access, Visa, Lombard tricity credit charge. Mon-Sat 9-5.30, closed Wed.

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IMAGE HI-FI, 17 The Springs, Wakefield, WF1 1QE. (0924) 200272. Arcam, Linn, Meridian, Mission, Quad, Rotel, Etc. 2 Listening Rooms Free Parking, DeL & Instal Mon-Sat 9.30 5.30 pm **BADA**

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LYRIC HI-FI, 163 Stranmills Road, Belfast. (0232) 381 296. Linn, Naim, Rega, Arcam, Denon, Rotel, Musical Fidelity, Revox, Mission etc. Mon-Sat 10-6, Late night Thurs **BADA**

COUNTY DOWN

ASTON AUDIO, Unit 8, Kings Road Shopping Centre, Kings Road, Belfast. Tel: 0232 402220. Akai, Technics, JVC, Mitsubishi, Samsung, Toshiba, Panasonic, and many more. Demos available, Open Mon-Fri 10-8pm Sat 10-5pm

LONDONDERRY

ZEUS AUDIO, 23a Kingsgate Str, Colrairie, BT52 4LB. (0265) 56634. Marantz, Mission Cyrus, Aiwa, Akia, Alphason, Sony, Pink Tri, Celestion, Rotel. Open Mon-Sat 10-5.30, Closed Thurs. **BADA**

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Ireland

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ZEUS AUDIO, 6 Hope Street, Belfast, (0232) 332522 Audio Innovations, Pink Triangle, Roksan, Marantz, Celestion, Linx, Meredian, Mission Cyrus, Ortofon, etc. Mon-Sat 10.00-5.30. Late night Thursday

Scotland

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TAYSIDE

J.D. BROWN, 28-36 Castle St, Dundee DD1 9NZ. (0382) 26591. Rotel, Denon, Pioneer, Technics, Aiwa, Mission, Castle, Mordaunt-Short, Celestion, Bose, Infinity. All equipment ready for demonstration. No appt nec, free installation, service dept. Mon-Sat 9-5.30. All demonstration systems wired through a demonstration comparator. Licensed credit broker, Access, Visa. Monday-Saturday 9.00am-5.30.

ELECTRO TRADER, 19 Colwyn Crescent, Rhos On Sea, Colwyn Bay, Clwyd NorthWales LL24 4RN. (0492) 548932. Rotel, Yamaha, Harman Kardon, Teac, Alphason, Heco, Infinity, JBL, Musical Fidelity, Tannoy, Rotel, Michi etc. Dem room. Appts preferred. Home trial. Free installation. Access, Visa. Open 9.30-1.00, 2.00-5.30 Mon-Sat.

ACTON GATE AUDIO, 4 Ruabon Rd, Wrexham, North Wales, Tel: 0978 364 500, Arcam, B&W, Marantz, Mission, NAD, Quad, Rega, Rotel, Tannoy, Yamaha, etc, Dem Facilities, A.V. on dem, Mail Order. No appts nec, home trial fac, Free install, Service Dept. Access, Visa. 9.30-5.30 closed Weds PM

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GWYNEDD

I&H GRIFFITHS & SONS, 313 High St, Bangor LL57 1YA. (0248) 370655. Yamaha, Tannoy, Teac, Goodmans, Wharfedale. Demos available, no appts nec, home trial facilities, free installation, service dept. Access, Visa, Lombard credit charge. Mon-Sat 9-5.30, Wed 9-1. Audio Visual Specialists

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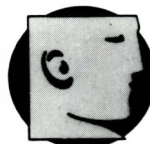
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THE listening
rooms

161 Old Brompton Rd. London SW5 0LJ. Tel: 071- 244 7750/59. Fax: 071-370 0192.
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The Directory

The ultimate buyer's guide with comprehensive information on every currently available product tested by *Hi-Fi Choice*.

Including test summaries covering

Amplifiers

Cables

Cassette decks

CD players

DACs

Equipment supports

Loudspeakers

Personal stereos

Tuners

Turntables

And much, much more

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 current retail price is placed in its respective category in alphabetical order. The prices of the products are updated on a regular basis, although it should be noted that our value ratings are based on the product's price at the time of review.

The next column contains 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. Please note that these comments are those of the reviewer and not, as is the case with some magazines, those of the manufacturer.

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 meritworthy. 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. Please note that an expensive Recommended product will nearly always sound better than a cheap Best Buy. 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, 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.

INDEX

Amplifiers	135
Cables - Interconnect	140
Cables - Loudspeaker	141
Cassette Decks	143
CD Players	144
CD Transports	149
DACs	149
DATs	150
Equipment Supports	150
Headphones	151
Loudspeakers	153
Loudspeakers - Sats & Subs	160
Personal Cassettes	160
Personal CDs	161
Tuners	161
Turntables - Cartridges	162
Turntables - Integrated	165
Turntables - Motor Units...166	
Turntables - Tonearms	167

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.

The first step in putting together a system is to decide which sources you require. There are now three different prerecorded music media competing for the affection 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.

Cassette has never really challenged vinyl's superior quality,

but it's a multiple role format, offering 'go anywhere' flexibility, a 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 relative newcomer but in the last decade it has come to dominate the market. The sound quality remains controversial, hailed as near perfect by its fans but derided by vinyl freaks. It is probably fairest to say that CD is fine for the majority of listeners, but may not suit everyone. Certainly the lack of background noise and deterioration are major strengths.

The advent of two box audiophile players has certainly

helped to gain better acceptance for the format and unless you are prepared to spend a substantial sum, CD arguably offers the best performance in terms of sound per pound. Players are now exceptionally cheap, having been reduced dramatically since the format was launched, however, the prices of the discs remains extortionate.

Choosing the components of a system is only part of the task of getting the system as a whole working as well as possible. Both components and loudspeakers benefit to a surprising degree from proper support in the form of stands that enable them to give their best performance, whether floor-standing or wall mounted.

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 simi-

lar immediate acoustic environment, unencumbered by other furnishings and structure, and a similar distance from listeners, 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 rigid support

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 as a guide in the sense that you should use the information in it to make a shortlist of equipment and then audition it before taking the plunge. Tastes inevitably differ and it's unwise to buy purely on the basis of our recommendation, as 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 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-47 £200	Very Good Good +	Something of a surprise from Akai: a made-for-Germany amp with plenty of widgets and an unexpectedly sharp, open and detailed sound. Looks ghastly but sounds strainfree	104W, 3 tape, 4 line and MM disc inputs. 4mm speaker outlets.	R	104
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 converters were less successful than its conventional analogue CD input.	112W, coax and optical dig inputs. MM/MC		68
Akai AM-95 £620	Average Average -	A revamped version of the older AM-93 with newer onboard bitstream DACs. Its sound is just too eager, however	110W, 3 tape, 3 line, MM/MC plus coax/opt digital inputs		109
Albarré PP1 £400-£500	Average Good +	Available with or without various MM/MC disc options, the 'basic' PP1 has an attractively warm, earthy sound. The budget MM stage needs some further work, however	48W, 4 inputs with extra gain available for low-level sources	R	104
Alphason Apollo £295	Average - Average +	A year and a half later and Alphason's Apollo is still beset with technical problems. This sample buzzed like a distant bandsaw	38W, 5 line, tape and MM/MC inputs. Solid wood fascia		109
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 inputs	R	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 3 £200	Good Average	After the enthusiastic reception earned by the older Alpha 2 the generally lacklustre and bland sound offered on this occasion met with (unexpected) disapproval.	53W, 3 line, tape and MM disc inputs. Direct option.		104
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 inp	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 1000/2nd AA £1499/£2999	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 £349/£499	Poor + Good	Recently updated, this pre/power combo turns-in a fuller and more substantial performance via MM rather than CD. Otherwise its sound can seem slightly bleached and lacking expression.	10W, 3 line, 1 tape and MM or MC inputs. 'Isolate' switch		109
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 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-100 Evolution £270 and £300	Average - Good +	This beefed-up VA50 might overheat when driving insensitive, low-impedance speakers but was applauded for its sense of scale and daram via CD	81W, 4 line, 1 tape and MM inputs. Bi-wire outputs	R	109
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 monoblock 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

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The Directory

AMPLIFIERS

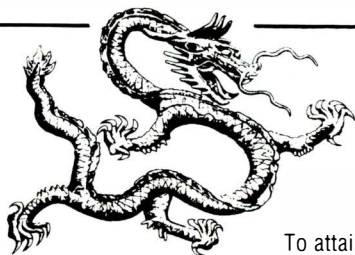
MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Carver CM-1090 £595	Average Average +	Looks very professional with its meters and handles but suffers from a loose and dirty sound that shies away from busy tracks	141W, 2 tape, 4 line and MM disc. Sonic Holography feature		97
Cello Audio Suite £1200	Excellent 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 Excellent	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		100
Conrad-Johnson PV-10 £1100	Excellent Excellent	Pricely, 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
Conrad-Johnson Premier 7A £8995	n/a Excellent	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
Creek CAS 4040s3 £200	Good 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 4140 S2 £230	Average Average +	Running production changes inspired us to re-review this amp which now sounds thicker and "blurred" compared to the original	41W, 3 line and MM/MC inputs, mono and mute facilities		109
Creek CAS 6060 £470	Good Good	An amp that looks like the '5050 but employs the sort of big, confident and meaty-sounding electronics used in the earlier '4040. Dynamic and impressive.	81W, 3 line, 2 tape and MM/MC disc inputs. Bridge-mono facility		104
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		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 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 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. R No tone controls	R	92
Cyrus PSX £250	Very Good 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
DNM 3A £1590	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
Deltec DPA 100S £2200	Very Good 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 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 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		68
Denon PMA-250II £140	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 £170	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 p	Excellent Very Good	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
Dual CV600RC £150	Good + Good	The heart of Dual's latest budget range enjoys a very lively, open and vibrant sound. Slightly sanitised via CD perhaps, but still damn good for a features-first integrated amp!	63W, 3 line, 2 tape and MM inputs. Remote control	R	104
E.A.R. 549 £3628 pair	Very Good 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		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
EMF Audio Sequel £349	Good - Good +	A fresh start for Mike Creek has resulted in the Sequel, a minimalist amp with a very refined but mildly restrained sound	47W, 3 line, 1 tape, MM or MC inputs.		109
Entire Sound EX50 £500	Average- Average+	A new and fairly costly Mosfet 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.		92
Exposure VI/VII*/VIII £1580	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 £530/£580	Very Good 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		62
Exposure XI/XII/VIII Super £1900	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		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 £365	Very Good Average	Sound quality results were decent enough, but this power amp won't set the world on fire at this price	60W		44
Hafner SE-100/SE-120 £370/£380	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 £1200	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		74
Harman Kardon HK6150 £160	Good Good +	Based on the older HK6100 but with a more solid, punchy and expressive performance that attracted considerable praise from our listeners	44W, 3 line, 2 tape and MM inputs, loudness, tone controls	BB	109
Harman Kardon HK6850 £700	Good + Good	This monster is derived from the HK6800 with a similarly deep and powerful sound but a rather steep price tag	101W, 4 line, 2 tape and MM/MC inputs. Preamp direct		109

AMPLIFIERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
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
Heybrook C3/P3 £479/£660	Average + Average	Since we last looked at this combo Heybrook has improved the manufacture of its power amp though flaws in the preamp's disc input remain unchecked	146W, oodles of current, passive line inputs		104
Heybrook Signature £649+£150/£92	Good + Very Good	Heybrook have re-boxed the best facets of the old C3/P3 to produce a stunningly powerful and vivid-sounding combination which is equally impressive via vinyl or CD	148W, 3 line, tape and MM/MC inputs. Outboard transformer	R	109
JVC AX-A342 £169	Very Good Average	A value-conscious budget amp offering plenty of power but a slightly untidy and inconsistent sound	77W, 3 line, 2 tape and MM inputs, tone, loudness controls		109
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
JVC AX-A441 £210	Good+ Average	A return to the traditional style of mass-market design brought an inconclusive reaction from our panel. Blowing 'hot and cold', our listeners ultimately found its music uninteresting	93W, 3 line, 3 tape, MM/MC inputs. CD direct facility		104
JVC AX-Z1010 £650	Very good Good+	JVC's flagship amplifier also houses a couple of ancient 16-bit DACs for good measure! One of the best behemoths: a big amp with a big, boppy and unmuddled sound	124W, 6 line and MM/MC inputs plus opt/coax digital inputs	R	109
Jadis JP30/JA30 £4990/£4900	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	30W 2-box pre-, monoblok power, MM-only, 4 line inputs	R	60
Jeff Rowland Coherence One/Mod	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
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 £395/295/595	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-4040R £220	Good + Average +	In many respects this sophisticated amp is a 'digitised' version of the KA-4020 with relay-switched inputs and full remote control. Unusual looks but can seem insubstantial via CD.	82W, 3 line, 2 tape, MM/MC inputs. Full remote control		104
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
Kenwood KA-5040R £270	Good + Average	A flexible, remote-controlled amp that uses the old KA-5020 as a building-block. Unfortunately it lacks dynamics, sounding stifled and uninteresting	100W, 3 line, 2 tape and MM/MC inputs. Source Direct		109
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
Lescon 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
Lescon Stereo £200	Poor Very Good	Can reflect the full weight and ambience of a tense, classical performance. A genuinely deep, detailed and enthralling sound marred by unreliability of our sample. New stock will be cured.	76W, 4 line, 2 tape, MM/MC inputs.		104
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 Intek £398	Good - Average +	Linn have slashed its price and made various internal revisions, but their no-nonsense Intek still lacks the authority and confidence to support its forward balance.	55W, 3 line, 2 tape, MM/MC inputs, rec-out, mono + mute		104
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
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
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-30 £130	Good + Good +	The building-block for Marantz's popular budget 'SE' amplifier is no slouch, providing a lively and very expressive sound with plenty of strong bass. A good 'un.	49W, 3 line, 2 tape and MM inputs, source-direct	BB	104
Marantz PM-30SE £150	Very Good Good+	The breathed-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-72 £300	Good + Average	This is a very neutral, pleasantly detailed and even-handed performer but one that lacks a sense of emotion or expression	155W, 3 line, 2 tape and MM/MC inputs		109
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/£525each	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
Moth Series 30 £132/ £203 (£254)	Good Very Good	A modular system capable of cracking results. The passive preamp and power amp combination is especially good value and warrant a Best Buy in their own right.	35W, 4 line inputs on passive pre, MM/MC on phono eq unit	R/BB	109
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
NVA AP20 £260 or £290	Average - Good +	Available with or without a disc stage this utilitarian amplifier sounds gentle and restrained but is euphonic and utterly engaging	35W, 2 line, tape and either MM or MC inputs	R	109
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
Naim Separates £750 pl	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	40-70W, MM/MC etc	R	60
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

AMPLIFIERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Orell SA-040SE £400	Average +	Very natural, relaxing if not overly exciting via CD, the sound closed-in to become 'pinched' or lettered via disc	64W, 5 line + MM/MC i/p's. Tweakable 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
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 FA-930 £200	Average Average +	Radical styling hides a digital switching facility plus full remote control over what is Philips' best effort to date	99W, tape, analogue and digital inputs with ESI BUS	R	109
Philips FA-890 £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 FA-960 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-229 £130	Average + Average	An unambitious amplifier that fights shy of tricky speakers with a sound that's equally unadventurous. Slightly soft and comfortably even-handed presentation	60W, 2 line, 2 tape and MM inputs, loudness and direct		104
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 £250	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
Pioneer A-676 £280	Good + Average -	A lusty amplifier at a modest price yet one that failed to inspire our listeners with its bland, indifferent sound	98W, 4 line, 3 tape and MM/MC inputs + subsonic filter		109
Pioneer A-777 £400	Very Good Average -	A larger version (!) of the A-676 that offers more power but an equally sluggish and uninspiring sound	121W, 4 line, 3 tape and MM/MC inputs + muting facility		109
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 p	Average Good +	Monstrous valve monoblocks which represent good value. What they lack in musical subtlety they make up for in sheer muscle. And these are Lumley's small monoblocks!	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 given the competitive price	MM plus 3 line inputs	R	77
Rotel RA-930AX £160	Good - Very Good	Based on the original RA-820AX but featuring a new look and a tweaked circuit design, this budget wonder captivated our listeners with its clean, vibrant and thoroughly involving sound	53W, 3 line, tape and MM inputs, tone bypass	BB	104
Rotel RA-940BX £200	Good Good	Rotel's cheapest 'BX' amplifier prompted a mixed reaction, some finding it muddled while others thought it 'exceedingly musical'	53W, 3 line, 2 tape plus MM/MC inputs. Tone defeat	R	109
Rotel RC-960BX/RB-960BX £150/£180	Very Good Good -	With excellent standards of construction, flexibility and plenty of power under the bonnet, this duo represents an ideal choice for the first-time buyer.	80W, bridge-mono facility. 3 line, 2 tape and MM/MC on preamp	R	104
Rotel RC-980BX/RB-980BX £275/£350	Excellent Average	Plenty of watts per pound sterling from a technically flawless combination. Its sound is equally expansive but lacks a sense of poise, of control and fine detail - a disappointment	143W (33A!), 3 line, 2 tape and MM/MC inputs + headphone socket		109
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-F440E £180	Very Good Good	A new budget amp based on tried-and-tested circuits but free of spurious widgets like tone controls. It has a fresh and up-beat sound with plenty of detail, can sound smeared via CD	109W, 3 line, 2 tape and MM + rec out	R	104
Sony TA-F540E £230	Very Good Good -	An extra £50 buys you an MC input but little else over and above the TA-F440E. This version sounds more consistent from input to input but is still rather superficial or unconvincing	108W, 3 line, 2 tape, MM/MC + rec out		104
Sony TA-F670ES £400	Very Good Good	Nothing fancy, just a heavyweight amplifier that puts up 'a damn fine show'. Fresh and sharp-sounding but a little too expensive	133W, 3 line, 2 tape, direct and MM/MC inputs. Pre-out facility		109
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
Sony TA-F770ES £600	Good + Average -	Another monster amp offering full remote control and buckets of power. It's also another monster amp that sounds boring	125W, 3 line, 3 tape, direct and MM/MC inputs. Remote operation		109
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
Technics SU-VX600 £200	Good + Good	What looks like a fairly ordinary mass-market offering is actually the first 'tweaked' amp from Technics, its solid and sharply focussed sound a taste of things to come.	90W, 3 line, 2 tape, MM/MC + power-amp inputs	R	104
Technics SU-VX800 £450	Very Good Average	On the other hand, this is a mass-market amp still hampered by over-enthusiastic protection circuits! It sounds raw and congested when the going gets tough - positive but raucous	148W, 3 line, 3 tape, balanced input + MM/MC		104
Technics SU-VZ220 £100	Good Average -	Cheap, cheerful and pretty flexible to boot yet the SU-VZ220 quickly sounds thin, splashy and relentless when the going gets tough	50W, 3 line, tape and MM inputs plus tone and loudness controls		109



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AMPLIFIERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Threshold FET 10e system/ £2995	n/a Very Good	Almost valve-like limpity 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. '9
Woodside SC26/STA35 Renaiss £2895	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
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
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	neutral yet lacks the ability to involve on an emotional level	131W, 5 line + MM/MC. Pure Direct + remote control		97
Yamaha AX-750 £399	Very Good Average	Big and bulky with remotely-controlled input and volume. Impressive handling, but two samples split the opinion of our listeners, one sounded squashed the other fast and articulate	149W, 3 line, 2 tape, MM/MC inputs + remote control		104

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

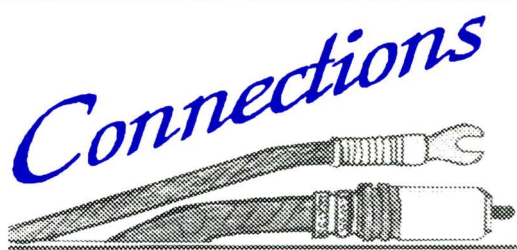
to that length - some cables may well perform differently when used in longer lengths. What's more, most cables are significantly cheaper if you are prepared to fit the plugs yourself. The features column contains information on the material makeup of the different cables with the following abbreviations: 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	OFHC 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
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
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	OFHC 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	OFHC, gold plated Deltron plugs	BB	59
Supra EFF-1 £60/0.75m	Average Average	A new, costly and mildly disappointing addition to the range. Edgy, smeared sound plugs	Screeded, symmetrical dir. cable		83 Supp.
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 dryscreening	Silver plated 'matched copper'		59

CABLES - LOUDSPEAKER

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Absolute Wire Force 4 £4.75 per metre	Good	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 +	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 -	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	Excellent	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	It proved clear and punchy but with some grain across the treble. Nevertheless Black remains an interesting concept and proved better than Livewire Green	OFHC, surface only - foam core construction	R	64
Cyrus £2.50 per metre	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
Deltec 8S £144 - 5m pair	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
Deltec Gortex Black 16 £528 - 4.5m pair	Very Good	Improvements in bass resolution, transparency and treble poise maintains status of this cable	Silver-plated OF copper with Gore-tex ins	R	83 Supp
Exposure £2.50 per metre	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	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	Average +	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	Good	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	This directionally marked cable benefited from an open and airy treble quality but seemed notably leaner than 4TC. Bass was well round and satisfyingly laut	4 x 7 copper strands per conductor, PVC diel.		64
Kimber Kable 4TC £17.65 per metre	Average +	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	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	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	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 +	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	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	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 Flat 200 £2.20 per metre	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 +	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	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 +	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
van den Hul CS-122 £6.50 per metre	Average +	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	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	Average +	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 +	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



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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 RD-06 £300	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	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	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 adjus	R	93
Aiwa AD-F810 £200	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 hdph	BB	99
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 XK-S9000 £700	Good +	Genuine state of the art in battleship pale gold/wood gloss clothes. Fabulous build, clunky transport and sharp, refined sound quality with Dolby S or B and metal tapes	Dolby B/C/S/HX Pro, built in DAC, tape alignment	R	105
Akai DX-57 £200	Good	Confident sounding price deck which eschews fancy gadgets for a good transport and decent electronics. Sound quality is firm and tidy under most conditions of use; avoid Dolby C	3 heads, dual capstans, Dolby B/C/HX Pro, variable bias		105
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
Akai GX-W45 £299	Average	Costly but musical high-spec dual deck, doesn't like modern high energy Type IIs and IVs, but with careful tape matching it has all the key attributes, including stability and clarity	Dual auto reverse, record/play transports, Dolby B/C/HX Pro	R	111
Arcam Delta 100 £850	Excellent	Ambitious first cassette deck from Arcam has a superb transport and a ripe, spacious sound. The Dolby S installation more successful than most. Some replay incompatibility	3 heads, dual capstans, Dolby B/C/S, tape calibration	R	111
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-710 £230	Average	Although this is a fair performing model, the design has lost some of the competitive edge of its predecessor, the DRM-700. Memo: must try harder - and where's the timer standby?	Dolby B/C/HX Pro, fine bias adjust, record return		105
Denon DRS-610 £200	Average+	Unique loading mechanism provides stability, and the deck has a crisp, clean quality. But has occasionally anaemic bass and a channel mismatch with metals	Drawer loading, Dolby B/C/HX Pro, R fine bias, track search,	R	111
Denon DRS-810 £300	Poor	Basically good deck with non-stressful material let down by an inability to deal with high energy tapes properly. The horizontal loading mechanism is a success.	CD style loading drawer, real time remaining display, Dolby B/C/		105
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 CC800RS £150	Average -	Low(ish) cost auto-reverse deck has mic input but lacks some niceties. Delivers a punchy but ultimately rather crude impersonation of source material, and a thin, lightweight bass.	Auto reverse, Dolby B, C, HX Pro, microphone input.		105
JVC TD-R441 £170	Average -	This deck would make a good choice for those who need the unattended recording time to deal with absentee recording off air, but is a less than wholly convincing musical advocate.	Auto reverse transport, Dolby B/C/HX Pro, CD direct input		105
JVC TD-V1010 £400	Good+	Very high grade enthusiasts deck with almost-CD like resolution and stability, especially with Type IV tapes	3 heads, Dolby B/C/HX Pro, variable bias, sens, 3 line,	R	111
JVC TD-V541 £280	Very Good	Crisp, lively sounding deck with excellent timing and occasionally slightly thin tonal quality. Best with metals and Dolby B	Dolby B/C/HX Pro, 3 heads, fine bias, display off	BB	105
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-5530 £190	Average -	Neat looking and well equipped deck, adequately engineered but somewhat lacking musically. Worth considering if auto-reverse is the key to your happiness	Dolby B/C/HX Pro, auto reverse, auto biasing, auto fader		105
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 C sound quality and dubbing performance poor	Dolby B/C/HX Pro, twin transports, one rec/play, one play only. Mic i		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

CASSETTE DECKS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Marantz SD60 £350	Good Very 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	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 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 1.5 £500	Good Very Good	High grade 3 head deck with minimal features but fine engineering and sweet, open though slightly coloured sound quality.	Dolby B/C 3 heads, bias adjust	R	105
Nakamichi Cassette Deck Two £350	Very Good 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 Very 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 DCC900 £500	Average Good-	Intriguingly uneven performer, ranges from grim with prerecorded material to erratically excellent when recording. Analogue cassette replay satisfactory	DCC deck with analogue playback compatibility, Dolby B/C.		111
Philips FC870 £250	Average 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-91a £550	Very Good 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 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
Pioneer CT-S410 £200	Average+ Average+	Powerful selection of features, excellent ergonomics and the fine, explicit sound with metals, though some instability was noted and the first test sample was faulty	3 heads, Dolby B/C/HX Pro, automatic tape alignment	BB	111
Pioneer CT-S610 £270	Good Very Good	Exactly engineered and highly articulate up-market cassette deck. Electronics are slightly coloured, but imagery and dynamics are finely resolved	3 heads, Dolby B/C/HX Pro, Super Auto BLE, CD Sync	R	111
Pioneer CT-W601R £200	Average- Average-	Mediocre performance attributable to flimsy build and less than stable transport. Frequency responses not wholly accurate even with Auto BLE. Not ideal ergonomics	Dual auto reverse, one records, Dolby B/C/HX Pro, Auto BLE		111
Pioneer CT-W650R £200	Average Average	There were some intermittent problems with the tape alignment system on the test sample, but the deck was otherwise good, despite a coloured bass and inability to exploit Type IV tape	Twin deck, both reverse, one records, auto align, B/C/HX Pro	R	105
Revox B215 £1727	Very Good 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 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 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
Revox H11 £938	Average + Average +	Costly and well engineered deck which boasts the bare minimum of facilities and which is primarily designed for the Revox multi-room H-Line system. Moderate performance.	3 head, Dolby B/C/HX Pro, manual tape alignment		105
Revox Pro Series C115 £843	Good Good	Not for the numbers freaks, it's unobtrusively musical, with a slightly wayward top and a very clean, extended bass	Professional 3 head, Dolby B/C/HX Pro, variable bias & sensitivity.		111
SAE C102 £549	Average Good	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-X111E £120	Poor Poor-	Very high levels of flutter, and a shabby, hollow sound with metallic colorations and a severe loss of detail - is it necessary to go on?	Dolby B/C/HX Pro, fine bias adjust		105
Sansui D-X117WR £220	Poor Poor	Bass is thin and coloured, and the sound lacks dynamics, pitch accuracy and overall stability - the sound is neither stable nor solid. Prerecorded cassette quality is also poor	Dual, one transport records, both auto reverse, Dolby B/C/HX Pro.		111
Sansui D-X211HXR £170	Good 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 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 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 Poor	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
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 Pr		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		99
Teac R-9000 £450	Good + Good	Much better than average auto-reverse deck, well worth considering, though short of the special qualities required for formal endorsement at this price. Nicely engineered too.	Auto-reverse, 3-head, tape calibration, Dolby B, C, HX Pro		105
Teac V-8000S £700	Good + Good	Superb stability and real subtlety from a cassette deck, this must be the best Teac yet. The only disappointment was the Dolby C circuit which was coloured and lacking in transparency.	3 heads, dual capstans, Dolby B/C/S/HX Pro, tape calibration	R	105
Technics RS-BX626 II £180	Good Good	First rate deck at a bargain price. Losses when recording are low and mostly benign, and dynamic range with high energy tapes is excellent. An all-round achiever	3-heads, Dolby B/C/HX Pro, optional remote control	BB	111
Technics RS-BX707 £220	Average Average -	Uneven but ultimately messy sounding deck with a number of oddities, including a tape calibration system lacking in accuracy and poor Dolby alignment	3 heads, Dolby B/C/HX Pro, bias & level calibration		105
Technics RS-BX828 II £300	Good + Good	Fine middle ranking deck, with explicit detail and stability, but which in the final analysis doesn't go much further musically than the cheaper RS-BX626	3 heads, Dolby B/C/HX Pro, tape bias/sensitivity lineup.		111
Yamaha KX-260 £150	Average Average	Lively, entertaining deck that trades gadgets for a convincing performance at an attractive price point	Dolby B/C/HX Pro, Play Trim, bias adjust	BB	111
Yamaha KX-360 £179	Average Average	Updated KX330, performance has a very KX-260 like dryness and precision. Good - but doesn't 'breathe,' and occasionally sounds unstable	2 heads, Dolby B/C/HX Pro, bias, Play Trim, intro scan,		111
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-W362 £250	Average- Average-	Almost a good deck, it is let down by audible levels of wow & flutter, apparent even with prerecorded material The audio circuits are good	Two auto reverse, 1 records. Dolby B/C/HX, Play Trim		111

The Directory

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-	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	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-300 £130	Average +	Cheap, cheerful and gratifyingly free of digital 'nasties', this new bitstreamer is well-equipped but safe rather than thrilling on the sonic front.	Remote control, optical output, Toshiba bitstream DAC.	R	107
Aiwa XC-700 £180	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 +	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	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	Budget model which fails to compare with the CD52	Remote, hdph, Good programming		83
Akai CD-57 £180	Average +	A very flexible machine with a slightly lumpy but fullsome bass, no model of clarity but very entertaining!	Remote control, motorised volume, hybrid PWM DAC.	R	107
Akai CD-62 £330	Average	Looks, build quality and the technical specification are right up to date. As it stands it sounds ve 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	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	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	Track entry remote, menu display etc.		58
Arcam Alpha Plus £420	Good -	As its name suggests, this is the 1992-version of a classic 16-bit player with an all-round smoother sound!	Remote control, 20-track memory, digital o/p, 16-bit DAC	R	112
Arcam Delta 70.3 £650	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
CEC 880CD £230	Poor	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
Carver TL-3220 £495	Good	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 +	Carver needs to listen critically to CD sounds; in our opinion. DTL does not improve the recipe	DTL, remote, programming, digital output		83
Cary Audio Design CAD-955 £899	Average	Rotel's latest 16-bit wonder with an add-on valve processor to filter-out any residual RF garbage. Nice idea but the player sounds very dry and taut, lacking warmth and body.	Remote control, triode-output stage, Philips 16-bit chipset.		107
Creek CD60 £500	Good +	A big and confident sound from a player that's stuck with a green display, green lettering and green-fronted drawer. So it looks ghastly even if the internal design is very thoughtful.	Remote, spring-loaded buttons, coaxial digital output, 16-bit.		107
Denon DCD-1290 £319	Good	This player certainly looks the business but its sound is a real five-minute wonder. Its compelling fizz lasts about as long as your average firework.	Remote, pitch control, index skip, variable output, 18-bit		107
Denon DCD-1460 £400	Good+	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 £570	Very Good	Beautifully built and generously equipped yet with a sound that's decidedly sluggish, particularly through the bass. Vocals are more forward but can sound a little glassy	Remote, pitch, tape edit features, opt/coax digital output, 20bit 16		95
Denon DCD-860 £250	Average+	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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CD PLAYERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Denon DCD-890 £270	Good + Good -	Similar to the DCD-1290 in its execution though manages a better technical performance. Sounds lively and powerful but lacks subtlety	Remote control, 20-track memory, tape edit, 18-bit DACs		112
Dual CD1080RC £200	Very Good Average -	A rather strange-sounding player with a top-heavy treble that does little to redress its lack of vibrancy and emotion. The back-lit LC display and clean digital output are plus points.	Remote, coaxial digital output, digital volume, MASH/PWM DAC.		107
Ferguson CD008 £150	Average Average	Not as strong as its relatives, sample fault perhaps? Though performance is fair enough overall	Remote, midi digital output, 2x 0/s, timeshare 16 bit		64
Goodmans GCD-435 £140	Poor Average -	Goodmans has the poweer to source with more care than this, music centre quality!	multibit, remote, basic facilities		88
Harman Kardon HD7450 £260	Poor Average +	This player looks little different to other HKs but its performance is dominated by a budget decoder/oversampling IC. Good bass nonetheless but pop tracks can sound fizzy and tiring	Remote control, display-off, timed-shared mono 18-bit DAC		107
Harman Kardon HD7500II £300	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 £400	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-V152 £130	Very Good Average	Based on earlier budget designs but minus a remote control. The voluminous but vague sound is equally familiar.	Tape edit, DDRP, PEM bitstream DAC		112
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
JVC XL-Z441 £200	Very Good Good	The smoothest-sounding of JVC's budget machines - clear and bold but also very even-handed One if not their best sub-£500 players to date and strongly recommended.	Remote control, tape edit, index skip, PEM bitstream DAC	R	107
JVC XL-Z452 £180	Very Good Good +	Another lightweight player but graced with a surprisingly bold and detailed sound. Impressive stuff for the money.	Remote control, 32-track memory, volume control, PEM DAC	R	112
Kenwood DP-3040 £180	Good + Good +	The sophisticated sound of this budget player could teach Kenwood's costlier offerings a thing or two!	Remote control, 20-track memory, volume, NPC bitstream DAC	R	112
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, disc file, Sony PLM DAC.	R	100
Kenwood DP-5040 £200	Very Good Average	Better built and technically superior to the older DP-5030 but its untidy, detached treble quality proved a real disappointment in our listening tests.	Remote, display control, tape edit, peak search, Sony PLM DAC.		107
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 DP-7040 £300	Very Good Good	A classy, polished sound from a decidedly refined piece of engineering. Close to the older DP-7030 in terms of performance but better value in construction and technology.	Remote control, Disc File memory, display control, Sony PLM DAC.	R	107
Kenwood L-1000D £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 eq'ped	"valves", remote inc vol, hdph, well equipped		88
Marantz CD-42 £180	Average + Good +	Not as warm or rugged-sounding as the CD-52 but still wonderfully spacious and intimately detailed. Currently the best player under £200, plus it's got a decent coaxial digital output.	Remote control with direct track access, SAA7350 Bit Stream DAC	BB	107
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-52SE £280	Average + Very Good	A similarly dramatic yet far more neutral sound than the basic CD-52. Either way, its engaging and believable performance was a real hit with our listeners.	Remote, FTS memory, switchable digital output, Bit Stream DAC	BB	107
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-72 £400	Good - Good +	A heavily-constructed player based on the same digital electronics as the CD-42 and CD-52. This implementation sounds astonishingly solid and immediate but also rather too 'clean'.	Remote, variable and digital outputs, FTS, Bit Stream		107
Marantz CD-72SE £500	Good Good +	A recommendation just eluded the grasp of this superbly built player thanks to its very polished but restrained sound.	Remote control, 20-track memory, FTS, volume, BS DAC		112
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
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 (DAC7) £971	Good + Very Good	Plenty of tight, strong bass but a little mechanical or even sparse at times. Its technical presentation of music is spot-on, only the sense of drama or anticipation needs working on.	Remote control, novel direct-loading transport, DAC7		107
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	R	83
Micro Seiki CD-M100 £5541	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
Mission DAD5 £300	Good Average +	Similar-sounding to Philips' 600-series players: lively, plenty of space and full of 'bounce' but a little too eager to impress in the short term.	Stylised remote, no 'stop' key on player, digital out, Bit Stream		107
Musical Fidelity CD1 £400	Average + Good -	Put together in Taiwan to MF's specifications, the main PCB and digital electronics are also used by Rotel's RCD-965BX! This version lacks the creamy, engaging quality of the latter.	Simple remote, index and track skip, digital out, SAA7323 DAC		107
Musical Fidelity CDT £500	Poor - Good +	An oddball player equipped with a cheap top-loading transport and appalling digital gubbins yet saved by the euphony of its valves!	No remote, no memory, hybrid DACR with valve output stage		112
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	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 OMS-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, I		51

The Directory

CD PLAYERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Nakamichi OMS-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 CD930 £180	Good + Good -	Featuring new 900-series lively and digital circuitry similar to Marantz's players but a sound that's a little too ripe and soft.	Remote control, Personal Presets, FTS, 30-trk memory, BS DAC		112
Philips CD950 £350	Very Good Good +	Philips' top 900-series player is the first to employ its advanced DAC7 chipset. Sounds very crisp, clear and confident.	Remote control, FTS, volume, display off, DAC7 Bit Stream	R	112
Pioneer PD-201 £150	Good + Good	A budget player with a genuinely fizzy and exciting sound. Hardly neutral but audacious and entertaining nonetheless.	Remote control, 24-track memory, volume, PFM Bit Stream DAC	R	112
Pioneer PD-75 £800	Very Good Very Good	A confident yet beautifully poised and relaxing sound from an equally luxurious package. Oodles of refinement plus Pioneer's hi-tech Stable Platter transport, but still expensive.	Remote, index and track skip, display off, PDM Bit Stream DACs		107
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
Pioneer PD-S501 £190	Good + Average +	This is the cheapest player thus far to be equipped with a Stable Platter mech, but compromises elsewhere have suffocated its flair	Remote control, 24-track memory, hi-lite scanning, Bit Stream DAC		112
Pioneer PD-S801 £300	Unusual! Good	Pioneer's version of Wadia's Digimaster digital filtering provides odd technical results with an equally unpredictable sound. Capable of poor or superb results, depending on system.	Remote control, stable platter mech, Legato Link + bitstream DAC		112
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-955AX £260	Good + Average	Touted as a repackaged version of the evergreen RCD-855. In practice, however, our sample disappointed on several visits lacking the clean, cohesive quality of the original	Remote control, digital output, repeat, scan, Philips 16-bit		107
Rotel RCD-965BX £320	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-X317 £300	Good + Average	Not in the same class as Sansui's older CD-X311mkII. Same technology and a similar appearance but the sound is neither as responsive or engaging.	Remote, fixed, variable and digital outputs, MASH/PWM DAC		107
Sansui CD-X617 £300	Good + Average	This 'double-DAC' version of the CD-X317 is no more impressive, sounding light and tizzy with pop but dull with classical CD's	Remote control, 24-track memory, display dim, MASH/PWM DACs		112
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-397 £140	Very Good Good	The first CD player to be almost entirely composed of miniature surface-mount components. Unsophisticated but enthusiastic sound	Remote control, 24-track memory, fade, tape edit, PLM DAC	BB	112
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-797 £200	Good + Good -	Another day, another DAC. This new budget player succeeds with its taut imaging, clean and impressive soundstaging. Can seem a little too lean or dry, however.	Remote, motorised volume, edit and scan facilities, PLM DAC	R	107
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-X229ES £300	Excellent Good -	Built to the same standards as the CDP-X339ES but with a colder and less forgiving sound. Lacks a sense of integration and warmth	Remote control, Custom Edit and Custom File, PLM bitstream		112

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CD PLAYERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
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-X339ES £430	Excellent Very Good	Superbly constructed, this tour-de-force of features and technology offers a tightly detailed almost cavernous sense of acoustic. The mid and treble can sound positively magnetic	Comprehensive remote, Custom/Edit Navigation System, new PLM DAC	R	107
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,	Remote, everything but Custom File titling, Complementary PLM		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
TEAC CD-P3500 £170	Good + Average	A well-meaning attempt to pare-down the CD-P4500 results in a similar looking player with a thoroughly uninspiring sound	Remote control, volume, cue-lock, index skip, Philips BS DAC		112
TEAC CD-P4500 £250	Good + Good	TEAC's first genuine 1-bit player uses Philips BS DAC to great effect, its sound described as having a certain 'organic warmth', very composed and easy-going.	Remote, pitch control, variable out, SAA7350 Bistream	R	107
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 bistream	BB	100
Technics SL-PG320A £140	Good + Good +	A cheaper and remote-less version of the '420A with an equally dry but vivid, spacious and astringent sound. A good 'un	No remote, synchro-edit, auto-cue, 20-track memory, MASM	R	112
Technics SL-PG420A £160	Good + Good +	No repackaged version of the SL-PG200A but a new player in familiar clothes. Still offers an open, transparent and uncommonly fresh sound but a little of the 'magic' is missing.	Remote, digital volume, synchro edit, auto cue, MASH/PWM DAC	R	107
Technics SL-PG520A £200	Good + Very Good	A cracking player that builds upon the astonishing out-of-the-box sound of earlier budget players. Superb clarity and dynamics, thrilling but musically involving too.	Remote, shuttle search dial, edit mode, peak search, MASH/PWM DAC	BB	107
Technics SL-PS620A £230	Good + Very Good	A costlier, tarted-up version of the SL-PG520A that loses very little in the way of clarity, sparkle or in compelling dynamics	Remote control, synchro-edit, 20-trk memory, MASH/PWM DAC	BB	112
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 £	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. '9
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		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-560 £180	Good Good	A real advance on the old CDX-450 though the light, up-front if not entirely welcoming sound of this newcomer could shock the timid listener	Remote control, volume, tape edit, 18-bit hybrid DAC		112
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 eith busier, more complex passages	Remote control, variable and digital out, LC display. PDM DAC		100
Yamaha CDX-860 £280	Very Good Good +	A strong recommendation for what is probably Yamaha's best CD player to date: powerful and confident yet delicate and nimble when the occasion demands.	Remote control, variable o/p, dimmer, 25-trk memory, PDM DAC	R	112

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 convertor 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	CD transport, optical output only, remote		88
Wadia WT2000 £5614	Very Good Good +	Based on TEAC's P-2 with onboard mains transformers, active digital output and solid alloy casework. Dynamic and crisp sound best realised with Wadia DACs, otherwise 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 £3898	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
Audio Research DAC1-20 £3898	Very Good Good	This expensive DAC works surprisingly well with Meridian's cheaper 200 transport, an impressively weighty and engaging combo that proved entertaining on audition.	BNC, Toslink and AT&T optical inputs, phase invert, 20-bit DACs		103
Audiolab 8000DAC £695	Very Good Good	Needs to be used with a genuine Class 1 digital drive. At its best with the Wadia WT3200 where it sounds vivid and alive. Otherwise can sound a little antiseptic.	Coax and opt inputs, phase invert, crystal lock, Bit Stream		103
Deltec Bigger Bit £650 + £98	Good Very Good	Partnered with either TEAC P-10 or Meridian 200 transports, the Bigger Bit delivers a very taut and dynamic sound, bathed in an open acoustic. Deltec's RF mains filter is a must.	Coax and opt. inputs, Deltran sync facility, DAC7 Bit Stream	R	103
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.	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 PDM1 Series 3 £1195 + £196	Very Good Good +	Hailed as a budget version of the PDM2, it bears technical comparison with both the PDM2 and Bigger Bit but - in terms of sound quality - is no great advance on its cheaper relative.	Coax and opt inputs, two-box construction, DAC7 Bit Stream		103
Deltec PDM2 £2000	Excellent Excellent	State-of-the-art technical performance with a pristine sound to match. Repertoire includes a solid, invert, two-box DAC7	Coaxial and optical inputs, phase	R	101
Forte Audio Model 50 £950	Good Very Good	The first American DAC7 design and one that offers a typically big and full-blooded sound, infiltrated by a slightly euphonic quality but never hard or gritty	2 Coax and 2 optical inputs, DAC7 Bit Stream technology	R	103
Kelvin PDM DAC £200	Average + Average +	Don't disregard this DAC-in-a-matchbox for though it can sound a little unconvincing it is capable of developing a surprisingly lyrical and natural sound with the right transport.	Single coaxial input, low analogue outputs, SAA7320	R	103
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 further Meridian have also tempered its vibrancy and 'life'. Fickle with other 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
PS Audio Superlink £1498	Average Good -	Another transport-fussy DAC that, once again, does the business with Meridian's 200 but can sound bloated, smeared and even vaguely electronic with standard 75ohm digital outputs.	Touch-sensitive coax and optical inputs, phase invert, 18-bit		103
Proceed PDP2 £1595	Average Good -	The PDP2 has a wobbly input impedance that's suited to specific drives, ie Meridian 200, or Proceed's own. At its best expressive and enticing, otherwise it can seem gutless and smeared.	Coax and XLR inputs, balanced outputs, 18-bit DACs		103
Stax DAC-Talent £1400	Excellent Good +	Natural, refined and never over-zealous, the DAC Talent is also capable of sounding very spicy and dynamic. Capable of wielding a maturing influence over a light or bright-sounding system	Coaxial and optical inputs, phase invert, mute, 20-bit DACs		101
TEAC D-500 £399	Good + Good +	An unusual combination of NPC oversampling filter and no less than two Philips' DACs. Its reliable 75ohm input infers broad compatibility. A dynamic and 'interesting' sound	Coax and optical inputs, complementary 16-bit DACs.	R	103
Threshold DAC 1/e £3150	Very Good Very Good	The DAC 1/e can sound beautifully detailed with a marvellous sense of scale and sharp, solid images. Its unpredictable behaviour with unknown transports precludes recommendation.	Coax and opt inputs, balanced outputs, phase invert, MASH/PWM DA		103
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*	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 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 ou		87
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 upgrade	BNC coaxial input (no optical), 16-bit 4x	R	101

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.

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Aiwa HD-S100 £450	Average - Average -	Largely bulletproof in non-critical and semi-critical applications. Despite the usual limitations of DAT as a hi-fi medium, the HD-S100 is a practical and well built tool.	Portable, ADC, mic in, phone/line sockets (3.5mm), 70 min battery	R	105
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 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/analogue out		99
Casio DA-7 £400	Average Poor	Below average notebook size portable, and in some ways inferior to Casio's own DA-R100 pocketable due to high noise floor, flat dynamics and poor soundstaging	Portable DAT with case. SP record mode, basic editing		111
Casio DA-R100 £410	Average Average-	Somewhat flat sounding and lacking differentiation through the analogue inputs but good via the digital ones, a masterpiece of miniaturisation, wonderful tool where size is important	SP/LP record, optical/electrical in/out, 2.5hr battery life	R	111
Denon DTR-2000 £700	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 rec/play, LP analogue play only	R	93
JVC XD-Z1010TN £1050	Good Average-	Ambitious but ultimately disappointing deck which marries poor ergonomics and an opaque musical delivery to a feature roll call longer than the weekly shopping list	SP/LP record, mic input, remote control, display off, auto fade		111
JVC XD-Z505 £620	Good Good	Competent middle market DAT with uncomplicated (but still flawed) user interface, but good basic sound quality. A fine CD dubbing machine.	DAT SP/LP en/decode, low bit conversion, remote control	R	105
Kenwood DX-7 £500	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	Mains recorder, LP mode. Optional accessory packs adds battery/ADC		94 Supp.

DIGITAL AUDIO TAPE

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Kenwood DX-7030 £700	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	Remote control, stand-alone DAC facility, optical/coaxial in/out		99
Panasonic SV-3700 £1111	Good	Slick, powerfully equipped and reasonably priced, this pro DAT has a clear, quick and colourful sound somewhat lacking in weight and substance	Professional DAT, infra-red remote, S/PDIF & AES/EBU I/O		111
Pioneer D-500 £600	Good - Average	Looks extremely good. Fascia design is complex yet accomplished, and offers very slick tape handling. Musically however it is on the messy side compared to others in this price area.	SP/LP en/decode 1-bit converters, many search/display aids		105
Sony DTC-750 £450	Good	Superb value for money: the lowest price full size DAT on the market, fine features, build, measurements and sound approaching the best DAT has to offer at any price.	SP/LP record, real time/date recording	BB	105
Sony DTC-77ES £1000	Excellent	Superb engineering, many well implemented features (including off tape monitoring) and technical near perfection (!) don't offset perceptibly slowed, thickened sound	4-head, tape monitor, many search/display options, SP/LP		105
Sony DTC-M100 £799	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		DAT recorder, detachable rechargeable power pack, LP/SP	BB	94 Supp
Tascam DA-30 £1199	Good	Interesting pro DAT deck with solid, tangible sound quality which is nevertheless lacking in analysis	Wired remote control, S/PDIF, AES/EBU and standard analogue I/O		111

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	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	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	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	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	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	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	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	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 ZD22 £97	Table	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	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	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

EQUIPMENT SUPPORTS - LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE (H x W x D)	VALUE	ISSUE
Appolo A10 £52.50	4 leg	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	A light open-framed budget design slightly lacking in rigidity and subjectively superceded by other stands costing £10 more.	19 x 19cm 53cm		58
Foundation Fred £70	2 leg	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	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	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	Upgraded 'Fred' with special in-fills. Sweet sound but one that also lacks bite and edge	19 x 19 x 46.5cm		83 Supp.
Goldring Black Satin £65	1 leg	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	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

EQUIPMENT SUPPORTS - LOUDSPEAKERS

■ MODEL ■ PRICE	■ LAB ■ SOUND	■ COMMENTS	■ SIZE (H x W x D)	■ VALUE	■ ISSUE
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
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
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.

HEADPHONES

■ MODEL ■ PRICE	■ FIT ■ SOUND	■ COMMENTS	■ TYPE	■ VALUE	■ ISSUE
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
AKG K500 £119	Good Very Good	Distinctively open and clear, they reproduced music with impressive definition, balance is on the light side but transparency is high for the price	Circumaural, open-back, dynamic	R	111
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
Audio-Technica ATH-308 £26	Good- Average-	These small cans have a fairly forward balance which helps perceived clarity but they can become wearing over time, good for personals	Supra-aural, semi-open, dynamic	R	111
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
Audio-Technica ATH-9000 £246	Very Good Good	These electret cans connect up to the amps speaker outputs via an adaptor, it sounds a little too smooth and relaxed but would suit aggressive amps	Circumaural, open-back, electret		111
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 DT411 £49	Good Good	A reasonable but not very thrilling headphone that doesn't really offer enough at the price	Supra-aural, open-back, dynamic		111
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 DT911 £179	Good Very Good	Probably too revealing for many headphone amps these are very subtle and fine if expensive cans	Circumaural, open-back, dynamic	R	111

The Directory

HEADPHONES

■ MODEL ■ PRICE	■ FIT ■ SOUND	■ COMMENTS	■ TYPE	■ VALUE	■ ISSUE
Beyer DT990 £102	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
JVC HA-D690 £40	Average	Competent but rather undistinctive cans, a bit middle of the road and well suited to aggressive sources	Supra-aural, closed-back, dynamic		111
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
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
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 HD 480II £50	Good+ Good	Not the most accurate cans on the market but amongst the most enjoyable	supra-aural, open-back, dynamic	BB	111
Sennheiser HD 540II £100	Good+ Good+	A good but not great headphone that due to its high impedance and efficiency should work well with most sources	circumaural, open-back, dynamic		111
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-CD1000 £150	Very Good Very Good	A fine sounding and comfortable headphone that's likely to work well with most sources	circumaural, closed back, dynamic	R	111
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-CD750 £73	Good+ Good+	Reasonably comfortable and eminently listenable these Sonys have characteristically good bass power and relaxed hf	Circumaural, closed-back, dynamic	R	111
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/£2	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/£8	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 (i)	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-75B	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 Energis	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
Technics RP-F3 £100	Poor Average	Robocop styling coupled with a turbo bass switch and an uncomfortable fit, rhythmically OK but not up to the price	Supra-aural, closed back, dynamic		111
Yamaha YHD-1 £46	Good+ Good	Stylish semi-folding design with a slightly forward balance that very nearly scraped a recommendation	supra-aural, open-back, dynamic		111
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

The Directory

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.

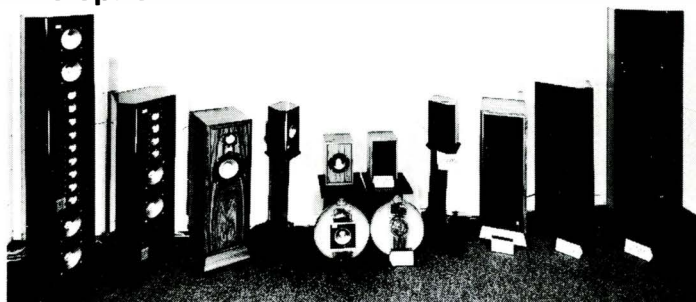
MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
ATC SCM20 £1419	Very Good Good +	Massively built to no-compromise Pro monitoring standards, the SCM20 is invariably informative but the rather forward presentation can be uncomfortable	44 x 24 x 31cm stands close to rear wall	82dB 28Hz (in room)		86
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 wall	84dB 48Hz (in room)		102
Acoustic Energy AE2 £950	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	88dB 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 23Hz (in room)	R	86
Acoustic Research Pi 3 £219	Average- Average	Lively good value box has extra bass driver to give plenty of thump, but lacks refinement and extension	51.5 x 21 x 23cm close to wall	88dB 50Hz (in room)		110
Acoustic Research AR M1 £199	Good Good	Cute!y shaped miniature delivers splendidly unboxy bass and midrange, but is a little marred by a rather bright treble	27 x 20 x 26cm close to wall	85dB 30Hz (in room)	BB	110
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 wal	87dB 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 wal	87dB 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 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
Alexander SE11 £299	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 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 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 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 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 wa	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 45Hz	R	71
Allison MS 200 £220	Average- Average-	Built as small and solid as a brick, this micro-miniature has limited bass and bright balance, but sounds agile and communicative	25.5 x 14.5 x 15cm close to wall	85dB 50Hz (in room)		106
Alphason Amphion £695	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 47Hz (in room)		78
Alphason Artemis £299	Average Average+	Pretty little miniature sounds nicely unboxy but is also a bit short of punch and balanced rather too bright.	27 x 17.5 x 22cm stands 1ft from wall	86dB 50Hz (in room)		94
Alphason Orpheus £1070	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 wal	87dB 43Hz	R	71

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LOUDSPEAKERS

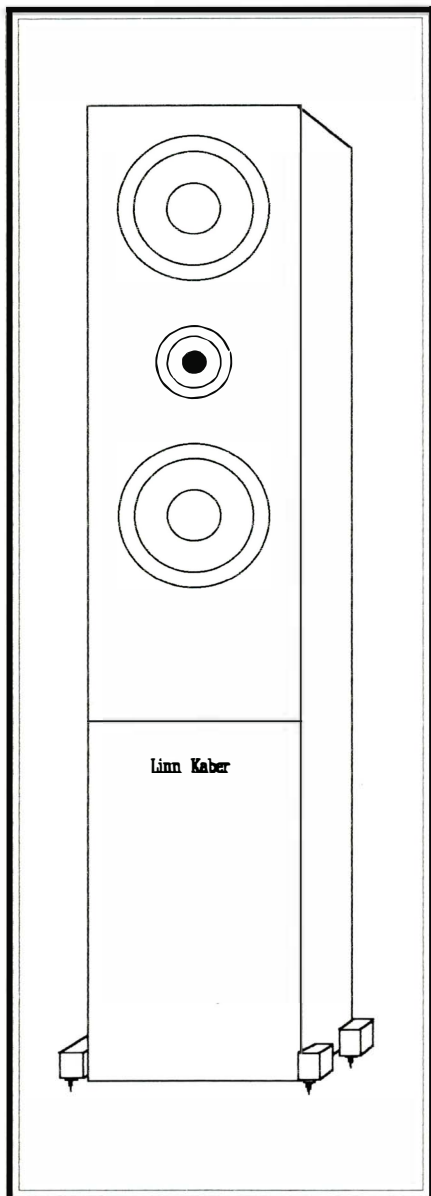
MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
Apogee Caliper Signature £3998	Good + Very Good	Pretty but power hungry full range panels have remarkable transparency and delicacy, though loudness and bass 'grunt' are both a bit lacking	122 x 59-70 x 6.5-28cm floor, free space	81dB 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 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 wa	87dB 40Hz (in room)	R	94
Audio Note AN-E £1300	Very Good Very Good	Lovely coherence, great midband dynamics and transparency, extended bass and high sensitivity — pity it's so darn ugly!	80 x 36 x 28cm low stands, free space	91dB 20Hz (in room)	R	106
Audio Note AN-J £799	Very Good Very Good	Light damping and local unevenness adds some coloration, but doesn't spoil the very lively, dynamic and coherent sound. Fine sensitivity and balance.	58.5 x 33 x 24.5cm heavy stands, free s	90dB 25Hz (in room)	R	110
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 stan	83dB 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 o	89dB 25Hz(in room)		102
B&W 620 £320	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 25Hz (in room)	BB	94
B&W DM600 £160	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 wa	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, fre	86dB <20Hz (in room)	R	81
B&W Matrix 805 £795	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
Bose 305 £360	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 40Hz (in room)	R	78
Bose 401 £430	Average - Average	Cheaply built but distinctively styled semi-omni floorstander suffers from heavy midbass but still manages to sound lively and open	78.5 x 30 x 28.5cm clear of walls	89dB 28Hz (in room)		110
Bose 901 MK6 £1650	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	(9dB midband) 28Hz (in room)		86
Bose Interaudio 3000XL £160	Average Average -	Lots of perceived value and well enough balanced, but low cost cabinet and driver engineering results in a crude and subtle sound	46.5 x 29 x 23cm stands in free space	89dB 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 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	88dB 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 wal	87dB 30Hz (in room)	R	82
Boston HD5 £115	Average Average	Tiny and prettily shaped miniature has an attractive lack of boxiness, but is a little short of drama and dynamic drive	25 x 16 x 18.5cm close to wall	86dB 30Hz (in room)		110
Brinkmann Endymion £395	Average- Average+	Omnidirectional design with rococo styled urn-shaped ceramic enclosure. Distinctly bass light, but sounds impressively coherent and solid	48 x 29 (diam)cm stands in free space	85dB 50/150Hz (in room)		106
C-J Synthesis LM210 £895	Good Good+	Elegant compact US floorstander is eminently relaxing and listenable, with open and coherent midband, if a bit short on welly and drive	90 x 26 x 27cm 28Hz (in room)	86dB clear of walls	R	106
Cabasse Bisquine £600	Good+ Good+	Classy French large bookshelf speaker has great coherence and dynamic grip, but a rather mid-forward overall character	48 x 26 x 30.5cm 20-30cm from wall	91dB 30Hz (in room)	R	110
Cambridge SoundWorks Ambianc	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 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 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 67Hz	R	46
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 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 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 25Hz	R	90
Castle York £340	Good Average+	Pretty little real wood compact has an engaging transparency, good balance and fine timing, but could do with more authority and welly	43 x 22 x 26cm clear of walls	86dB 30Hz (in room)		110
Celestion 3 £115	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 55Hz (in room)	R	78
Celestion 5 £155	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 30Hz		90
Celestion 6000 £1510	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	82dB	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 wall	89dB 30Hz (in room)		102
Celestion DL8 Series II £205	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	87dB 60Hz	R	59
Celestion SL12Si £615	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 clea	85dB 50Hz		66
Celestion SL600Si £820	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 52Hz		68
Celestion SL6Si £409	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 wa	86dB 30Hz (in room)		94
Creek CLS20 £120	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 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 20Hz		90
Diamond Acoustics Ref III £895	Average Good+	Lovely freestander suffers from indifferent bass alignment, but is fast, coherent, solid and very informative indeed.	87 x 27.5 x 28cm well clear of walls	90dB 30Hz (in room)	R	106

LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
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 £330	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 45Hz (in room)	BB	94
Epos ES14 £485	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 wa	85dB 25Hz (in room)	R	98
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
Faraday Siren £330 (d)	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 48Hz (in room)		94
Genexxa SE100 £150	Average Average	Pretty little Tandy-stocked miniature is attractively lively, coherent and communicative, but could do with more grunt and welly and lower coloration	28 x 15.5 x 19cm close to wall	84dB 50Hz (in room)		110
Goodmans B-Max/Maxim 2 £100/£9	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 55Hz (in room)		78
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 50Hz (in room)	R	86
Goodmans M300 £110	Average Average -	Conveying much of the charm and life which has made the Maxim 2 so popular, the M300 is sensitive, bu hampered by upper bass cabinet coloration	38.5 x 21.5 x 17cm stands close to rear	89dB 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 50Hz (in room)		94
Goodmans Maxim 3 £110	Good Average	Smooth and accomplished wall-mount miniature makes a worthy replacement for the bestselling Maxim 2	26 x 17 x 21cm stands against wall	85dB 50Hz (in room)	R	106
Harbeth HL Compact £584	Very Good Average	The clean and neutral sound lacks resolution and gives rather unobtrusive though well differentiated stereo. Can be bi-wired to advantage	52 x 27.2 x 28.1cm open space, on high	87dB 65Hz		59
Harbeth LS3/5A £379	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 60Hz		66
Heco Presto Superior 750 £600	Good+ Average	Tall slim and attractive floorstander delivers a fine, even in-room balance but lacks transparency, coherence and dynamic drive	95 x 24 x 27cm clear of walls	87dB 22Hz (in room)		106
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 fro	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 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 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 £300	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 50Hz	BB	66
Heybrook Prima £120	Average+ Average+	Neat and discreet miniature delivers fine coherence, pace and timing, though balance is a trifle forward and bass a bit light	29 x 19.5 x 18cm close to wall	86dB 50Hz (in room)	R	110
Heybrook Sextet £1079	Good Very Good	Elegant floorstanding 3-way 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
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 28Hz	R	90
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 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 33Hz		72
Infinity Modulus £695	Good Average +	Luxury hi-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 45Hz (in room)		86
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 50Hz (in room)	R	78
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 wa	88dB 27Hz (in room)		102
Infinity Reference 30 £330	Good Good	Drivers from Ref 20 in box from Ref 50 creates a well balanced and extended floorstander at a very competitive price	85 x 26.5 x 25cm clear of walls	87dB 25Hz (in room)	R	106
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
JBL Control 1 Plus £206	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 50Hz		90
JBL LX33 £270	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 48Hz	R	82
JBL LX44 £350	Good - Average	This generously built model offers good power handling, bass extension and dynamic range, but suffers from the 'three-way syndrome', with middle middle	58.5 x 30 x 29cm stands in free space	89dB 40Hz		71
JBL LX55 £400	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 wall	91dB below 20Hz (in room)		102
JBL XE2 £160	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
JPW AP2 £180	Good Average	Good size bookshelf model offers real wood veneer at a bargain price; performance is cleaner but broadly comparable to P1 Vinyl overall	43.5 x 25.5 x 26cm stands in free space	86dB 45Hz (in room)	R	106
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 57Hz	R	46
JPW Minim £79	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 28Hz (in room)	R	82
JPW P1 £155	Good Average +	Honest and basically articulate if not very sophisticated, resolution is good but it can sound a little wearing in bright systems	44 x 25.9 x 26.1cm free space on stands	89dB 60Hz	R	59
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 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 30Hz		90

Choice Hi-Fi

Fantastic!



Yes, we could devote a whole page telling you how wonderful we are, but with so many good products arriving every month we feel we just have to break the mould and say **some of these are really fantastic!**

When you walk into our large display area you'll immediately see exciting new models from NAD, Rega, Linn and Marantz and you'll be more than welcome just to browse or chat about some of the new features these products offer.

Should you wish to listen, our friendly and experienced sales staff will be pleased to devote as much time as you require to demonstrate the advantages of new models such as the Mission 753 or Linn Keilidh loudspeakers, Arcam 290, AMC3030, Linn Klout or Naim NAP 180 amplifiers and the benefits they can bring.

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LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
JRT AD1 £500 (s)	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 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 50Hz (in room)	R	94
Jamo Concert II £300	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 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 £800	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 25Hz (in room)		94
Jamo Cornet 40 £110	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
Jamo Cornet 50 £150	Average Average+	Good value bookshelf size speaker has a rough and ready sound but good heart, engaging liveliness and fair timing	42 x 23 x 22.5cm away from wall	87dB 28Hz (in room)	R	110
Jordan JH400 £504	Average- Average+	Beautiful piano finish hexagon has single full range driver and controversial sound, with uneven balance but delightful mid coherence	33 x 24 x 30.5cm 1-2ft from wall	83dB 50Hz (in room)	R	106
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 spa	92dB 50Hz	R	60
KEF K120 £159	Good Average	Physically pretty and sonically competent but undistinguished medium bookshelf size model has good sensitivity but limited extension	34 x 20.5 x 26cm 1ft from wall	87dB 45Hz (in room)		106
KEF Q60 £379	Good Good	Uni-Q co-axial driver provides fine imaging and mid coherence, while magnet decoupling reduces cabinet coloration. Bass not entirely convincing	48x25x27cm stands close to wall	90dB 25Hz (in room)	R	102
KEF Q80 £499	Good Average+	Uni-Q floorstander has good stereo and fine midband coherence, but bass lacks extension, drive and resolution	85 x 24.5 x 26.5cm free space	87dB 45Hz (in room)		106
Kammerzelt Reference Mini Monitor	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	27x17x24cm stands 1-2ft from wa	85dB 50Hz (in room)		94
Kenwood LS-770E £260	Good Good	Impressively communicative made-in-Japan large bookshelf size model has fine vigour, scale and dynamics, if not the smoothest sound around	48 x 27 x 25cm stands in free space	86dB 25Hz (in room)	R	106
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 25Hz		90
Linn Helix II £357 (s)	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	88dB 33Hz (in room)	R	102
Linn Index II/KuStone £110	Good Good	Stand and speaker looks and sounds very good for the price, 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 28Hz	BB	90
Linn Kaber LS500 £1198	Average Good +	Wall-mount package trades sensitivity for fine bass extension and midbass performance; little relentless but has prodigious dynamic capabilities	93 x 19 x 28cm floor against rear wall	86dB 28Hz (in room)	R	82
Linn Kan II £495	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 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 60Hz		59
Magneplanar MG1.4 £1090	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 40Hz	R	72
Magneplanar SMGa £688	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 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 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 45Hz	R	72
Meridian Argent 1 £995	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 stan	83dB 28Hz (in room)		98
Meridian Argent 2 £875	Good+ Good	Beautiful but pricey high-tech 'large compact' delivers 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 23Hz (in room)		94
Meridian M30 £950	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	Ac dB 40Hz		46
Mission 760i £120	Average+ Average+	Attractively styled little wall-mount miniature has livelier dynamics and bass drive than most of its type, but sounds as little shut in	29.5 x 18 x 20cm close to wall	87dB 48Hz	R	110
Mission 761i £170	Good Average	760 theme adds an extra main driver for easier amp loading and power handling. Sound judged slightly inferior to its simpler, cheaper stablemate.	38x19x24cm stands close to wall	88dB 48Hz (in room)		102
Mission 762 £230	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 55Hz		66
Mission 763 £350	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 40Hz	BB	68
Mission 764i £450	Good Average	Despite improvements, this large floorstander still lacks low frequency authority, which is probably a function of its comparatively modest price	88.5x25x32.5 1ft from wall	87dB 20Hz		94
Mission 765i £700	Good Average+	Big heavyweight floorstander has good sensitivity and bandwidth, but somehow lacks agility, authority and dynamic grip	102 x 25 x 33cm clear of walls	91dB 22Hz		110
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 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 28Hz (in room)	R	86
Mission Cyrus 782 £350 (s)	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 50Hz		71
Monitor Audio MA700 Gold £400	Good Average	Lovely luxury compact does a good job of voice reproduction, but sounds a bit lazy and off the tempo with faster, busier material	35 x 21.5 x 25cm clear of walls	85dB 50Hz		110
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 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 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 70Hz		74

LOUDSPEAKERS

■ MODEL ■ PRICE	■ LAB ■ SOUND	■ COMMENTS	■ SIZE ■ PLACEMENT	■ SENSITIVITY ■ BASS FROM	■ VALUE	■ ISSUE
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 30Hz		78
Monitor Audio Monitor One £150ewoo	Average+ Average+	Pricy but very cute little micro-miniature just about gets away with it sonically, though performance envelope is inevitably limited	24 x 15 x 16cm stands against wall	85dB 55Hz (in room)	R	106
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 wall	87dB 45Hz		90
Monitor Audio Studio 15 £1,600	Average+ Good	A little slow and lazy but better balanced than the smaller Studio models, the midband coherence and focus is superb, but it aint cheap	51x20x26cm free space	87dB 45Hz (in room)	R	102
Monitor Audio Studio 5 £700	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
Mordaunt-Short 5.10 £119	Good Average	Plenty of well engineered speaker for the money, and smoother than most of the competition, but lacks timing and enthusiasm	30.5 x 18.5 x 21.5cm c20cm from wall	85dB 50Hz		110
Mordaunt-Short 5.30 £200	Average+ Average-	Good hi-tech material value for money, but a disappointingly dull and rather bland sound. Safe but uninspiring.	42.5 x 25 x 28cm stands clear of walls	86dB 28Hz (in room)		106
Mordaunt-Short 5.40 £299	Average+ Good	Elegant near-floorstander has an even balance that makes it very easy on the ears, yet also inviting and informative	64 x 21.5 x 26.5cm low stand clear of walls	85dB 28Hz	R	110
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
NAD 8100 £300	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 45Hz (in room)	R	86
NVA Cube 1 £600 (s)	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 wa	85dB 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 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 28Hz (in room)		78
Naim NA IBL £798	Average+ Good	This tiny floorstanding wall mount delivers outstanding dynamics, speed and detail, marred by pronounced upper mid forwardness	80x18x15-20 against wall	84dB 30Hz		94
Naim SBL £1475	Good Very Good	Impressive scale full bandwidth coheren an attractively discrete floor standing wall-mount coloured midband very well balanced and agile with it.	88x26.5x17-27cm close to wall	86dB 25Hz (in room)	R	102
Neat Petite £525	Average Good+	Pricy 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
Nobis DM7 £560	Average+ Good	Pretty but pricey US bookshelf size model has more than enough speed, timing and coherence to make up for a measure of coloration	38 x 21.5 x 28.5cm 30-60cm from wall	85dB 25Hz		110
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	86dB 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 65Hz		74
Origin Live OL1 £499	Very Good Good	Luxury miniature has very good overall balance, sacrificing sensitivity to achieve remarkable bass extension for the box size	30.5 x 19 x 21cm stands close to wall	82dB 25Hz (in room)		106
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 30Hz (in room)		78
Philips FB820 £470	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 £700	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 25Hz	R	90
Professional Monitor Co LB1 £998	Good+ Good+	Delightful smoothness and transparency distinguishes this classy compact, though bass extension and sensitivity are both limited	53.5 x 18 x 26cm high stand well clea	86dB 33Hz	R	110
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 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 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 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 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
Rega ELA £405	Average+ Good	Very compact floorstander with integral stand has serious coherence and dynamics, but a measure of brightness and untidiness	84.5 x 20 x 30cm c20cm from wall	86dB 30Hz	R	110
Richard Allan CD5 £176	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 80Hz		68
Rogers LS2a/2 £220	Good+ Good	Balance is a bit warm and rich but 2a/2 has delightful mid-to-treble coherence and transparency, and more welly than Mk1	35.5 x 23 x 22cm stands clear of walls	84dB 30Hz (in room)	BB	106
Rogers LS4a/2 £300	Good Average+	Very civilised but a trifle lazy with it, this large bookshelf size model hasn't quite the timing or agility to be particularly engrossing or exciting	43 x 25.5 x 25.5cm clear of walls	86dB 25Hz		110
Rogers LS8a £450	Average + Average +	This modestly priced floorstander is 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 £599	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 36Hz	R	66
Roksan Oarius £1569 (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 spa	82dB 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 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 75Hz	R	53
Royd Apex £500	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 33Hz (in room)	R	78
Royd Eden £245	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 85Hz	R	66

LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
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 fro	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 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 wal	84dB 50Hz		71
Ruark Swordsman Plus £269	Good Average	This real wood 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 wal	86dB 30Hz	R	90
SD Acoustics OBS £865]	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 30Hz (in room)	R	82
SD Acoustics Ribbon £2295	Average Good +	A little underdeveloped and rather amplifier sensitive, 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 30Hz (in room)		81
SD Acoustics SD1 £1650	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 50Hz	R	60
SD Acoustics SD3 £399	Good Good	Port firmly blocked, the new SD3 has the agility and charm of a quality miniature, with good bass extension but low sensitivity	38 x 19.5 x 29cm stands 1ft from wall	83dB 25Hz (in room)	R	106
Seventh Veil System IV £1290 (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 28Hz (in room)	R	86
Shahinian Arc £1062	Average Good	Unusual and occasionally wonderful small floorstanding omni; too bright but exceptionally coherent and revealing	69 x 35 x 25cm well clear of walls	85dB 24Hz		110
Shan Shimna £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 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 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 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 40Hz		71
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 wa	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	86dB 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 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 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 25Hz (in room)	R	82
TDL Monitor £1999	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 28Hz	R	66
TDL Studio 0.5 £450	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 40Hz (in room)		94
TDL Studio 1 £650	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 Free space	84dB 25Hz (in room)	R	78
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	85dB 45Hz (in room)	R	102
Tannoy 605 £150	Good Average+	Largish bookshelf size hexagon is potentially fine performer, though unusual stand sensitivity makes optimisation difficult	40 x 27.5 x 18cm stands 1-2ft from wall	85dB 25Hz (in room)	R	106
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 wall	90dB 25Hz (in room)	BB	102
Tannoy 611 £399	Good Average	This compact floorstander would seem to have plenty going for it, but somehow failed to gel musically under our listening conditions	72 x 32 x 24cm clear of walls	92dB 25Hz		110
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	R	Coll '87
Technics SB-EX2 £180	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 wall	86dB 20Hz (in room)		98
Technics SB-RX50 £650	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 40Hz	R	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 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 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 wall	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 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 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 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 55Hz	BB	66
Wharfedale 515 £260	Good Good	Effectively a technical update on the continuing 505 theme, this is still more evenhanded, with better bass extension and smoother treble.	40 x 25.5 x 30cm stands clear of walls	85dB 28Hz (in room)	R	106

LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
Wharfedale 517 £400	Good Average	Similar to the 515 but half as big again, the hefty 517 should offer an improvement, but somehow has a less effective overall subjective balance	53 x 26.5 x 34 stands clear of wall	86dB 25Hz		110
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 wall	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 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, stan	90dB 40Hz	R	46
Zyp A1 £199	Average Average+	Cute metal cased micro-miniature is quite coloured but great fun, with surprising dynamics and fine wall-loaded room balance	22.5 x 14.5 x 13 close to wall	85dB 30Hz	R	110

LOUDSPEAKERS - SATELLITE AND SUBWOOFER SYSTEMS

Satellite and subwoofer systems, sometimes referred to as three way systems, consist of a small pair of speakers (the satellites) and an extra box (or two) to handle the low frequencies.

Most systems use a single sub-woofer to supply low bass output, although stereo sub-woofer systems are available. By freeing the main speakers of the necessity of generating deep bass they can be made much smaller than a standard design and as a result sat and

sub systems are usually visually unobtrusive.

Positioning of the sub-woofer is usually not as critical as the positioning of a conventional speaker and as a result the largest part of the system can be hidden away entirely, although please refer to the placement notes below as this does not apply to every system.

In general the sonic performance of these systems will fall below the performance of a good, comparably priced, conventional speaker. The value ratings given below are judged in the

context of sat and sub woofer systems only and are not judged by the same criteria as the main speakers, thus a Recommended sat and sub system probably won't sound as good as a Recommended traditional speaker.

If you are prepared to compromise slightly in terms of sound quality then a satellite and sub-woofer system might represent a good solution for those situations where the loudspeaker should be heard but not seen.

LOUDSPEAKERS - SATELLITE AND SUBWOOFER SYSTEMS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE (cm) PLACEMENT	SENSITIVITY BASS FROM	VALUE	ISSUE
Allison MS 205 £420	Average Good -	Tasty high quality satellites give this quite pricey 3-box system a touch of class. Subwoofer is very compact and only slightly boomy.	25.5x14.5x15 + 29x 29x36 stands close to wall	86dB 30Hz	R	104
Bose Acoustimass AM3 £289	Average Average	Ultra compact 3-box is well balanced though limited in loudness and bass. Tiny satellites are a bit fierce, and grilles unhelpful	9x11x11 + 20x37x19 close to wall	85dB 48Hz		104
Bose Acoustimass AM5 £569	Average + Average +	Pricey but cleverly engineered 3-box system is well balanced and uses tiny twin-driver satellites to good effect	16x7.7x12 + 36x19x48 sats at wall, sub 2ft from wall	85dB 40Hz	R	104
Heco Libero £375	Average Average	Attractive 3-box package uses neat metal satellites with versatile mounting accessories, but subwoofer is boomy in the midbass	18x11x12 + 21x55x 31.5 uncritical	85dB 45Hz		104
Jamo SW/SAT300 £300	Average Average	Attractively finished 3-box package has 'tunable' subwoofer that allows boom to be minimised and a good balance achieved	21x15x8 + 21x48x34.5 uncritical	85dB 40Hz	R	104
RSS Solid/Bass Station £550	Average Average	Multi-driver macho subwoofer adds mucho muscle to Solid satellites, but it's much more midbass than serious extension	24x12x12 + 47x 48 x 20 sub at wall, sats in free space	91dB 45Hz		104
Wharfedale 2130 £300	Average Average +	3-box system marred by indifferent boomy subwoofer but rescued by novel wide-dispersion satellites that give an open sound	14x24x11 + 19x32x 50 sub away from wall	86dB 48Hz	R	104

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 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.

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	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

The Directory

PERSONAL CASSETTES

MODEL PRICE	SOUND	COMMENTS	FEATURES	VALUE	ISSUE
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	SOUND	COMMENTS	FEATURES	VALUE	ISSUE
Aiwa XP-6 £150	Good	Punchy sound both via headphones and when used in a system but transport lets the side down a bit - not one to take out jogging	Digital output, mains adaptor, remote, headphones	R	106
Denon DCP-100 £250	Good	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	Average +	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 -	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	Mains adaptor, headphones		66
Kenwood DPC-41 £130	Average -	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 headphones		94 Supp.
Kenwood DPC-81 £200	Good +	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 charger and batts, digital output		94 Supp.
Philips AZ6897 £200	Good +	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, headphones	BB	94 Supp.
Philips AZ6819 £300	Excellent	Unusual looking machine with interesting radio headphones. Excellent sound quality but not one to walk with, superb styling	Radio headphones, rechargeables, plinth, infra-red remote	BB	106
Samsung MY-CD2 £110	Poor	Cheap and not particularly cheerful, minimum of facilities and naff sound quality, could suit those on a very tight budget	Headphones, mains adaptor		106
Sanyo CP-12 £260	Good +	Sonically amongst the more enjoyable CD players and capable of revealing the musical aspects of a disc in an interesting and entertaining fashion	Wired remote, headphones main adaptor	R	66
Sony D-11 £135	Average -	Chunky player with old fashioned styling, a rather lightweight sound and limited dynamic range.	Headphones, AC adaptor bass boost		106
Sony D-202 £160	Average +	Good sound quality twinned with relatively good portability accounts for the recommendation, can also sound OK in a main system. Nice entry level machine	Headphones, AC adaptor rechargeables, remote, digital out	R	106
Sony D-303 £280	Excellent	Tidy design with adequate features but not as cluttered as the D-350. Excellent sound quality and will even serve as a CD transport	Headphones, AC adaptor rechargeables, remote, digital out	BB	106
Sony D-350 £300	Good	More buttons and widgets than any of the others but not the sound quality or walkability to go with it	Mains adaptor, clock, rechargeable batteries		94 Supp.
Sony D-66 £180	Average +	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	Good +	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, headphones	BB	94 Supp.
Technics SL-XP505 £180	Average -	Excellent transport makes this one of the most stable players on the market and the infra-red remote control is a nice bonus. Sound quality leaves a little to be desired	Headphones, AC adaptor rechargeables, infra-red remote		106
Technics SL-XPS900 £280	Excellent	Great sound quality both via phones and in the home backed up with an impressive array of accessories. Transport is not up to use on the move	Headphones, AC adaptor rechargeables, infra-red remote	R	106

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. For more information on choosing and aerial see the feature in issue 108

Tuners come in two basic types. Analogue

models tune gradually (and usually manually) across the 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-56L £170	Good	Listenable, but not exciting, was the overall verdict - it had no gross flaws but failed to capture the imagination	FM/MW/LW digital, 20 presets, 2 aerial sockets, switchable IF bandwidth		108
Akai AT-93L £250	Good +	By AM standards presentable (good) while FM delivers the goods	All bands, aerial switch	R	65

The Directory

TUNERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
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
Aura TU-50 £230	Good Good	Tonally neutral, but with rather poor imaging and a certain woodenness to the sound.	FM digital, 16 presets		109
Creek T40s3 £220	Average+ Average	Creek's FM-only analogue tuner is now in series 3 form, though the aesthetics remain unchanged. Ours 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.
Denon TU-660L £190	Good Good	Not so successful under 'ideal' conditions, the '660 nevertheless made a fair fist of real reception, if a little muddled and lacking life.	FM/MW/LW digital, 30 presets, switchable IF bandwidth, remote	R	108
Harman Kardon Citation 23 £600	Good Very Good	Fine performance, interesting features and ease of use are this tuner's forte, and the sound quality is top notch	FM/AM seek/manual adjustment muting 16 presets remote control	R	60
Harman Kardon TU9200 £170	Average Average	The listening panel appreciated its liveliness, but found it a little muddled. Excessive pilot tone breakthrough may be distressing to listeners under 30 and indicates some design slip-up.	FM/MW digital, 16 + 16 presets		109
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
Harman Kardon TU9600 £299	Average Good	Good bass and detail, and good - perhaps slightly 'enhanced' - dynamics, but measured performance is odd in normal mode and poor in 'Active Tracking' mode.	FM/MW digital, remote control, 24 presets, 2 aerial sockets		109
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
NAD 4225 £160	Good Good ++	Slightly edgy at times and a tad coloured too, but the sound is so free and open that the tuner must be regarded as one of the most enjoyable models of its type.	FM/MW digital, 14 presets	BB	108
Nakamichi Tuner 2 £350	Good Good +	Generally a believable sound with good detail in complex music, but imaging is not 100% The price seems rather high for the performance offered.	FM digital, 30 presets, switchable IF bandwidth		109
Nakamichi ST-7E £765	Good + Good +	Exceptionally good for weak-signal areas, and good all round	16 AM/FM presets, auto time digital		55
Pioneer F-676 £200	Good + Good ++	Pioneer's extensive homework on the design seems to have paid off in a tuner that's detailed and clean-sounding. Perhaps a little bright, but not unpleasant.	FM/MW digital, 36 presets, switchable IF bandwidth, 2 aerial sockets	R	108
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
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
Rotel RT-930AX £150	Good Good -	A competent rather than exciting performer, with low audible interference though slightly compressed and muddled sound.	FM/MW/LW digital, 20 presets	R	108
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
Sony ST-S570ES £200	Good Average	A host of features, but the sound is muddled, compressed and lacking in frequency extremes.	FM/MW/LW digital, 30 presets, RDS, switchable IF bandwidth		109
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.
Yamaha TX-950 £260	Good + Good +	Very clean and civilised - a bit too much so for one listener. But tonal balance, detail and clarity are all very good; lots of useful features add to its value.	FM/MW digital, up to 40 presets, switchable IF bandwidth, 2 aerial sockets	R	108

TURNTABLES - CARTRIDGES

Very much the 'slave' of turntable and tonearm and to some extent undermined by the supply of free 'starter' cartridges on many turntables, 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 records - and the cartridge also plays a significant role in determining the system balance.

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 MM 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.

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
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

TURNTABLES - CARTRIDGES

MODEL PRICE	LAB SOUND	COMMENTS	ARM EFFECTIVE MASS OUTPUT/TYPE	VALUE	ISSUE
Audio Note IO2VDH £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
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	Downloading 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

TURNABLES - CARTRIDGES

MODEL PRICE	LAB SOUND	COMMENTS	ARM EFFECTIVE MASS OUTPUT/TYPE	VALUE	ISSUE
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 Kisekis	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 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
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
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

TURNTABLES - CARTRIDGES

MODEL PRICE	LAB SOUND	COMMENTS	ARM EFFECTIVE MASS OUTPUT/TYPE	VALUE	ISSUE
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 'record players' with a variety of automatic facilities, sometimes tied into a system remote control. But engineering compromises usually severely limit sound quality, cartridge choice may be P-mount restricted, and nowadays such machines are rarely stocked by specialist hi-fi dealers.

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 components, but 'naturally sympathetic' combinations exist, and a good dealer can help. Listed separately as integrated players and

as motor units and tonearms, our sound quality rating is based on results achieved using a high quality system - but in point of fact the deck is usually the limiting factor soundwise in any system.

Lab performance rating 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 unuddled 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
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		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

The Directory

TURNTABLES - INTEGRATED

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES ARM EFF. MASS	VALUE	ISSUE
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 Basic £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 Basic/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, 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
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
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	After-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

The Directory

MOTOR UNITS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	ISSUE
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
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, 33Gy1/3Gyrpm 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 TOO 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

TONEARMS

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 Summ
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 targetted 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

Personal Messages

As Editor Benham recently and forcefully pointed out, *Hi-Fi Choice* has never (well, hardly ever) sought 'scoop reviews', which all too often rely upon unrepresentative and misleading prototype samples. Yet I now find myself carrying out a multiple comparative review of a complete hi-fi product category that has actually been around for several years, but which appears to have been completely ignored by all our poop-scooping contemporaries.

Which turns out to be a singular oversight, explainable though not excusable by the practical difficulties involved.

The flush-mounted, in-wall loudspeaker is generally regarded, even by its manufacturers, as a niche convenience product for US 'custom fit' multi-room and A-V applications. But that is to sell the wallspeaker short. It's no universal panacea, it has some very real performance limitations, and is less well adapted to British home construction techniques. But its remarkable strengths in certain respects leave conventional box loudspeakers standing.

When a pair of loudspeakers are placed in a room,

This month Paul Messenger gets dedicated to the point of demolition by installing, often neglected, in-wall speakers.

we hear not only the direct sound but also the reflections from the boundaries of the room. Floor, ceiling and sidewalls all add contributions, both in 'early reflections' which arrive very shortly after the direct signal, and in the general lower level reverberation from subsequent multiple reflections.

The ear is quite good at picking out the 'direct' signal, but the early reflections invariably add troublesome colorations, according to the characteristics of the room, the location of the sound sources therein, and the distribution of the loudspeakers themselves (which is one reason why a dipole panel speaker will always sound different from a conventional box monopole). It's always worthwhile experimenting with the precise locations of any speakers, primarily I suspect in order to make the best of the early reflection bad job.

All surfaces play their part, but the most pernicious is certainly the wall immediately behind the speaker, partly because its reflections coincide spatially with the direct sound, but also (as Phil Ward of Canon Audio pointed out) because the reflected output from the rear of a monopole loudspeaker is far more distorted in balance than that from the front.

As KEF's Laurie Fincham pointed out during an AES lecture/demonstration, as you move a loudspeaker from the middle of the room towards the wall, the distortion created by this reflection beomes steadily more and more intrusive. But if you then take things to their logical conclusion and flush-mount the speaker front panel into the wall, all those problems suddenly evaporate, and a whole layer of

previously unavoidable coloration is stripped away.

Not only do you remove the rear wall reflection coloration, you also remove all the nasty colorations created by the enclosure in which the drivers are mounted. The wallspeaker therefore removes at a stroke two of the major distortion mechanisms that plague loudspeakers, a fact which is immediately audible in an uncanny lack of boxiness.

Sod's Law dictates that they introduce their own set of limitations of course, notably an element of unpredictability concerning the type of wall (or ceiling) and cavity (or not) behind. Unfortunately, there are also substantial mechanical limitations in the integrity of the fixing methods practised by the various commercial wallspeakers I tried, in order to enable the speaker to be installed easily into a hole cut through the plaster skin of a stud type wall.

As I don't have any genuine stud walls here, for test purposes I made two serving hatch type holes in a brick wall that separates my listening room from a loo/vestibule, with a wooden frame lining allowing alternative front baffle cutouts to be substituted for the different wallspeakers. A back panel could be fitted or removed to create the two extremes of a 12litre closed, damped box, or a complete lack of any rear loading, damping or pressure.

This latter is the true infinite baffle, taking the dipole to its logical conclusion. And although the closed box turned a few useful tricks, it was the open back that proved a total and dramatic revelation, providing a wonderful bass freedom and clarity and delivering serious in-room bass extension right down to 20Hz, even using a comparatively tiny main driver. Besides the mechanical problems of the fixings, the limiting factors were the excursion and control of the main drivers, with the smaller units providing better overall balance, if inevitably lacking loudness.

I then moved on to Phase 2, discarding the dubious stud-wall mounting arrangements and rigidly six-bolting the nice cast frame of the (£165/pair) KEF *CR160* Uni-Q driver directly to a baffle, helped by the fact that this handy little co-axial two-way unit has its crossover mounted on the back of the magnet.

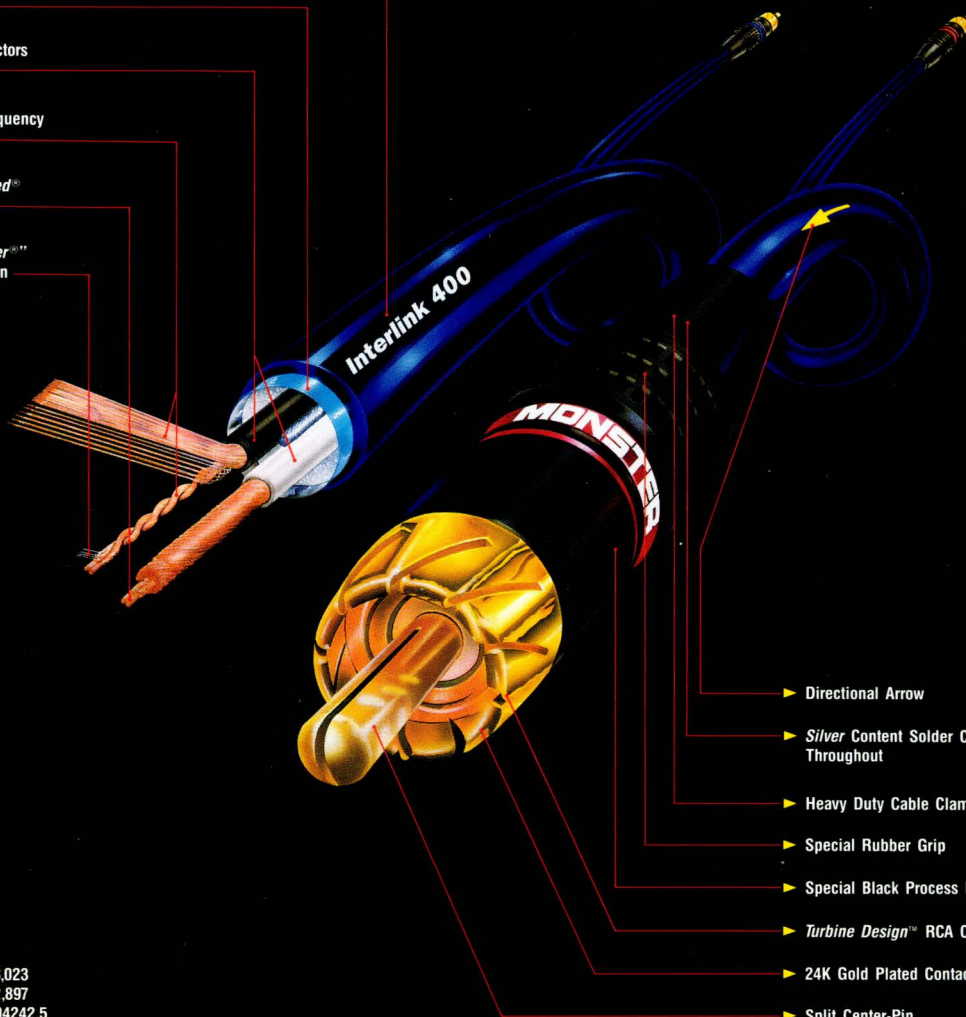
I played the results (sighted) to my speaker listening panel prior to the main proceedings getting under way, and at the end of the afternoon, one member commented that the relatively inexpensive wallspeaker had produced the best sound of the day.

Phase 3 will involve a pair of 15inch Tannoy dual-concentric drivers, but will necessitate a purpose-designed crossover. Watch this space!

Everybody's home is different, and I'm not advocating all DIY minded readers should head off to hire a Kango for the weekend. But I can affirm that there are major sonic advantages to be had from discarding wooden boxes and, if the situation permits, letting your vastly more substantial and expensive house take over the role of enclosure/baffle.

Thinking flush-mount makes a lot of sense for anyone with suitable walls or ceilings and no intentions of moving house. And when it comes down to it, a sealed box is nothing like a genuine infinite baffle, whatever the ad copy writers might have you believe.

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- ▶ Two Center Conductors plus Shield
- ▶ High and Low Frequency Networks
- ▶ Bandwidth Balanced® Conductors
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- ▶ Silver Content Solder Connections Throughout
- ▶ Heavy Duty Cable Clamp
- ▶ Special Rubber Grip
- ▶ Special Black Process Finish
- ▶ Turbine Design™ RCA Connectors
- ▶ 24K Gold Plated Contacts
- ▶ Split Center-Pin

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4,932,897
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