

HI-FI CHOICE

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

134 LOUDSPEAKERS - SUMMARISED

PERSPECTIVES EXPLORES THE FUTURE OF HI-FI

FOCUS ON CD MANUFACTURING

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SPECIAL OFFER ON WBT HI-FI ACCESSORIES

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COMPETITION

OVER **£5000** WORTH OF **MARANTZ HI-FI** MUST BE WON!

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TEST SUMMARIES ON OVER 900 HI-FI PRODUCTS



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PM 95 Reference Standard Digital Class A Amplifier.



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PUBLISHED by Dennis Publishing Ltd,
14 Rathbone Place, London W1P 1DE. Tel: 01-631 1433.
Telex: 8954139 DENNIS G. Fax: 01-436 0350
Company registered in England.
REPRO: Graphic Ideas.
TYPESET by: Time Graphics Ltd.
PRINTED by: Riverside Press.
DISTRIBUTED by: SM Distribution,
6 Leigham Court Road, Streatham, London SW16 2PG
Tel: 01-677 8111.



PUBLICATION

Enquiries regarding the content of this journal should be made in writing to *Hi-Fi Choice* Editorial, 14 Rathbone Place, London W1P 1DE. We regret enquiries cannot be dealt with by telephone. While every care has been taken in the preparation of this journal, the publishers cannot be held responsible for the accuracy of the information herein, or any consequence arising from them. Readers should note that all judgements have been made in the context of equipment available to *Hi-Fi Choice* at the time of review, and that 'value for money' comments are based on UK prices at the time of review, which are subject to fluctuation and are only applicable to the UK market. This edition © 1989. Felden productions. ISSN No. 0955 111 5.

A few days ago we were on the listening panel auditioning loudspeakers in preparation for next month's issue. As usual, the listening room was rigged with a large cloth screen hiding the loudspeakers from view – and, true to form, we came up with some unexpected results. "The screen is a great leveller", commented one member of the panel at the end of the day, by which he meant that when you're totally unaware of which model is playing, you're left with no option but to concentrate on the musical presentation and ask yourself, "Is this an enjoyable and convincing sound?"

At the end of the day, when we huddled together to compare notes, one particular loudspeaker was found to have been praised unanimously by all members of the listening panel. So imagine our surprise when it was revealed to be an unpretentious £100-a-pair model. We'd all convinced ourselves that we'd been listening to a much bigger speaker. In fact some of the other speakers in the day's presentation had been £700 floor-standing models, yet this little speaker had clearly delivered the goods. All will be revealed next month . . .

To some extent this unexpected result in our speaker listening tallies with the current state of play in the CD player market. As you'll see when you read through this month's reviews, some of the cheaper Philips and Marantz CD players are capable of producing a remarkably good sound which makes many of the much more ambitious expensive models currently available seem poor value when rated purely on a 'sound-quality-for-the-money' basis. Of course, with the cheaper players you don't get Rolls-Royce build quality – but you can get exhilarating performance at (almost) giveaway prices if you buy wisely and assemble a well balanced system.

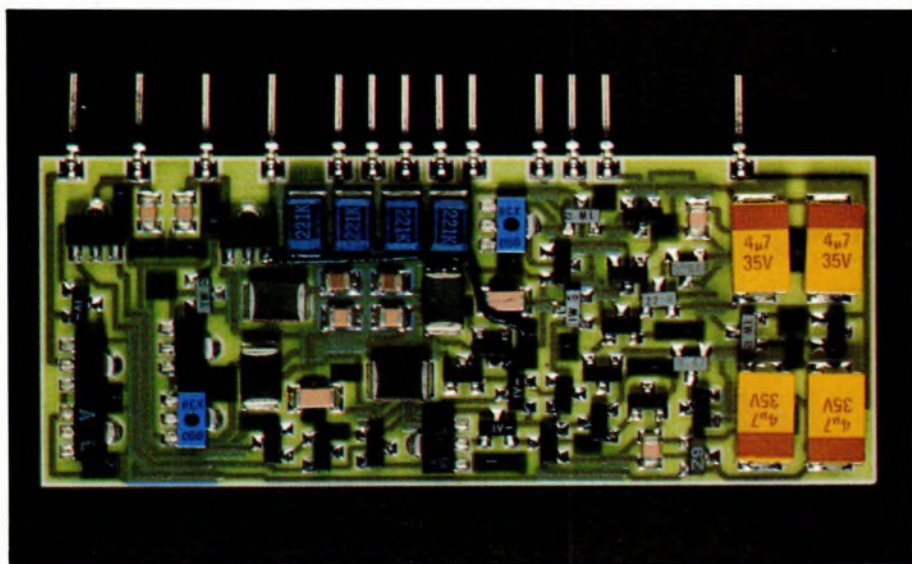
Talking of putting together complete systems on a sensible budget, the receiver appears to be gaining in popularity once again. A couple of years ago we'd have been hard-pushed to name more than two or three receivers available in the UK. Suddenly they're springing up from manufacturers all over the place. We've tested seven new models this month and will endeavour to check out another batch in the not-too-distant future. Also in this issue we've some observations on miniature 'satellite' loudspeakers which come with matching subwoofers, for those listeners who insist their hi-fi be heard but not seen. Rarely can such speaker systems perform as well as conventional (much more intrusive) enclosures, but they are a valid alternative if living space is at a premium.

John Bamford



Cover photograph
of the Marantz CD12LE,
see page 63.

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THE HI-FI CHOICE/MARANTZ COMPETITION

Your chance to win over £5,000 worth of top flight Marantz equipment. In part two of our competition there's another *CD75/II* compact disc player to be won, plus the second part of the entry form for the grand prize of a complete hi-fi system.

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RECEIVER REVIEWS

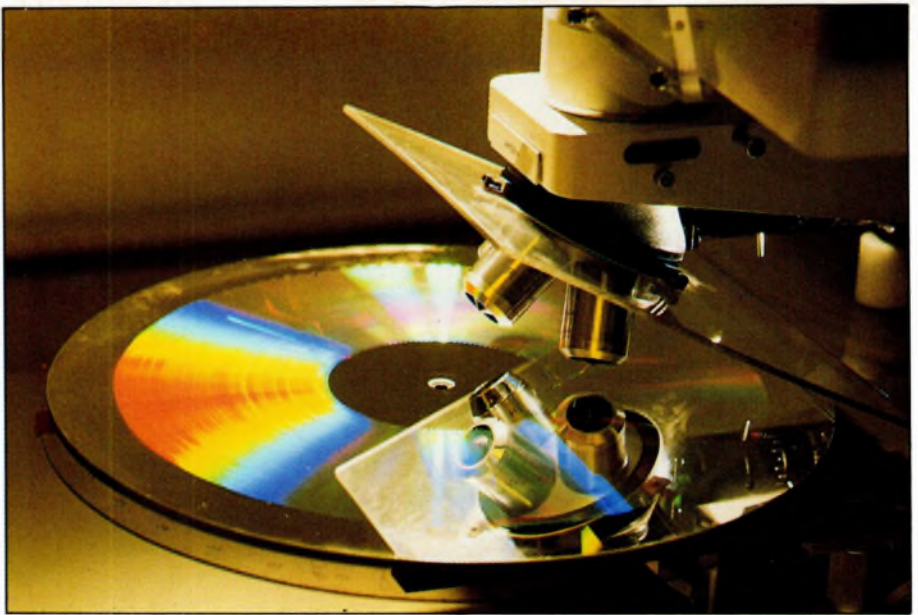
AG turns his unerring gaze upon seven contenders in the tuner/amp market.

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Our unique buyer's guide, choc full with information on all the currently available equipment that we've reviewed.

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This month we are offering a discount on WBT plugs, possibly the sexiest audio connectors made. Don't miss this chance to get your mitts on the plugs worn by the best dressed interconnects.

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COMING UP

Next month Paul Messenger brings you the word on 30 new loudspeakers, Alvin Gold dabbles with NICAM and hi-fi VCRs. Plus . . . it started with 14 bits, then they gave you 16, 20 and even 32 bits, but Philips is now telling us you only need one bit! Paul Miller explains. And not forgetting, the third and final part of the £5,000 Marantz competition – get those entries in!

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Hi-Fi Choice and Absolute Sounds bring you the DMP audiophile Jazz CDs at £5 below retail price.

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PERSONAL MESSAGES

Paul Messenger relates hands-on experience of Naim's unipivot tonearm, the ARO.



CD Manufacturing explains how those silver discs are made (top). Centre, Part Two of our fabulous competition to win over £5,000 worth of Marantz hi-fi. And below, a Choice Sessions taster of the Pluto arm/Zarathustra coming up soon in The Collection

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YAMAHA T09 Tuner Crystal clear, to your ear, this sleek, highly desirable digital tuner features 2 wavebands and sixteen touch presets ●435x72x237
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ONKYO TA2120 Cassette deck Computer controlled logic is at the heart of this high spec cassette deck featuring Dolby B&C NR, 7 segment peak meters and auto tape select. ●435x116x264
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ROTEL RA810A Amplifier At under £100 you can't go wrong on this 20wpc classic. Impressive performance and a specially designed phono input make it a 'knock 'em dead' 'Best Buy'!!
Full range of Rotel stocked!



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HITACHI FTMD5500 Tuner Containing award-winning circuitry a mind-blowing specification and 16 touch presets this tuner's knockout performance takes care of itself! Only while stocks last. ●370x65x268
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ARISTON Q Deck Turntable What Hi-Fi? magazine's 'Turntable of the Year' and Hi-Fi Choice mag's 'Best Buy' the sound on this 'Q' will blow your mind with fidelity!! While stocks last... (Quality OMP10 cart only £10 extra)



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BARGAINS!

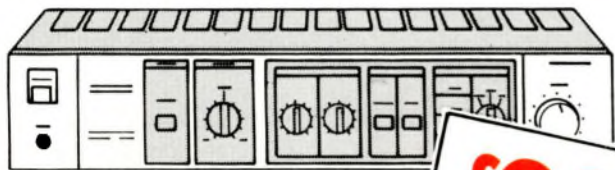
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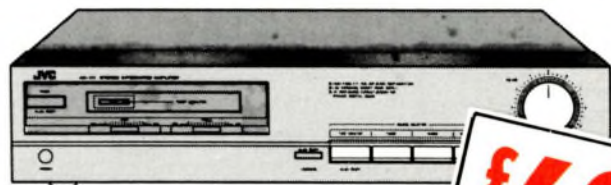
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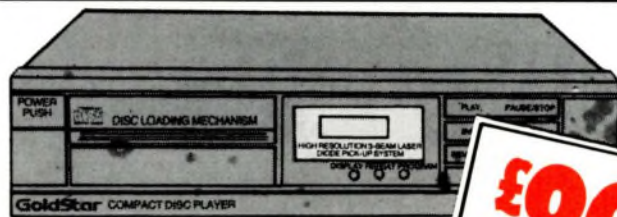
£69

JVC AX111 With internal 30wpc twin-amp high fidelity configuration and a low impedance direct power supply what more could you wish for? •435x92x218



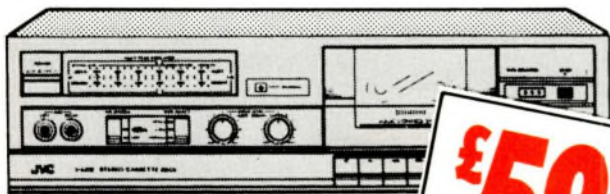
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DUAL CS410 Turntable Brand-new to the UK, this high performance low priced Dual brings new standards to budget turntables! •(Cart £5 extra.)



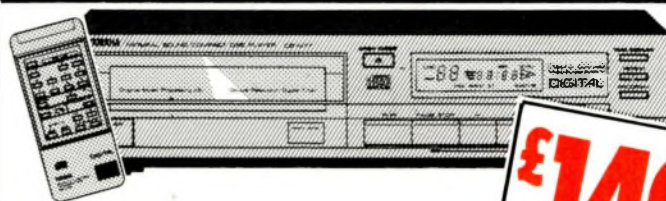
£89

GOLDSTAR CD613 An incredible deal that'll excite even the most dooby-down audiophiles after a hard days night. Throw a disc at it and allow it to seduce your ears.



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JVC TDX102 Cassette deck This super-value JVC deck comes equipped with Dolby B NR, metal heads and soft touch controls, a snip . . . but only while stocks last!



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YAMAHA CDM77 Compact Disc Sophistication is the name of the game here. A classy, crisp sounding disc spinner that'll satisfy even Mr. Richer's ears, complete with multi-function remote control.

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UPDATE

PRODUCTS

AVOIDING THE KINKS

The quest for analogue sound from digital technology continues apace with the introduction of a new 20-bit linear digital to analogue convertor in two Denon CD players. The £500 *DCD-1520* which has replaced *DCD-1500/II* (see review in this issue) and £1,000 *DCD-3520* (replacing *DCD-3200* in June) both include

amplifier – an integrated model finished in champagne gold matching the *CD12* CD player. The *PM95* was unveiled in Marantz's audiophile room at the Bristol hi-fi show and features (among other things) an on-board DAC (digital-to-analogue convertor) taking the digital bitstream from a CD or DAT player. The amplifier offers 20W Class A performance switchable to 120W per channel into 8ohms RMS. Triple independent power supplies, direct signal routing



The chips are up: Denon refines digital sound.

Denon's *Delta* system. The *Delta* system uses a 20-bit 8x oversampling digital filter and a pair of "true" 20-bit linear D/A convertors in a bid to cut out the kink in D/A transfer which is audible as distortion during quiet passages.

In addition to the new technology the *DCD-1520* has five independent power supplies, further damping on the laser subchassis, separate left and right channel D/A convertors, linear crystal oxygen free copper analogue outputs and coaxial and optical digital outputs. The *3520* will have all this plus hand-tuned conversion of the top four significant bits (which account for 93 per cent of the analogue output)

PACK LEADER

Just £1,700 will buy you the latest top of the range Marantz

and an absence of tone controls also smack of high performance characteristics.

PM95 is supplied with its own *RC95* intelligent 'table-top' remote control unit which can be used with other brands' components – or the *CD12*, say. Unfortunately the latter also comes with its own remote control unit but Marantz says that it won't supply the units separately.

Marantz also announced a Technical Helpline (on 01-897 6633) for customers dazzled by the range of features offered on some of its equipment, or who want spares and service information.

The company promises technical expertise at the end of a telephone line between the hours of 3pm and 5pm Monday through Thursday and from 3pm to 4.30pm on 'poets' day (Friday).

CROSSING THE . . .

Threshold amplifiers from California are available in this country again at about the same price they retail for in the States. Pure Sound, the Birkenhead retailer and distributor, is importing six models ranging in price from £895 to £3,950. The line-up includes the established £1,995 *FET 9* preamplifier, *FET 10* two-box component preamplifier (£3,950 if you buy both boxes) and *Stasis* power amps. In addition there is the cheaper *Forte* range consisting of a £895 preamplifier, and two dual mono power amplifiers offering Class A or A/B ratings at £995 each.

Pure Sound boss Carl Woodward said the Threshold contract was "a licence to print money" – though as yet he is restricting dealership to one other outlet in Merseyside plus his own shop. However, he said the *FET* and *Stasis* amps could be auditioned in the Midlands or Scotland. Pure Sound, 41 Green Lawn, Rockferry, Birkenhead, Merseyside. Tel. 051 645 6690.

REAL EFFECT

Yamaha has developed its new *Effect* loudspeaker to complement the *DSP-100* surround sound package. At £70 a pair the *NSE2 Effect* is described as "a neat, lightweight rear speaker system designed for easy placement and soundfield enhancement". The speaker creates a Yamaha complete surround sound package

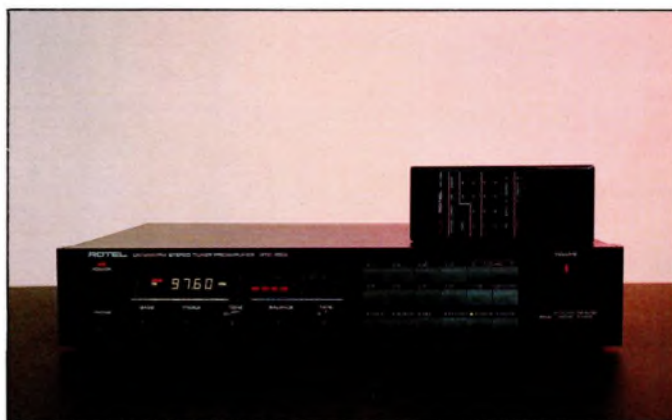
consisting of the soundfield processor (which gives you 12 varying ambient sounds, from a cathedral to a concert hall). *MX35* four channel power amplifier and two pairs of *NSE2s* for £700.

AUDIOPHILE RECEIVER

Rotel has come up with a first in the form of a tuner preamplifier which should retail for £290. The *RTC-850* is a fully remote control unit "bristling with features". The preamp section has inputs for MM/MC cartridges, CD player, two tape decks and an auxiliary (video).

The 16-station preset tuner section will pull in long, medium wave and frequency modulated offerings with automatic or manual tuning.

Rotel recently launched its *RT-870* three-band digital stereo tuner – a £220 all-singing model which promises to sort the wheat from the chaff on the airwaves. For the au fait it does this with the likes of a dual gate MOSFET mixer and double tuned RF stage, switchable FM IF bandwidth and RF gain, relay muting and an active MPX filter. The company also has a £120 cassette deck in its line-up of new products. *RD845* features Dolby B and C noise reduction, switchable tape type selection and one touch recording as well as a balance control for recording. For those who like the pneumatic approach the eject mechanism is fully damped.



Oddball: Rotel's tuner preamplifier.

RICHTER SCALER

Seismic Audio, a Basildon-based company with its roots in the professional audio market, has announced a domestic power amplifier. The company has been designing 'bespoke' monitor amplifiers for recording studios for a number of years and has standardised its most popular format for the hi-fi user.

Dubbed the *3500 Series*, the £600 (approx) mono power amplifier is based on a steel chassis and is all made 'in-house'. Audiophile features include total star earthing, gold plated connectors throughout, three separate power supplies, heavy current wiring, FET (Field Effect Transistor) technology and optical and digital D/A inputs. Fred Prior, for Seismic, said that the *3500 Series* was also likely to include a volume control.

Seismic's background means that customers can order custom versions at competitive rates – for instance Mr Prior guessed that a stereo version could be made for around £900

MODULAR AMPLIFICATION ON THE MOVE

Ortofon is now distributing the Canton range of in-car audio. This consists of a range of loudspeaker drivers and an unusual modular amplification system dubbed *Mainframe*. This is a metal frame into which individual amplification blocks can be fitted, the frame containing connections to power supply, speakers and source. It is said to be one of the most flexible in-car amplifiers available and certainly sounds as though it could meet most needs comfortably.

Canton stresses that *Mainframe* is a high-end system and this is reflected in the high-end pricing. A five module frame costs £339 and each 50W monoblok costs £299. For less ambitious systems the £239 three-block *Mainframe* is available.

TINNED CANS

Ross is launching a cordless headphone system for £99.99 which is boxed in a tin. The *Cordless Headphone System 1* has been designed by Brand New Product Development and uses the recently deregulated 49MHz frequency band. It incorporates a transmitter which can be plugged into any normal headphone socket and a receiver on the headphones themselves giving a promised hi-fi sound



Seismic's debut in the domestic scene.

quality. Ross says the range of the headphones is about 30 metres "in town" but up to 150 metres in "good conditions". "You can walk the dog around the block and still be listening to your hi-fi", said Ross Marks, for the firm.

ACOUSTICALLY SOUND

Acoustic Energy has developed a range of alloy stands to complement its (or other) loudspeakers. The stands consist of cast top and base plates hex-bolted to fluted columns which are filled with lead shot for mass loading. All three models have adjustable floor and top spikes and a concentric spirit level to ensure absolute vertical alignment. The stands match the speakers in nomenclature and are dedicated to them. *AE1* stands cost £299 a pair, *AE2s* £495.50 and *AE4s* £552.

Acoustic Energy has also made its *AE1* loudspeaker bi-wirable (like the other models) and has introduced gold-plated low

resistance terminals to the range at no extra cost.



Standing together: AE's new loudspeaker supports.

GHETTO STYLE

First of a new generation of Philips portable radio cassette recorders, the *D8288* offers many features in a styled package. A three band graphic equaliser (tone control), twin auto-reverse cassette decks with high speed dubbing (gotta have that) and

FM/LW/MW radio are all incorporated with a neat little console of controls on top of the machine. And while it may look a bit like a bluebottle Philips says it certainly doesn't sound like one. *D8288* retails for £70 – and for a tenner more you can have autosearch tuning with 24 presets in the chunkier *D8188* package.

BUSINESS

BROWN GOODS '89

Harking back to the long but now virtually defunct tradition of teak finish cabinetwork, 'Brown Goods' is the name given to home entertainment equipment by the electrical retail trade – to distinguish it from 'White' kitchen appliances. Each year a number of trade shows are staged concurrently by various brown goods manufacturers to introduce the next season's product to the dealers.

This normally happens in May, but this year was moved forward to March, with the result that a number of major brands gave it a miss altogether.

Most audio activity concentrated on midi systems, down through one-piece 'stacker' music centres to portable and personal stereos – most of which have no place at all in a hi-fi magazine. The most relevant comment is that 'soft' styling with rounded edges is steadily spreading up the price scale, and is now found on midi systems and VCRs as well as personals and portables. CD continues to spread down through the product hierarchy, and some are predicting the imminent disappearance of vinyl replay from midi-land.



Tinned cans: listen to your hi-fi while mowing the lawn.

THE ONE-BIT REVOLUTION?

Give the Japanese electronic multinationals a numbers race and they will compete fiercely to outdo one another. The present situation with CD players is another example of this familiar litany, with Sony, Technics, Yamaha, Denon and others offering various permutations of 18- and 20-bit decoding with four and eight times oversampling.

But the brief history of digital audio also suggests that Philips' steadily refined 16-bit, four times (4x) oversampling digital-to-analogue convertor chip set remains a benchmark in total performance terms. Now Philips plans to introduce a new DAC technology that threatens to make the whole numbers race **redundant**, while extending the **deprocessing** carried out in the digital rather than the analogue domain.

The new approach called 'Bitstream Conversion' will be discussed in more detail in a special feature next month.

The technique avoids the nonlinearities of current 16-bit convertors, and should in time be less expensive to manufacture and will use simplified power supplies. Philips claims very positive results from early listening tests, and will be prototyping the chip set in April/May, for anticipated player production at the end of the year. Whether the **SA47320** Bitstream DAC will yield results comparable with the current **TDA1541** series to start with must remain to be seen, but it seems likely to represent an important new step forward for the '90s.

Along with this technical tour de force a demonstration of DBS (direct broadcast satellite) digital radio given during a press conference at Philips' Eindhoven HQ showed that the company is ready to go with this potentially interesting programme source too. However, it seems unlikely that broadcast services will start for this new medium for some while yet, if at all, given the limitation of a home-based directional dish antenna.

No less esoteric but possibly more useful, Philips envisages a future development for RDS (radio data services) incorporating voice synthesis and memory banks. Commonly used words or phrases like "a five mile tailback clockwise on the M25 at Chertsey" could be held in permanent store and triggered by



While Philips announces the 1-bit revolution, we see the company also has a CD transport ready and waiting. How long before it sees these shores?

Amidst all this, one pleasant oasis of sanity was a demonstration room for Marantz's new 'high-end' two-box CD player and digital amplifier. The champagne gold finish is further evidence that hi-fi is likely to turn shiny again, fashion dictating the need for change at regular intervals.

One other area of interest to the hi-fi world is the quite rapid appearance of TV sets and VCRs fitted with on-board NICAM decoding (for TV stereo sound). The price of this feature is currently around £100 built in, with the hi-fi VCR probably the better option for the sound enthusiast (permitting the archiving of important broadcasts). Test transmissions interspersed with occasional treats is all that is available at present, but the IBA has now joined in with the BBC here and could well begin regular services in London and Yorkshire before the end of the year. Those who don't feel inclined to trade in their current TVs or VCRs might note that a company called AVTS of Feltham (Tel: 01-890 3010) is planning to produce an 'outboard' NICAM decoder 'black box' priced around £150.

SOFT STUFF

Record industry sales figures show music in the home continuing to thrive with an overall growth in value of 16 per cent from 1987 to 1988. As might be expected sales of CDs are surging ahead with an increase of 60 per cent (to 29.2m units) in numbers delivered to shops. However, the falling price of CDs means that the translated market value is rising by only 31 per cent to £167.9m. LPs still sell more than CDs – but the British Phonographic Industry's figures put volume sales down four per cent to 50.2m units. Prerecorded cassette sales are also up, by nine per cent to a total of 80.9m units. The value of this market has risen by 21 per cent to be worth £224.8m. The market for singles (CD, seven inch and 12 inch) fell by five per cent in 1988.

SHAPE OF THINGS TO COME?

Some might think it's an intergalactic sales initiative by the Terrahawks but this is the winning piece in Hinari's Industrial Design Competition. It's by Margherita Talbot, a student at Edinburgh's Napier Polytechnic who won herself a week's travel scholarship to Taiwan, Hong Kong and Japan with her *Triquetra* audio system.

The competition, run by the Design Council of Scotland and sponsored by Hinari, was open to students at Glasgow's School of Art, Napier Polytechnic and the University of Ulster. The brief was to design an "alternative style audio system without a record deck". Hinari thinks the day of vinyl is over. The judges chose the *Triquetra* because it is not only visually different but ergonomically praiseworthy and feasible to produce.

Jim Green, Hinari's Communications Manager, said the company had teamed up with the Design Council in order to get an idea of what talent existed in the colleges for this kind of thing. "The standard was exceptional, we were quite surprised," he said. As well as talent scouting, Hinari might get ideas for future production although it was unlikely it would produce anything like the *Triquetra*. But Mr Green said the firm was "very keen" to offer Margherita a scholarship to join the firm "doing her own thing".

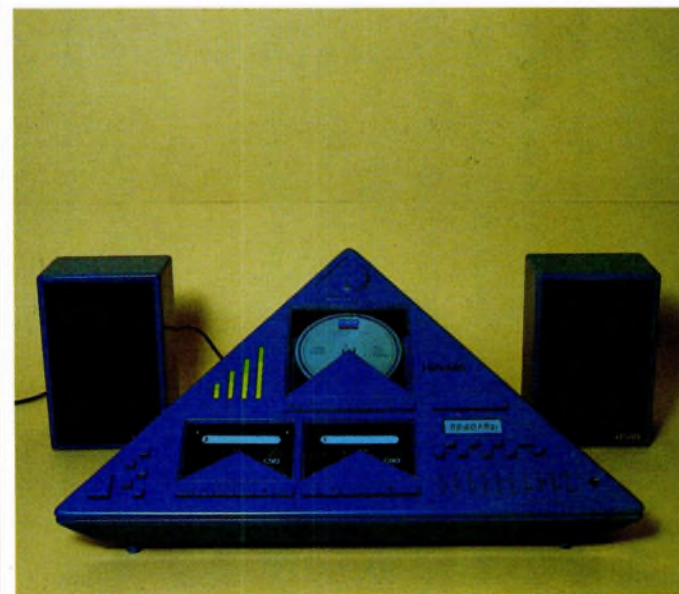
QUAD'S FOUR

Quad has commissioned four

point of sale posters from the Conran Design Group in the themes of Jazz, Classic, Opera and Modern music. The posters are supposed to enhance Quad's (Conran designed) corporate image and are aimed at identifying with the range of potential Quad customers. Designer Dinah Lone says, "strong illustrations will appeal to the customer with a serious taste in music."

AIWA'S WELSH WORKS

Aiwa's Gwent factory extension was opened by Peter Walker, the Secretary of State for Wales, on March 5th in a move enabling the firm to treble its output. Aiwa UK says the £4.3m investment will create 200 jobs at the South Wales complex where midi-systems components (ie CD players, cassette decks, amps and tuners) are made. The extension increases factory space to 100,000 square feet and Patrick Chambers, for Aiwa UK, said that future output would include separate amplifiers and tuners as well as personal stereos and in-car units.



the limited capacity data signal when needed. In-car navigation aids are already well into development and bound to become important before the end of the century, and RDS data could provide valuable traffic update information to feed into car computers handling CD-I/ROM maps, direction gyros and even satellite position finders.

IN BRIEF

Ceol Products, Dublin based professional audio manufacturer, has opened a shop selling top hi-fi brands from Audio Innovations to Oracle and TDL. The Music Mansion is in Lower Rathmines Road, Dublin 6. Tel: 961358.

Cello has announced its new *Encore* range of amplifiers, distributed in the UK by Aston Audio of Alderley Edge, Cheshire. Cello sound quality is promised in a no frills package at a realistic price.

Hi-Fi Markets is to cease distributing Sansui products in the UK from May 1st.

Presence Audio of Horsham in Sussex notifies that it services and provides new styli for Decca and Glanz cartridges. It has also changed its telephone number to (0403) 891777.

Richer Sounds, the audio discount store, has opened a new shop in College Crescent, Swiss Cottage, North London. It's open on Saturday and Sunday, and 'til 7pm on weekdays.

Nottingham has a new high-end dealer - Audio by Design, which is selling Voyd, Systemdek, Audio Innovations, Snell and JPW products. Auditions are by appointment in your own home or that of Kevin Scott - who runs the firm. Telephone (0502) 813562.

AND THE SHOW GOES ON . . .

Back in February JB and JK fired up the Uno and trucked down to the Bristol hi-fi show in search of action and adventure. This is what they found . . .

It were a grim weekend weatherwise, which made it all the more palatable to be cooped up in the Bristol Holiday Inn with hordes of hi-fi maniacs and their assorted spouse and offspring. But perhaps cooped up is the wrong word; unlike another annual show we could mention, this one is relatively civilised and spread out. Certain floors were

more popular than others, but the corridors remained negotiable and with patience most rooms could be scrambled into. We even managed to get snaps of a few new products.

This year's show was organised by three local dealers: Absolute Sound and Video, Audio Excellence and Radford Hi-Fi in association with the Haymarket group of audio magazines. This team produced a well oiled and smooth running event that unearthed a good selection of previously unseen equipment.

The talk of the show was the Pearl & Oakley Acoustics range of loudspeakers. These highly unusual transducers employ ceramic enclosures and come in a variety of wife-pleasing guises - including a classic vase shape and something that resembles a scale model of the Eddystone lighthouse. And yet these domestically oriented speakers seemed to be making quite reasonable sounds, even the almost spherical units suspended in hanging baskets which blended in so well that one could be forgiven for thinking that they actually *were* hanging baskets with plants in. Green speaker cable is the order of the day here. The sound is created with upwards and downwards firing drivers, the mid and treble units using what the company calls a Cercacreflect sound deflecting device to radiate sound through 360 degrees. Looks and sound quality never come cheap of course, these speakers costing from £500 to £900.

There was more activity on the loudspeaker front from Monitor Audio whose baby *Monitor 7* (£150), a compact design, was making some quite acceptable sounds. And Rogers was showing off the new *LS4a* (£219), a two-way closed box, and the *LS6a* (£279) which is now bi-wire ready and has a new bass unit, the 'a' suffix standing for aluminium and referring to the use of metal dome tweeters in both models. New transducers could also be found in the Mission room where the *Cyrus 782* (£340), a twin bass unit infinite baffle design of modest proportions, was being put through its paces. Allison was demonstrating the new, relatively affordable, *AL* range (prices start at £150) and Acoustic Energy proved that heavy stands don't have to be ugly with its new cast and extruded aluminium speaker supports - very tasty but inconveniently priced at £300 upwards.

Audio Concepts, a Soundtec Marketing offshoot and yet another high-end distributor was

showing amplification from FM Acoustics (a pro based Swiss firm) and Air Tight (Japanese, ex-Luxman) which produces a pre/power combo using tubes in the power amp. Both brands are in the very expensive class and certainly look the business. Kelvin Labs has discovered black and are using it liberally on its amps, including the new *Absolute Zero* pre/power priced at £395/£295. The Finestra preamp turned up on the Moth Marketing stand looking quite appealing in its clear acrylic case and EAR was turning heads with a new cost-no-object valve preamp figured to retail for £5K. More thermionic goodies were to be found in the Absolute Sounds room on the ninth floor where a black *ARC SP-15* was feeding a *Classic 60* triode power amp, and on static display was the new *SP-14* single valve preamp which is slated as Audio Research for those on a budget.

Probably the sexiest new product at Bristol was the Quest *Kouros* turntable, a white marble Sorbothane-decoupled beauty featuring a two part vinyl platter and marble puck which acts as a record clamp. Price looks likely to be in the £1,300 ballpark. However, for those who prefer their turntables in darker shades the latest offering from Oxford Acoustics should whet a few

appetites . . .

Most of the other new front ends we spotted were of the digital variety, including top-of-the-range champagne finish models from Sony (the two box *RI*) and Marantz (*CD12*). We even glimpsed a Micromega *CDFI Classic*, a rather attractive French player being distributed by Linx. Almost in the real world, Arcam had brought along a new transport-only player, the *Delta 70* (£500) and teamed it up with its latest *Black Box*.

There was no obvious 'best sound of the show' winner, but Audio by Design was making realistic noises with a modest Systemdek/Audio Innovations *Series 300/Snell Type K* system, and despite the piles of fake Lacoste polo shirts JPW managed to make some pretty convincing sounds. Neither, for that matter, was anyone complaining about Absolute Sounds' dems which were as seductive as ever.

Despite the weather Bristol '89 was an enjoyable and lively show with a good crop of new product to drool over and some tucked away for editors' eyes only, including an in-car range from Denon that looks likely to upset the high-end ICE applecart. What more can we say, except you missed a good'un!

JK



Ceramic sound for the porcelain potty.

If you like Rock music Quest's marble offering might suit.

Your ears tell you it's British, your eyes tell you it's not. Which do you trust?

A dilemma facing any discerning hi-fi buff when hearing our ES separates for the first time.



CDP 557ES

This unnerving experience should be blamed on the team of top British audio engineers and consultants who helped us develop our ES range.

For Sony to use the best hi-fi specialists in the World (the British), to satisfy the most demanding hi-fi enthusiasts

in the World (the British), is cheating you might say.

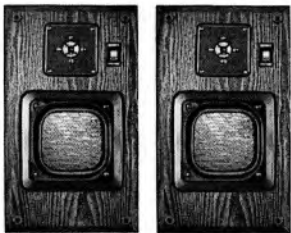
Maybe. But there's definitely no cheating on what goes into our equipment.

Both the CD player and the amplifier featured for example, have Gibraltar chassis. (Rock solid bases that keep vibration and magnetic interference to an absolute minimum.)



TCK 700ES

Both have 18-bit linear converters with eight-times oversampling. (To save you looking through reams of competitive specifications, that's the best there is.) In fact, we've gone to extraordinary lengths to keep sound signals pure.



APM 17ES

The CD player is copper shielded, its loading tray acoustically sealed. The tape deck is divided

into three compartments (all shielded), with equal weight distributed on each foot to reduce vibration. The tuner (What Hi-Fi 'Tuner of



STS 700ES

the Year' Award 1989) has AM circuitry specifically designed for the UK's medium and long wave bands.

Lastly, the loudspeakers have titanium tweeters to improve treble and a reflex design for more accurate bass.

**IF IT WASN'T FOR ONE SMALL DETAIL
YOU'D THINK OUR
HI-FI SEPARATES WERE BRITISH.**

All these measures would be pointless, though, if you skimmed on cable. We don't.

Our phono leads have gold plated connectors to improve the flow, and we spot weld them onto the cable (instead of using 'sound tarnishing' soldering like some people).

Both phono and speaker cables are made of linear crystal, oxygen free copper. They offer a lack of resistance so negligible that unless you accidentally trip over them, you'll forget they're even there.



TAF 450ES

To hear some pure, unadulterated sound, have a listen to Sony ES separates at one of the dealers overleaf. And remember. Their origins may be Japanese, but their pedigree is essentially British.

SONY ES



WBT HI-FI ACCESSORIES OFFER

Get the best from your hi-fi and save £s with high quality connectors.



Ever felt like making up your own interconnects or improving the quality of the plugs and sockets around your system? Now's your chance to do it and do it properly. *Hi-Fi Choice* in conjunction with Absolute Sounds are offering you the chance to buy the very best audio connectors at a discount.

The German WBT company produces a comprehensive range of high quality gold plated plugs and sockets, which includes two varieties of phono plug, loudspeaker plugs and an array of sexy accessories.

The WBT-0101/0150 lockable RCA phono plugs are for soldered connections and come in two sizes, for up to 9mm and 11mm diameter cables respectively. The alternative is the WBT-0108 which has screw terminals and should be used with WBT-0425 endsleeves for best results. These gold plated tubes are crimped onto the cable ends and ensure an airtight connection without the fiddle of soldering. And for a really professional look to your home-made cables, you can finish the leads off with spiral sleeves. (Note: you don't use spiral sleeves with cables exceeding 7.3mm diameter.)

If you want to improve your loudspeaker terminals and feel confident with a Black & Decker in your hands, look no further than the beefy WBT-0700 4mm pole terminals. These are designed to accept any form of speaker connection from bare wire to banana plugs and can be fitted to virtually any loudspeaker.

Perfect for all loudspeaker connections, the WBT-0600 4mm lockable 'banana' plug fits cables ranging from 2.5 to 16mm², so no more effort with large cable cross sections. For thinner cables use the WBT-0570 spiral sleeve. The 0600 can either be crimped or soldered – just as you wish.

The WBT-0200 is a top quality phono socket, just the job for cabinet mounting, for casing-wall thicknesses ranging from 0.5-6.0mm.

WBT supplies audiophile solder too (WBT-0800), and once you've perfected your connections put your cable-jungle in order and label your cables with the WBT-0500 labelling card. These sticky-backed labels are marked 'CD', 'Tape', 'Video' etc and can be wrapped around cables and connectors to make identification easy when wrestling at the back of your audio gear.

WBT products are designed to make DIY connection upgrades a painless – even, dare we say it, fulfilling pastime. We suggest you check 'em out!

TO ORDER WBT ACCESSORIES

(Tick selections)

	Recommended Retail Price	Our Price
<input type="checkbox"/> WBT-0101 RCA Male for 9mm cable	£12.95	£10.95
<input type="checkbox"/> WBT-0108 RCA Male for 9mm cable crimp-type	£15.50	£13.50
<input type="checkbox"/> WBT-0150 RCA Male for 11mm cable	£17.50	£14.95
<input type="checkbox"/> WBT-0200 Chassis mount RCA Female	£12.95	£10.95
<input type="checkbox"/> WBT-0425 Strand end sleeves for WBT-0108	£ 1.95	£ 1.60
<input type="checkbox"/> WBT-0500 Labelling card (only available with minimum order of £5.75)	£ 1.95	£ 1.60
<input type="checkbox"/> WBT-0550 Spiral sleeve (5mm cable entry)	£ 1.95	£ 1.60
<input type="checkbox"/> WBT-0560 Spiral sleeve (6.2mm cable entry)	£ 1.95	£ 1.60
<input type="checkbox"/> WBT-0570 Spiral sleeve (7.3mm cable entry)	£ 1.95	£ 1.60
<input type="checkbox"/> WBT-0600 4mm Banana plug (lockable)	£16.75	£14.25
<input type="checkbox"/> WBT-0700 4mm Pole Terminal	£16.25	£13.75
<input type="checkbox"/> WBT-0800 Silver solder (0.9mm x 10 metre)	£ 6.75	£ 5.75

PAYMENT

- I enclose cheque/PO made payable to Dennis Publishing for _____
(£5.75 minimum order)
- Please charge my Access/Visa
(delete as appropriate)

Credit card number _____ Expiry date _____

Signature _____

Name _____

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(HFC70 WBT)

Please send order form with payment to:
Hi-Fi Choice Mail Order, PO Box 320, London N21 2NB.

All our prices are inclusive of postage, packing and VAT. Please allow 28 days for delivery. Available to UK readers only.

ES SEPARATE STOCKISTS.

London: Atlantic Electronics, 295-297 High Road, Willesden

Doug Brady Hi-Fi, 18 Monmouth Street, Covent Garden

Covent Garden Records, 84 Charing Cross Road

Hairros Ltd., Knightsbridge, Brompton Road

Missey Radio, 117 Chiswick High Road, Chiswick

Nicholls Hi-Fi, 430-434 Lee High Road

PNR AudioVision, 28 Tottenham Court Road

H.L. Smith, 287 Edgware Road

Sound Sense, 350 Edgware Road

Weibeck Video Plc, 26 Tottenham Court Road

Southern England: Absolute Sound & Video Ltd., 4 Feather Lane, Basingstoke, Hants

Basildon Sony Centre, Unit 46, Eastgate Int Shop Ctr., Basildon, Essex

Bexleyheath Sony Centre, 118 Broadway, Bexleyheath, Kent

Bournemouth Sony Centre, Westover Road, Bournemouth, Dorset

Bowers & Wilkins Ltd., 1 Beckett Buildings, Littlehampton Road, Worthing, Sussex

Bromley Sony Centre, 32 The Mall, High Street, Bromley, Kent

Chew & Osborne Ltd., 148 High Street, Epping, Essex

W. Darby & Co., Lockey House, St. Peters Street, St. Albans, Herts

Dawson Radio Ltd., 23 Seamoors Road, Westbourne, Bournemouth, Dorset

Gerald F. Giles, 32-36 Rose Lane, Norwich, Norfolk

High Wycombe Sony Centre, 7 High Street, High Wycombe, Bucks

Holman Radio & Television, 3 King Street, Wimborne, Dorset

Jeffries Hi-Fi, 4 Albert Parade, Green Street, Eastbourne, East Sussex

Merrow Ltd., 21/22 Tunsgate, Guildford, Surrey

Merrow Sound Ltd., 34 West Street, Horsham, Sussex

Norwich Sony Centre, St. Stevens Way, Norwich, Norfolk

Sonance Ltd., 553 Ivybridge Shopping Centre, Isleworth, Middx

Spalding Electrical Ltd., 352-354 Lower Addiscombe Road, Croydon, Surrey

The Audio File, 27A Hockerill Street, Bishops Cleeve, Herts

Tru-Fi Sound & Vision Ltd., 2 Central Parade, London Road, Redhill, Surrey

Unitel Products Ltd., Compton House, 35 High Street, New Malden, Surrey

South West England: Absolute Sound & Video Ltd., 65 Park Street, Clifton, Bristol, Avon

Absolute Sound & Video Ltd., 42 Albion Street, Cheltenham, Glos

Absolute Sound & Video Ltd., 60 Fleet Street, Swindon, Wilts

Barnstable Sony Centre, Holland Walk, Barnstable, Devon

Bristol Sony Centre, 8-10 Bond Street, Broadmead, Bristol

Exeter Sony Centre, 15 Paris Street, Exeter, Devon

Paul Green Ltd., Hi-Fi Harpers Furn, BL, London Road, Bath, Avon

Paul Lawrence, 100 Union Street, Torquay, Devon

R. Lewis & Co. Ltd., The Green, Stonehouse, Gloucestershire

Plymouth Sony Centre, 20 Armada Centre, Armada Way, Plymouth, Devon

Midlands: Absolute Sound & Video Ltd., 19 Old High Street, Headington, Oxford

Absolute Sound & Video Ltd., 256 Banbury Road, Summertown, Oxford

James Beattie Ltd., Victoria Street, Wolverhampton

Birmingham Sony Centre, 160-162 Corporation Street, Birmingham

Chew & Osborne Ltd., 26 King Street, Saffron Walden, Cambridge

Derby Sony Centre, 2c Albert Street, Derby

High Grade Hi-Fi, 297 Wellingborough Road, Northampton

Horns, 6 South Parade, Oxford, Oxon

Kings Radio (Hereford) Ltd., 35 Widemarsh Street, Hereford, Herefordshire

Leamington Spa Sony Centre, 3 Regent Grove, Leamington Spa, Warwickshire

Mansfield Sony Centre, 14 Queen Street, Mansfield, Nottinghamshire

Northampton Sony Centre, 771 Abington Street, Northampton, Northants

Sounds Expensive, 12 Regent Street, Rugby, Warwickshire

University Audio, 1 & 2 Peas Hill, Cambridge, Cambs

Northern England: Ball Brothers Ent's, Ltd., 15 Bacup Road, Rawtenstall, Lancs

Bennett Superstore, 136 Shields Road, Byker, Newcastle-upon-Tyne, Tyne & Wear

Bradford Sony Centre, Ericks, Rawson Square, Bradford, W. Yorks

Doug Brady Hi-Fi, 15A Kingway, Warrington, Cheshire

R.F. Lang, 30 Knowsley Street, Bolton, Lancs

R.F. Lang, 6 Compton Street, Wigan, Lancs

Leeds Sony Centre, Jones of Oakwood, 103 Vicar Lane, Leeds, West Yorkshire

Linton Audio Ltd., 7-11 Park Lane, Gateshead, Tyne & Wear

Manchester Sony Centre, R.N. Cleartone Ltd., 66/68 Bridge Street, Manchester

P & A Audio, 98 Liverpool Road, Crosby, Liverpool, Merseyside

Peters Electrical Ltd., 24 St. Michaels Square, Chester, Cheshire

Peters Electrical Ltd., 8 High Street, Bromborough, Wirral, Merseyside

Peters Hi-Fi of Chester, 11 St. Werburgh Square, Grange Precinct, Birkenhead, Merseyside

Preston Sony Centre, 98-100 Fishergate Walk, St. Georges Precinct, Preston, Lancashire

Searle Audio, 223-225 Rawlinson Street, Barrow-in-Furness, Cumbria

The Transistor Centre (Wilmslow), Hi-Fi Centre, Green Lane, Wilmslow, Cheshire

Wakefield Sony Centre, 3-5 Cross Square, Wakefield, W. Yorkshire

Scotland: Dundee Sony Centre, 18 Union Street, Dundee

Edinburgh Sony Centre, 165 Bonnington Road, Edinburgh

Perth Sony Centre, 38 South Methuen Street, Perth

Graham Robertson, 5 Fountain Road, Bridge of Alan, Stirlingshire

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NEWS, VIEWS, AND MUCH, MUCH MORE.

HI-FI CHOICE

JUNE ISSUE ON SALE MAY 12th

SONY ES

COMPETITION

Hi-Fi Choice and Marantz have got together to offer you the chance to win a selection of fabulous hi-fi and video components.

With our April, May and June issues we are giving away three CD75/II compact disc players, plus a £4,000 complete system comprising CD94/CDA94 two-box CD player, PM94 amplifier, SD55 cassette deck, ST54 AM/FM tuner, LD50 DMS bi-wireable loudspeakers . . . and a CV55 CD-Video combi player. In June there will also be a runner-up prize of another CV55 CD-V machine.

Over £5,000 worth of Marantz separates to be won!

1st PRIZE: Complete separates system including CD94/CDA94 two-box CD player and a separate CV55 CD-Video.

2nd PRIZE: CV55 CD-Video combi player.

PLUS: One CD75/II CD player to be won each month for three months.



THE COMPETITION

Here's how it all works. Each month we have a simple competition consisting of five questions requiring one word answers. Fill in your answers on the entry form provided, remembering to include your full name and address, and send it to us at the address shown at the bottom of the page. The first correct entry drawn from our mailbag after the closing date wins a *CD75/III* compact disc player. It's as simple as that.

We had a *CD75/III* up for grabs last month, there's another one for the taking this month, and there'll be a final chance to win a *CD75/III* in the June issue.

And there's more besides!

If you are a regular reader and save the *System Entry Forms* from the April, May and June issues you have the chance to win a complete separates system.

Obviously this is a little more challenging; there are two additional questions to be answered which, although one word answers, are a trifle cryptic. But get your brains into gear and you'll soon have them licked!

If you missed last month's issue, a copy can be purchased from our Mail Order department. See page 123 for details. When you have completed the answers on all three *System Entry Forms* - the one published in our April issue, this one, and

one in June - clip them together and send to the address at the bottom of the page, marking your envelope 'SYSTEM'. Similar rules apply, in that the first correct set of entries pulled from the mailbag on the competition closing date wins the fabulous system complete with two-box CD player and separate *CD-V* player. We also have a runner-up prize of a *CV55 CD-V* machine for the second complete set of correct entries drawn. Good luck!

THE QUESTIONS

1. A&R Cambridge's *Arcam* outboard D-to-A convertor is called the " _ _ _ _ _ Box"
2. Traffic information is constantly available to owners of the latest hi-tech in-car radios, thanks to a new radio data system known as _ _ _ _
3. The broadcast system employed for TV in this country is PAL; in America the system used is called _ _ _ _ _
4. The playing speed of LPs is a constant 33 $\frac{1}{4}$ rpm; with CDs the disc speed decreases progressively from 500 to _ _ _ _ rpm
5. A sealed box loudspeaker might otherwise be described as an infinite _ _ _ _ _ speaker

And for the system . . .

6. Jecklin 'phones refuse to sink! _ _ _ _ _
7. A 4mm plug, favoured by monkeys. _ _ _ _ _



COMPETITION RULES

- 1) All entries must be on the entry forms provided. Photocopies will not be accepted. Entrants for the system prize must submit completed entry forms for all three parts, in a single envelope. Incomplete entries will not be considered.
- 2) There is no cash or other alternative to the prize.
- 3) Employees of Dennis Publishing Ltd and associated companies, or their agents, or of the manufacturers and suppliers of the prize system components or their relatives are not

- eligible to enter the competition.
- 4) The competition is not open to readers living outside the United Kingdom.
- 5) The prizes in each competition section will be awarded to the first set of correct answers opened. The Editor's decision shall be final and binding. No correspondence whatsoever will be entered into regarding the competition.
- 6) The winners will be notified by post and the results will be announced in *Hi-Fi Choice*.

Beware of imitations

AKAI

POWER

DIGITAL INPUT

DIGITAL 1
(OPTICAL)

DIGITAL 2

DIGITAL 3

DIGITAL 4

DIGITAL

SAMPLING
FREQUENCY

48kHz

44kHz

32kHz

INPUT SELEC

AUX

CD

PHONO

D/A

SPEAKERS

PHONES

OFF

A

B

A+B

BASS

0

-10

+10

TRE

-10

Reference Master

DIGITAL INTEGRATED AMPLIFIER AM-73

With the coming of the true digital age, new standards in product performance and quality of sound will have to be achieved.

And no-one is in a better position to meet such a challenge as Akai.

Since 1929 our belief has always been the same.

We specialise in hi-fi and are totally committed to producing the best of its kind.

We do not compromise on quality.

We welcome innovation.

We copy no-one.

The ultimate achievement in product performance and quality of sound is "Grand Excellence."



A true example is our AM-73 Digital Integrated amplifier. 150 watts of pure sound. It represents what is predicted to be the future.

Among the many state-of-the-art features are the four digital inputs, one of which is for optically transmitted signals. Making it possible to connect it with Akai's matching CD players, using their digital transmission output and optical fibre cable, so that high grade digital sources are transmitted in their purest form.

The results from the first reviews on the "Grand Excellence" range speak for themselves.



HiFi Choice (April) had no hesitation in describing the GX.52 as "A Classic Best Buy."

HiFi News and Record Review (April) evaluated the CD.73 (matching compact disc player to AM.73) as possessing "Strong performance in the laboratory coupled with fine build quality, the latest technology and a comprehensive set of controls and facilities."

You won't find Akai's equipment bearing the Grand Excellence in any ordinary hi-fi shop. Only the very selective, hi-fi specialist will carry them.

You may have to search a bit to find one, but when you do, it'll be music to your ears.

AKAI
The genuine article



For your nearest Akai audio/visual specialist, see list overleaf.

Oxford Audio Consultants

Our shop facilities are like no other.
Our equipment is without peer, from
the affordable to the very expensive.

Our superb service is the same,
regardless of price.

Featured systems this month on
continuous demonstration:

CRYSTAL REFERENCE/SME V/KRELL KC 100
AUDIO RESEARCH SP 14
AUDIO RESEARCH CLASSIC 30
MAGNEPLANAR 1.4
MICROMEGA CD F1 CLASSIC
and
THORENS TD 160 SUPER
CAMBRIDGE AUDIO C/A50
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CHOICE SESSIONS

This month we take a look at some decidedly up market equipment, with an accent on quality of construction and sound.

SEVENTH HEAVEN

Conrad-Johnson's state-of-the-art preamp, the Premier Seven, has arrived here, for the first time from America. John Bamford got to hear it – and it blew him away.

I owed Branko Bozic of Audiofreaks a visit as I had a car boot full of Audion valve amplifiers to return to him. Audiofreaks, as regular observers of the hi-fi scene will know, is the company famous for importing the Yugoslavian-made Kuzma brand into the UK – and the business has been expanding rapidly in recent months having signed up new distribution deals with Conrad-Johnson and Sound-Lab of the US.

Audiofreaks is based in Ham, Surrey, not more than a 20 minute drive from where I live. And so it was that I came to be calling in to return some borrowed gear. What I hadn't been prepared for was a privileged taster of the renowned *Premier Seven* preamplifier, C-J's no-holds-barred high-end 'statement' which until now you could only have read about in American hi-fi magazines. Audiofreaks had just taken delivery of the first sample ever to grace these shores, imported specially for some lucky customer to whom money was clearly no object in the search for audio nirvana. Take a deep breath – the *Premier Seven* costs a cool \$7,669!

What you get for this princely sum is a preamplifier designed without compromise to "bring us near to the ultimate goal of exactly reproducing a live musical event". Being 'no compromise' necessitates dual mono construction – and in the *Premier Seven* this is taken to ultimate extremes. Look at the photograph and you'll see three boxes. The top two are the left and right channel preamps; not only are there separate volume controls, but to switch inputs you have to operate separate left/right channel input selector switches too. The box you can see at the bottom is in fact two power supply boxes joined by a common front plate. You'll need two mains plugs to power up a *Premier Seven* because there are two mains cables and the power supply has two on-off switches.

The audio circuit is an all valve design using 12 single triodes and zero negative feedback. Each channel employs a low-noise nuvistor input tube so that relatively low output moving coil cartridges can be used without recourse to step-up devices, and to isolate the individual gain stages (three per channel) each stage has its own discrete regulated power supply.

For my impromptu demonstration I was treated to a tantalising hour or so of subliminal sounds from a Kuzma *Stabi* turntable fitted with the latest *Stogi Reference* arm and an Empire *MC2* cartridge. The *Premier Seven* was driving a C-J *MV100* power ampli-

fier (\$2,975) and *Energy 22 Reference Connoisseur* loudspeakers (£1,599) – the latter being ultra-refined versions of the \$600 *22 Pro Monitors* which we reviewed favourably in the January issue.

I've heard this system before – though not with the *Seven*, of course – but what I was hearing now was enough to take away the breath of even the most seasoned audiophile. The sound appeared totally seamless, with a soundstage that was nothing short of unbelievable in terms of depth and the 'height' of the images produced. The *Energy* speakers are very 'tidy' and refined sounding transducers, but never had I heard them producing such effortless dynamics throughout the frequency range, coupled with out-of-the-box images which I really didn't think they were capable of. Judging by the looks on their faces, neither did the folks at Audiofreaks.

Unaffordable it might be, but the C-J *Premier Seven* is clearly something quite special. And with luck and a following wind I just might be able to procure a sample to review for our *Collection* issue in July. In the meantime, the sound I heard that evening still haunts me.

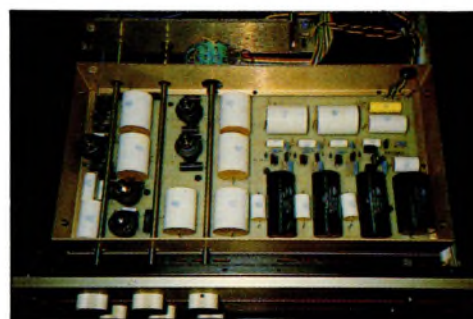
HOME-BREWED

John Bamford gave the utilitarian Analogue Electronics combination a listen and found that in the sound-per-pound stakes it took some beating.

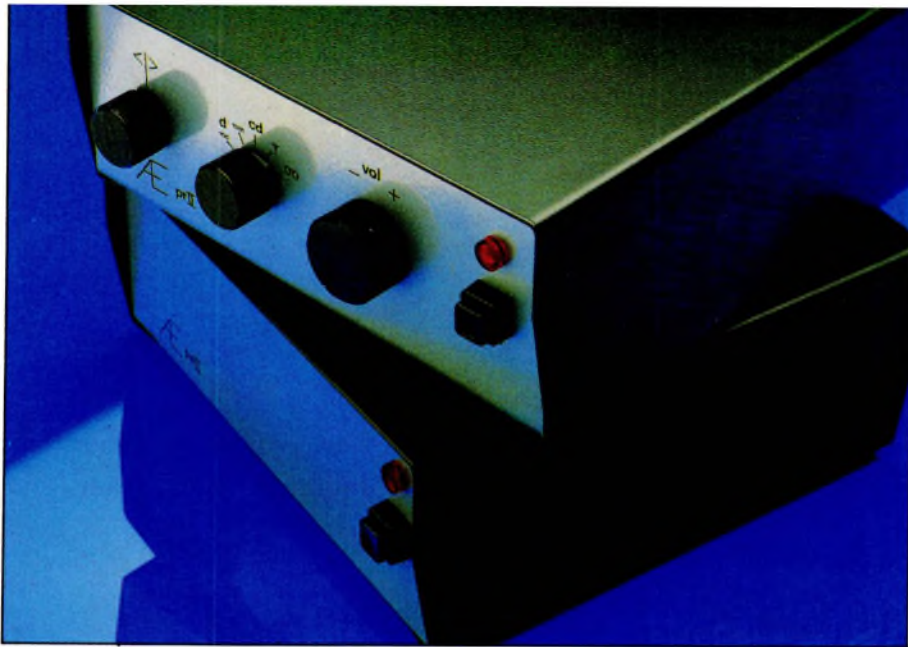
"Fine audio starts here!", is the slogan used by Analogue Electronics to promote the company's home-brewed hi-fi amplifiers. Recently I've been listening to AE's *PRII/PAII* pre/power amplifier combination which costs just \$277 all-up.

The *PRII* has a phono input which can be switched on the front panel for high (MM) and low (MC) output cartridges, along with inputs for CD, tuner and one tape deck. (An additional line input is available as an optional extra.) Controls consist of power on/off, volume, input select and balance; all that's missing is a proper tape monitor, which might upset owners of 3-head cassette decks. *PRII* is a straightforward design using integrated circuits, the moving coil stage operating in pure Class A.

The *PAII* is the company's smallest power amplifier, rated at 20watts (class A/B). Also available is the 35watt *PAIII* (\$155.50) and



The C-J Premier Seven: all the best things come in threes. Inside, damped tubes and 'floating' circuit boards.



Hi-fi for monks from Analogue Electronics

50watt FAIV (£280). The PAII has the bare minimum of facilities for a power amp – just an on/off push-button switch, left/right phono input sockets and outputs for one pair of loudspeakers (4mm plugs only). It can be bought separately for £138.50, as can the pre-amplifier.

Analogue Electronics' amplifiers bring back memories of the original Crimson Elek-trik products. The idea is that the amps should sound good while being as cheap as possible (within reason). Consequently they have a most utilitarian, rather home-made look which does little to inspire confidence in the products – and at first glance it might be difficult to take them seriously. However, get them up and running in a system and, just like the aforementioned Crimson amps, the results are rather good. In the sound per pound stakes there's little that comes even close.

To see exactly what the PRII/PAII was made of I slotted it straight into my system comprising *Rock/Excalibur/AT-OC9* front-end and Townshend *Glastonbury II* loudspeakers. The amp needs the best part of an hour to really come on song, after which it sounds rich and powerful with a particularly refined-sounding treble quality – quite smooth and innocuous. The only area in which I could criticise the sound was a lack of openness and 'sparkle' in the midband. Of course, you don't *have* to spend £250 on a hi-fi amplifier, as there are countless models available from the likes of Rotel, Mission (Cyrus), QED, Musical Fidelity (and many others) which are surprisingly capable when integrated into a balanced system, but what this AE combo provides which most other inexpensive (predominantly integrated) amplifiers don't is a sense of scale and power and authoritative 'slam' in the lower octaves.

I couldn't help but be impressed with the performance of the PRII/PAII. Nevertheless, the 'built in the garden shed' appearance is bound to limit its appeal and the lack of a proper dealer base makes it next to impossible for potential purchasers to listen before they buy. Retail outlets are currently limited to Bath and nearby Trowbridge, or the amplifiers can be bought direct from Analogue Electronics, Hartley Farm, Upper Swainswick, Bath, Avon BA1 8AF. Tel: (0225) 859473.

Maybe more UK dealers will take on Analogue Electronics amplifiers in the future, I don't know. They do appear well put together, and they certainly deliver the goods. But as I said before, the main stumbling block is bound to be that most dealers simply won't take them seriously.

UNVEILING THE KLYNE

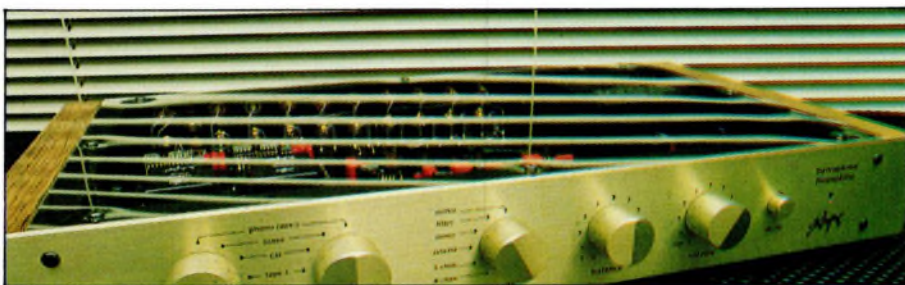
JK finds out if there's more than sex appeal to the more affordable of two new preamps from across the pond.

The Klyne name is a new one to these shores, but since autumn last year the Northern Irish company Audio Dimensions has been importing the brand from the United States and distributing it in the UK. At present Klyne Audio Arts concentrates its efforts in producing two preamplifiers, the *SK-6* auditioned here which retails for £1,675 and the *SK-5A* which comes in at £2,990. Apparently plans are also afoot for a power amplifier.

The Klyne *SK-6* is very much an American product – a highly professional looking preamp both inside and out and pride of ownership is definitely one of its selling points.

The finish is exceptional by any standards, with its oak end panels and light champagne metalwork making a welcome break from the ubiquitous black box, although black is available if required. The back panel is no less glossy with its row of gold-plated Tiffany sockets and an unusually placed on/off switch. Functionally, the *SK-6* is comprehensively equipped with twin main outputs (for bi-amping) twin tape outputs, and five inputs plus phono. Alternatively this moving magnet or coil phono input can be used as another line input if the board is removed. In fact for the dedicated digital user the preamp is available (Stateside at least) without the phono board, which must represent a considerable cost saving as the board is a complex and versatile component with user adjustable switches for impedance tailoring. Capacitance (which if you read our cartridge reviews is quite an influential factor on sound quality) can be set at one of six different levels for moving magnet cartridges, and in the case of moving coil designs resistance can be altered to suit the majority of cartridges. The six settings available range from 75ohms to 47kohms. If that isn't tweaky enough for you, check out the HF contour switches; these dictate the treble roll-off point for MC cartridges and can be set between 15 and 40kHz or not at all if you prefer. The idea is to tame the out-of-band treble rise inherent in many MC cartridges.

I mentioned that the on/off switch is mounted on the rear of the cabinet. This is to discourage the user from turning the preamp off, as leaving it on improves performance. Instead, the front panel accommodates a mute switch which cuts output to the power amplifier but keeps the machine warm. If power is completely cut and switched on again the *SK-6* 'wakes up' in mute mode and waits 30 seconds whilst it checks that the power supply is constant. Only then does its



Klyne's somewhat less hair shirt approach.

light turn from red to green and operation can commence.

So we have a professionally finished, comprehensively equipped preamplifier which, according to the blurb, is well suited to a variety of tube and solid state power amplifiers – apparently even output level can be altered to suit. However, this is something I failed to unearth in the lengthy manual, and listening was very slightly compromised by the very high input sensitivity of the Audio Innovations *First Audio* power amp that I'm currently using at home. The mismatch meant that a mid to high frequency hum could be heard during quiet passages, but my tastes don't usually wander in that direction so it wasn't too much of a nuisance. In fact Audio Dimensions has successfully used a pair of Innovations triode monoblocks with the Klyne with suitably reduced output.

To begin the auditioning I played a few different tracks using an Innovations *1000 Series* preamp and then switched to the *SK6*. The immediate impression was of a more *deliberate* sound. Notes had more of an edge to them and thus stood out more, and further listening revealed that this effect was for the most part greater transparency. It also struck me as being very consistent, ie notes appeared to have the same intensity each time they were struck – an effect, I suspect, of slight dynamic compression. Moving onto *ZZ Top*, the solidity and clarity of the Klyne allowed the rock steady rhythm section and whacky lead to really come through in a tight yet buoyant fashion. The extra edge gave amplified instruments and vocals more of their solid state feel. However, switching over to Sony Rollins' sax proved that the preamp was for the most part extremely neutral and revealing, as this acoustic recording sounded remarkably natural.

This pattern continued with everything I played, the Klyne revealing previously unheard nuance and colour in voices and instruments – the better a recording the more it was able to unveil. By comparison with the Innovations tube preamp the *SK6* is slightly lacking in dynamic range and bandwidth, but only slightly and these factors represent the strengths of that particular preamp. However, when it comes to fidelity they are also very important factors. Even at this price something has to be compromised. With compact disc the *SK6* had much the same effect, although it seemed to make the medium considerably more lively and up front. This could be construed as a bad thing but in this case it was a positive effect, as discs became that much more listenable and enjoyable.

All in all the Klyne *SK6* seems a very competent preamplifier offering more transparency than a £1,000 tube design which is no mean feat. Unfamiliarity discourages me from making comparisons with its direct competitors but I suspect it could give them a hard time. For further details you can contact Audio Dimensions on (0232) 655135.

ALSO SPRACH . . .

JK takes a first glimpse at one of the UK's most seductive turntables fitted with Denmark's zaniest tonearm.

Since the demise of Automation Sciences (once the high-end importer of audio delights such as Cello, Burmester and Infin-



Zarathustra & Pluto: an audio Odyssey.



ity), Zarathustra turntables have maintained a very low profile. However, late last year a press release and rather glamorous brochure appeared in our in-tray and shortly afterwards we received a call from Zarathustra's Simon Yorke offering us a turntable to review. Never one to pass up the opportunity to play with an expensive record player I made appropriately appreciative noises and soon got my eager hands on the Zarathustra *S4*.

Complete with two speed power supply and the outrageous Pluto titanium tonearm, this gramophone retails for a not inconsiderable four-and-a-half grand. However, the skeletal *S4* itself was designed as an affordable version of the *S5* which features a marble base and glass cabinet. At its most competitive price the *S4* can be had for £1,500 with single speed power supply; the power supply featured here retails for £500 and gives you the opportunity to play singles, as well as being able to cope with less than wonderful mains supplies.

Pluto tonearms which Zarathustra distributes are weird and wonderful things – like a Buck Rogers' style *SME MkIII*, they use highly toleranced gimbal bearings and are almost infinitely adjustable, even down to the angle of the headshell.

The Rolls-Royce standard of construction and superb finish of both components can just about be gleaned from the photograph, but what's more important is – does it work and is it worth it? The answer to the first question has to be a resounding yes, it works damned well and I was loathe to let it go; the answer to the second question is again yes, if you can afford it and you've got a system that will make the most of the signal it extracts.

In my Audio Innovations/Snell system,

equipped with a relatively down-to-earth Stilton *AT-F3*, the *S4* proved incredibly revealing, and the amount of extra information it managed to find on very well known records was, at times, staggering.

What becomes dramatically apparent when playing records on the Zarathustra is the different standards of recording, mastering and pressing – and even the extent to which a disc is worn. All these factors become painfully obvious with heavily compressed and crudely processed discs. Which is a crude way of saying that the player's character is so subtle that one gets the impression that only the vinyl can be heard, which is where a competitive reference would have come in very handy. By competitive I mean something that does a better or similar job, and this is where my usual reference fell down a bit.

If the Zarathustra *S4/Pluto* combination has a 'sound' then it's one of incredible solidity and control. Music like Zappa's *Rubber Shirt* and The The's *Soul Mining* really showed off the black, tightly etched bottom end of this turntable and arm combo. I even dragged JB around to see what he thought, and if he could detect the sonic signature of this combination. His conclusion was that he'd never heard Innovations and Snells sounding so 'warm', and although this is a strong character of the room we were in, it's also an indication of the total control with which the player reproduces the records it's given.

That's all for now, folks. But if this has whetted your appetite there'll be plenty more on this record player in *The Collection* which will be out on the shelves in early June. If you can afford a Zarathustra you can always ring Simon Yorke in the meantime on (0857) 662.



ASPIRATIONS

If you're a professional artist playing records can lead to frustration at the lack of realism in your system. Dan Houston visited a bass-singer who has found the right hi-fi for him. Chris Richardson photographs.

The constraints of a small London flat were a major concern for Peter Younie when choosing his new hi-fi. When he decided to upgrade his 18-year-old system, Peter, a design consultancy finance director by day and bass singer with The London Symphony Chorus by night, approached half a dozen hi-fi shops in search of what was right for him.

This search led him to The Cornflake Shop (named after the founders' original intention to sell breakfast *and* hi-fi), where Steve Moore suggested they first visit Peter's flat before he began auditioning any equipment. After Steve's visit the

two were able to discuss the positioning of equipment and the constraints that were likely to be imposed, with a clear idea of the hi-fi's setting in mind.

Peter was particularly impressed by this approach, one which had not been offered by other shops he visited (though it's not universally offered by The Cornflake Shop either). In fact he stressed that finding the right dealer for him was the most important step on his journey to aural happiness. Even though he was aware of what he wanted from a system he needed a dealer's expertise in finding the right balance of sound quality and facilities with as few sac-

The Professional's



rifices as possible in either camp.

Peter Younie lives on the top floor of a Georgian house in Primrose Hill where the early morning 'village' atmosphere and proximity to the green acres of Regents Park belie the fact that he can walk to work in Soho. Music, rather than hi-fi is his passion; he read Music and English at Cambridge University and sings bass for the London Symphony Chorus – a 200-strong group which he describes as being amateurs of professional calibre. He also plays, and his flat is home to a clavichord which provides true fidelity between the high-fidelity Roksan loudspeakers in their outlandish exoskeleton stands.

"Being a musician informs the rest of your life; that's why choirboys usually do well at school," he told me. "With music you have to have a clear idea of what you're trying to achieve overall and then pay attention to all the details. And the more you put in, the more you get out."

Happy with his choice, Peter wanted a system which was easy to use as well as good to listen to.



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Before embarking on the journey to choose his new system Peter was very clear about his needs. "I wanted to be able to sit here and listen to music loud but I also wanted a system that would cope with a small choir. If the system has any coloration you can hear that with polyphonic or choral music. Spending a lot of time in recording studios you know what a piece should sound like and a lot of dealers are unable to recreate that. I didn't want to be aware of the system - I wanted to be able to concentrate on the music. I also realised that it was necessary to compromise with classical music. With pop music many problems with hi-fi disappear because it is written for hi-fi or audio equipment and that sort of symbiosis works to create an overall effect.

"I needed a system that reproduces music the way I hear it - which is in a concert hall. But in the morning I listen to Radio 4 and I wanted something which would give me sound everywhere in the flat. That created different demands, but here I have the best of both worlds."

The vinyl source for this system is the

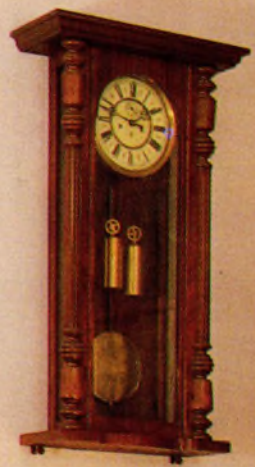
only non-new component - an original Heybrook 772 which will be upgraded when the need arrives. Peter changed to the CD medium preferring its ease of use over record players and he has a Marantz CD94 - a 'Rolls-Royce' among CD stand-alone units. His Yamaha KX500 cassette deck was likewise chosen for ease of use as well as superlative sound quality. It features a track search facility and is remotely controllable which he finds is especially useful in a practical application for learning Italian using cassette tapes and books. These, and a National Panasonic video recorder, are linked via a Harman Kardon HK330vi receiver and QED passive preamplifier to a Canadian Bryston 2B power amplifier which powers the Roksan Darius loudspeakers.

Altruism for his neighbours' ears late at night led to Peter buying a set of Jecklin Float electrostatic headphones. These generally enjoy high esteem but Peter felt they were "not very naturalistic". "I'll have to watch the development of headphones over the next few years," he said.

The rest of this bijou pad is served by



Space is a little place, above, but this room can feel like a hall when the system is doing its stuff.



two pairs of Mordaunt-Short *MS10* loudspeakers – all driven by the Harman Kardon receiver to bring Peter Radio 4 during his ablutions or over breakfast. One pair of *MS10*s hangs in the kitchen while the other is split, with one speaker in the bedroom and another in the bathroom. It was felt much better to have a speaker like the *MS10* in mono in these two areas rather than go for stereo pairs of less efficient or cheaper models. All four boxes are mounted on Target wall brackets (the walls here wouldn't allow the installation of a flush-mounted speaker). Wiring, although visible (but run under carpets where possible), is discreet with no unsightly coils hanging about. There are QED volume potentiometers in each room to allow individual control of volume.

The first and truly clever aspect of the choice of these speakers here is that they tonally match the *Darii* to a 'T'. There is no feeling of a different medium as you walk around the flat which lends a harmony (particularly with voices) when all six loudspeakers are being used. Another thoughtful piece of engineering on the



Bathroom, top, and kitchen speakers convey the living room sound from both hi-fi and TV.

Cornflakes' part is that although the Marantz *CD94* plays through the *Darius* speakers only via QED's passive preamp and the Bryston *2B* (giving the purest signal through the least number of components), CD can still be enjoyed through the rest of the flat via the receiver.

Of course once you start spending this kind of money on hi-fi it is possible to hear the faults in recording techniques – or at any rate drawbacks. Peter prefers the Telarc approach to recording (where three microphones are placed in front of the orchestra) because that gives a more natural sound as one might hear it at a concert, and allows the conductor to set the balance of the music rather than the recording engineer. And he believes the CD medium lends itself to simple recording techniques such as this. "As systems get better," he opined, "so we will notice all these things more. Sometimes it feels like you're in the middle of it all – and of course you are, because with many recordings that is just where all the microphones are."

The acid test for the system is whether it can sonically deliver the goods you expect. Here Peter was getting out compact discs and commenting about the vagaries of the recording sessions which he had attended. With a recent Chandos recording of Elgar's *Dream of Gerontius* he commented on the mezzo soprano Felicity Palmer, saying: "that is just what her voice sounds like . . . normally I would brace myself for that because I know it would be wrong. This system has unbelievable handling of the dynamic range."

Listening to a variety of both modern and classical material, it would be hard to disagree. The *Darius* always impresses, giving a sense of realism to the sound – Peter is confident that he is getting his Italian accent right with the speaker's help! And I was particularly impressed with its performance in this room where it was able to create both intimate and grand atmospheres. But of course the speaker can only deal with what is put into it and certainly the Marantz/Bryston set-up contributed to an enjoyable morning's listening.

The System:

Heybrook <i>TT2</i> turntable	n/a
Yamaha <i>KX500</i> cassette deck	£210
Marantz <i>CD94</i> CD player	£800
Harman Kardon <i>HK330vi</i> receiver	£260
Modified QED passive preamplifier	n/a
Bryston <i>2B</i> power amplifier	£695
Roksan <i>Darius</i> loudspeakers	£1,265
Jecklin Float electrostatic headphones	£399
Mordaunt-Short <i>MS10</i> loudspeakers	£100

Supplied and installed by: The Cornflake Shop, 37 Windmill Street, London W1. Tel: (01) 631 0472.

FOCUS ON . . .

John Seabury visits PDO Blackburn to talk to Dave Wilson, the company's Customer Services Manager, and to see just what it takes to produce those shiny silver (and gold) discs.

CD Manufacturing



recorded in analogue, not digital form. As there's no error-correction for the analogue part even very minor defects can cause problems. However, PDO's answer is to make its production lines dual-purpose, and bring its CD manufacture up to CDV standards.

The tapes PDO receives are usually Sony PCM 1630 digital masters on U-matic videotape. Other possibilities are PCM F1 and analogue masters, and these would usually be put out to a studio for conversion to 1630 format. The incoming 1630 masters may or may not have a 'verification certificate' – that is, the printed output from a Digital Tape Analyser (DTA), identifying the digital errors on the tape. Also, the tape may already hold the PQ coding defining track times, or there may be a list of titles and timings so PDO can do the coding.

The third item which may accompany the tape is a 'label film' – a line image for the printing of the CD label. An example I saw was for a CD single of Hendrix's *All Along The Watchtower*. The actual printed matter for the CD sleeve is produced elsewhere, and as Dave Wilson complains, it's often this low-tech part of the product that causes the longest delays . . .



As you approach Blackburn by train from the North, the railway line takes you through a time-honoured landscape of mills, factories and terraced houses. Passing the established Philips site, though, your eye is drawn across an open field to a brand new factory bearing the company name 'PDO' in large yellow letters.

PDO stands for Philips and DuPont Optical, and this is its hi-tech CD and CDV manufacturing plant. It represents an investment of over £25m, and in excess of 400 people work here.



CUSTOMER SERVICE

My tour of the plant began in the Customer Service area, where the client's master-tape is received and the job logged onto the computer. Each job is carefully tracked through the factory, with bar-coded labels for every stage. Normal turn-around time is six to seven days, rising to about ten days in the peak period before Christmas.

PDO differs from many of its CD competitors in that it presses a very wide variety of optical discs. These range from 3inch and 5inch CD singles and 5inch CD albums to 5inch CDVs, double-sided 8inch and 12inch CDVs, and the professional 'interactive video' products (previously called Laservision).

Although we're dealing here with CD, CDV is actually more demanding in manufacture, because the picture content is



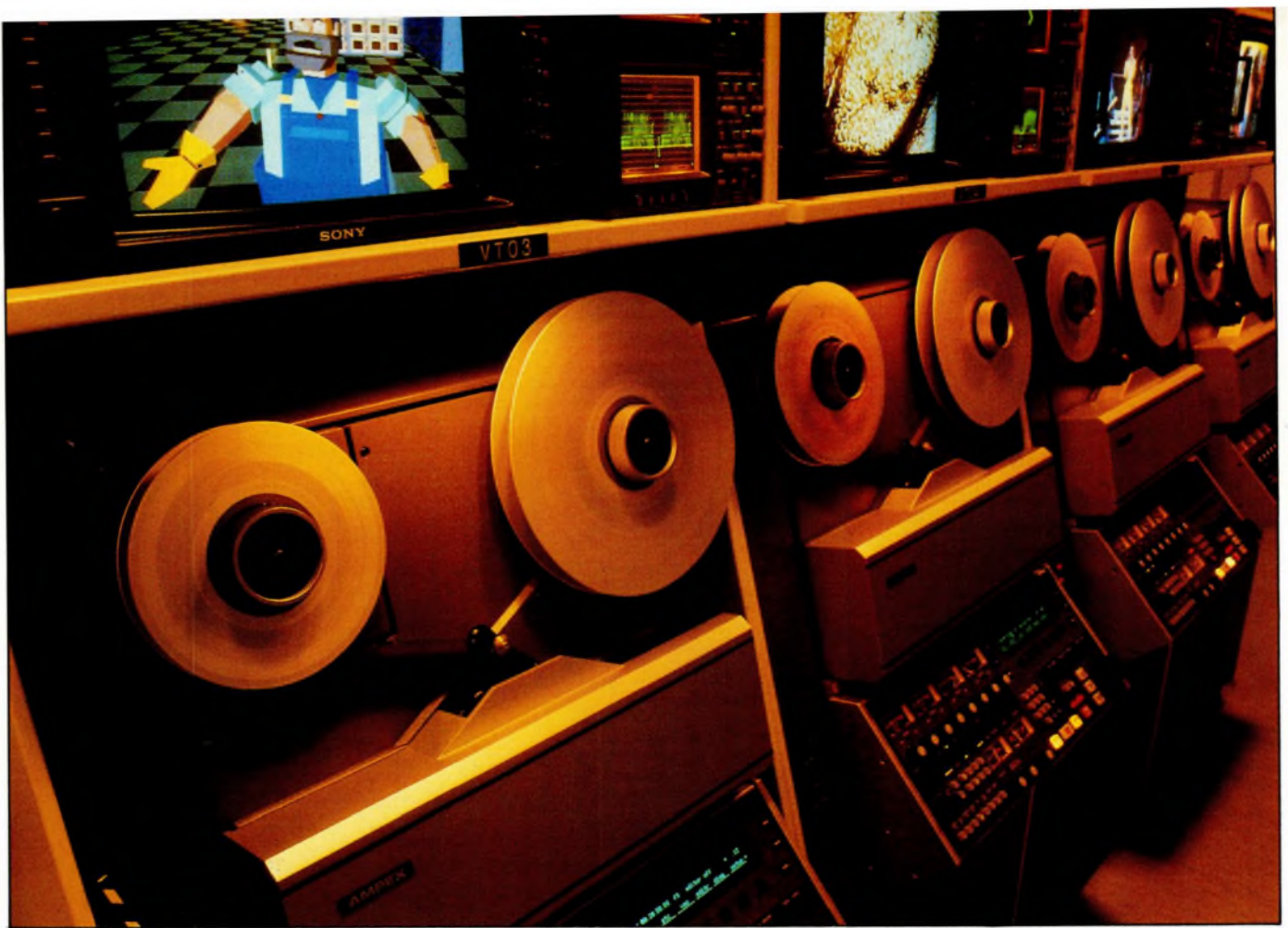
Various size stampers go through the processes of cleaning, plating and inspection. Above: PDO Blackburn at dusk

MASTERING

So to mastering, and there's a basic problem here. The 'pits' on an optical disc are incredibly small – even with all that error correction in the player, manufacturing standards still need to be tightly controlled. And the working environment, especially that for producing the glass master-disc, needs to be super-clean.

Specialist air-conditioning is fitted, and clean air blown downwards over the work. Staff in these areas wear gowns, caps and plastic overshoes and there are sticky mats in the doorways. 'Class 100' is what PDO specifies for the cleanest areas. That means no more than 100 microscopic particles per cubic foot of air, putting the average hospital operating theatre to shame! The rest of mastering and stamper-making is Class 1000, which is still clean enough to make dandruff-suffering mortals like myself thoroughly paranoid.

There are two 'legs' to the mastering



process. First there's the preparation of the glass disc, then there's the stream of digital information from tape, which goes through a series of processing and checking stages before meeting up with the glass disc in the Laser Beam Recorder (LBR). The over-sized glass discs (8inch for a 5inch CD, 14inch for a 12inch CDV) are flat to within 50 microns. (That's a twentieth of a millimetre, which is pretty flat!) These are cleaned, and the top surface coated with a uniform layer of photo-resist just 0.12 microns thick. The disc is then baked in an oven and housed in a plastic cassette.

As for the digital signal path, all the electronics for processing the CD and CDV signals are contained in one area, beside the LBR room. For audio, the first port of call is a Sony digital master recorder and PCM 1630 processor. The tape is also put through an analyser, even if this has already been done elsewhere. For CDV there are Sony and Ampex VTRs – in fact, there's £10m worth of equipment in that one room.

The tape then passes to the Sony DAE-3000 digital editing system, where track timings are checked precisely and any necessary editing is done. Then the PQ coding is completed; track timing and details about muting between tracks, pre-emphasis, and so on are laid down as a 'table of contents' at the start of the tape. This ends up as that narrow band round the inside of your CD . . .

The PQ-encoded tape is then transferred to a rack of electronics known as the



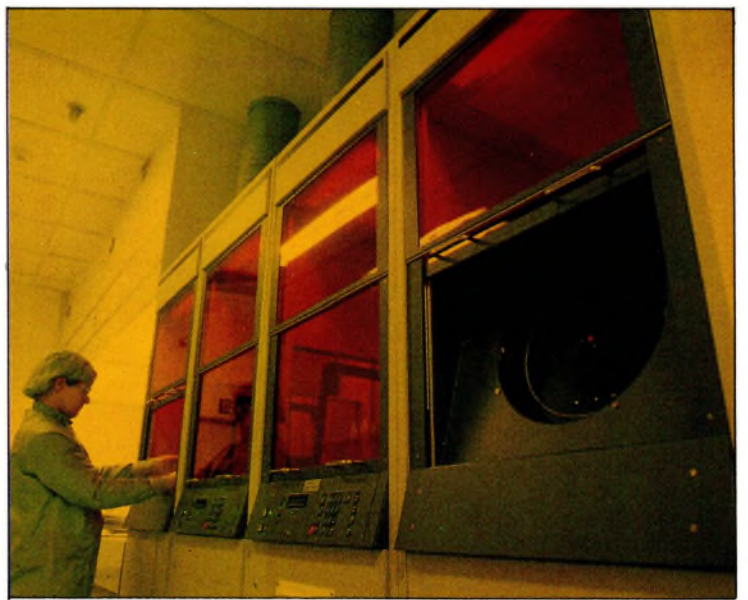
Top, a row of Sony and Ampex VTRs in the CDV mastering area. Below, a master tape for a 12in CDV being loaded.

'CD encoder', which is where the error-correction facility is built into the CD. The verified digital information is split up so that the individual bits of each digital 'word' will be spread out over the disc's surface. The data is also padded out with electronically-generated check digits.

This 'Solomon-Reed coding' means that a small scratch or speck of dandruff on playback will interfere a *little bit* with quite a few digital words, but won't destroy any completely. In many cases the player's

circuitry can reconstitute the signal completely. Then the CD-encoded signal, with a 44.1kHz sampling rate, is again analysed and if any nasty spikes or other nasties have intruded, the master is aborted.

If all is well, a prepared glass master is loaded into the Laser Beam Recorder from the clean-room behind. At run-time, each binary digit ('bit') of the CD-encoded signal causes the laser beam to switch on and off. But there's a second output from



Left, 4 CDVs undergoing a 'content control' test; Above, preparation of the photo-sensitive glass substrate, under red lighting; Bottom of page, the continuous on-line metallising process for CDs

the CD mastering system – a set of control signals to rotate the master disc and move the laser head across the disc. The head's vertical position is dynamically servo-controlled, and the CD mastering system (designed by PDO) includes a TV monitor which gives a real-time image of the laser 'dot' on the disc.

The exposed glass disc is then passed back into the clean-room for development under red lighting which softens the exposed areas so they can be washed away with (very pure) water to leave a spiral of pits. After a quick spin to remove the water, the disc passes into the silver deposition equipment where a thin layer of very pure silver is deposited on the surface making the disc *electrically conductive* and *reflective*. From here the disc passes straight to the 'DMP' – digital master player – which reads the table of contents and digital stream, checking the integrity of the information. This device effectively gives a yes/no decision on the disc. Any bubbles or debris are bad news . . .

There's a separate DMP for CDV masters, and note that the double-sided 8inch and 12inch CDVs don't have double-sided masters, each side having a separate master, giving two separate mouldings which are glued back-to-back in production.

ELECTRO-PLATING AND STAMPER-MAKING

The master-disc is now nickel-plated, the technology being similar to that used in making stampers for vinyl. "But we're much fussier than any vinyl producer!" Dave Wilson insisted. The silver-and-nickel sandwich is peeled from the glass, and the silver cleaned off to leave the nickel 'father', with bumps rather than pits. This is re-plated with nickel to produce a 'mother' disc, with pits again. And

the mother can then be electro-plated repeatedly to produce a family of 'sons', these being the stampers for the production lines.

The mothers are stored for future use, as just enough sons are produced for the job in hand. For a small run – a few thousand CDs – only two or three stampers would be produced, then discarded after use. The disc surfaces are delicate, so the father and mother are re-coated with nickel for protection; the stampers have a peelable plastic coating.

As the silvered master is even more vulnerable, PDO plates it within three hours of recording, as the silver can tarnish easily.

REPLICATION

Across the road are PDO's 'replication halls' where one hall is used mainly for pressing 8inch and 12inch CDVs and interactive video discs, and the other for 5inch CDs and CDVs. Two things here make PDO Blackburn stand out. Firstly, PDO is pressing CDV – at the time of my visit, no-one else in Europe was mastering

and replicating CDV. Current installed capacity is 30 million CDs per year, though the plant doesn't work flat-out, seven days a week

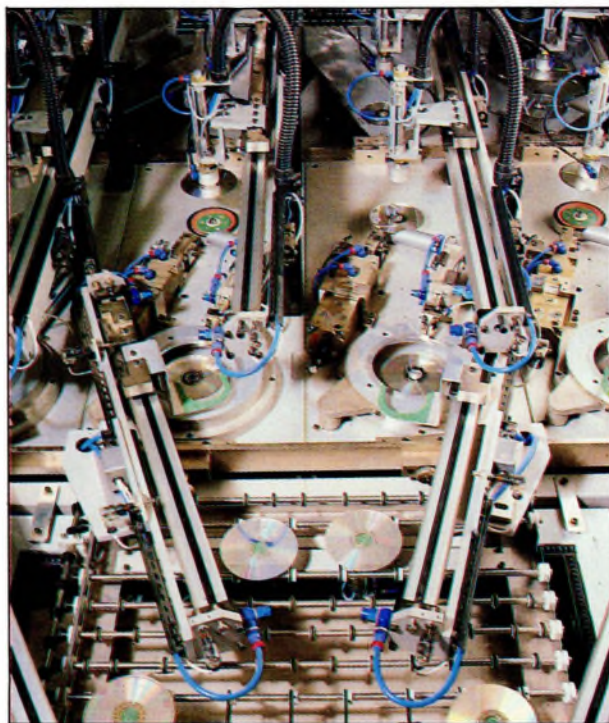
The other point is that PDO's replication *doesn't* take place in a clean-room. Specialist air-conditioning is a costly way of working, and PDO now defines the task as keeping the *product* clean, not the *people*. So the halls are a normal working environment, but there are down-flow air cabinets for 'Class 100-ish' conditions wherever the product is exposed.

In each hall there are several production lines; for CD, four injection-moulding machines feed one line. The starting point is optical-grade polycarbonate granules, each batch of which is dried and filtered. It is then vacuum-fed to the moulding machines, being drawn along a heated screw until viscous, forced against the stamper at high pressure, cooled, then removed by a robot arm. The cycle-time is around ten seconds. At this stage the CD is a see-through disc.

So is stamping infallible? No – for instance, you could have a 'catastrophic failure' if a robot arm knocked the stamper surface. And there's stamper wear – so PDO makes it its business to know just *how* stampers wear. Two thousand CDs per stamper is no problem, and five figures is not exceptional. CDV is more of a problem here, because of the analogue information.

The clear disc now needs its top-surface metallising to make the pits reflective. Aluminium is used, and PDO has a continuous, on-line process for smooth production. The disc is robotically trimmed and moves down the line to the lacquering stage. As the aluminium will oxidise if not protected properly, a measured dose of lacquer is dropped onto the disc which is then spun to produce an even coating. It then passes through a continuous drying





Above, rubber pads print the labels; Right, the complex equipment for lacquering CDs on the production line; Bottom (f page, the finished product – CD albums packed 25 to a box.

oven to harden the lacquer before the label is inked onto the top surface. PDO has never had an oxidation problem, but it double-checks by testing each batch of lacquer for impurities.

Label printing is done at the end of each production line to avoid mix-ups. There's a choice of four colours plus white, and quite elaborate effects can be achieved. You've probably seen those picture CDs in full colour – well, that picture is printed on the disc's top surface. For each colour there's a printing plate, produced on-site from supplied film or artwork. This is inked automatically, then a big, round, pink squeezy thing – like a soft rubber ball – is electrostatically charged, picks up the ink on its under-surface, then electrostatically discharged, and transfers ink to the CD.

So to inspection. Every disc coming off the line is viewed under a polarising screen, which shows up optical defects in the polycarbonate. Pinholes, black spots and surface blemishes are also looked for, and the discs which pass go to packing

SET-UP AND PROCESS CHECKS

The one area I haven't mentioned is testing. As you would expect, PDO carries out strict checks on its discs during production. When a set of stampers is installed, there's a test on the first discs pressed, covering two main areas – *plastic* control and *content* control. Plastic control is to do with the optical properties of the disc, like bi-refringence. The eccentricity of the pit spiral is also tested using a 50x magnifier and micro-manipulator.

Content control means analysing the digital content of the discs. The block error rate (BLER) is measured using a bank of four Studer A725 CD players. Four discs from the same stamper are fed in; the first quarter is tested in Player one, the next quarter in Player two, etc, so that an hour's

content could be tested in 15 minutes. If the BLER figure is too high, you're running towards the top of a playback machine's capability to error correct. The 'Red Book' specification allows a peak BLER of 220 counts per second: PDO typically achieves 20, and the *mean* value is often as low as five, but you'd never be able to hear the difference between ten and 20...

If all is OK, then the technical people 'release' a family of stampers, the tests being repeated approximately every hour. "It's important to balance the cost of testing against the cost of lost production in the event of a problem," says Dave Wilson. PDO doesn't test *every* disc this way, although it confirms that the stampers and the moulding machines are functioning properly at the start and at regular intervals throughout a run.

QUESTION TIME

Having seen the CD manufacturing process through, I was keen to discuss some related issues. Firstly, did PDO accept there was a delay in launching CDV which had confused the public?

"No – CDV was launched in Europe last

August, and in the UK in October. A considerable catalogue was available at that time, with at least 150 titles to date, from heavy rock to heavy classics. We're currently pressing CDVs, with the emphasis on the 12inch catalogue; some of these titles have already been announced, others are new."

What about the use of gold on CDs instead of aluminium?

"It's the *interface* between the layers which really matters. Manufacturers should eliminate the failure mechanisms, such as poor adhesion or the ingress of solvents or moisture into the lacquer – not just throw dearer materials at the problem."

But surely, there must be different manufacturing standards for full-price CDs and those which sell for £2.99?

"No – we make only one standard of disc, using the finest materials and the best inspection methods. The differences between budget and full-price discs are in the quality of the musical material and the printed matter."

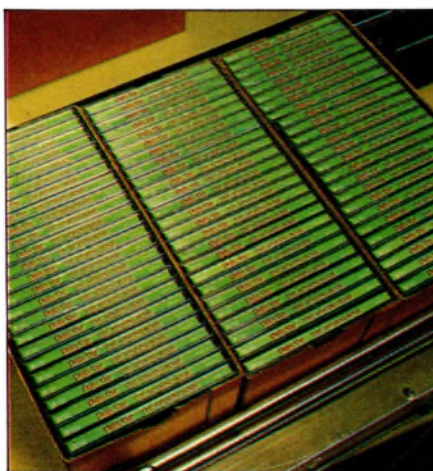
Pressing prices have dropped drastically in the last two years, though. How much does PDO charge?

"There are price offers in the marketplace from 60p to £1. And we endeavour to be price-competitive..."

Finally, is the company absolutely sure that all those technical parameters define the *sound* of the CD?

"We make sure that what's on the disc is what was on the PCM 1530 input. We're confident that the technical parameters do define the sound quality, though I can *just* conceive of a situation where perfect digital silence would be recorded..."

With that thought, I'll leave you to go and take a closer look at your CDs now that you know a bit more about how they're made.





The new Celestion 3 brings a new dimension to the low budget speaker. And with it the features and built-in quality you expect from Celestion.

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Special offer to *Hi-Fi Choice* readers. Save £5 on DMP compact discs.

Digital Music Products is a CD-only jazz label imported from the USA by leading audio specialist Absolute Sounds. As an introduction to the superb quality of DMP CDs, *Hi-Fi Choice* is offering its readers DMP CDs at a special price of £13.00 each, £5 off the recommended retail price.

As part of its exclusive deal with *Hi-Fi Choice*, Absolute Sounds is offering automatic free membership of the DMP Club as soon as you place an order for a DMP CD.

Membership of the DMP Club entitles you to:

- Select any of the CDs in the DMP catalogue at special discount prices.
- First option on all new DMP releases.
- DMP's quarterly newsletter, which keeps you up to date on all the new releases, live tours, and forthcoming projects by DMP artists. The newsletter also features regular competitions in which you could stand to win any number of the hi-fi accessories distributed by Absolute Sounds.

CD-443: TriCycle, Flim the BB's
Voted best jazz CD of 1985 by readers of Digital Audio in the US, combining pop melodies and jazz improvisation. Arguably the definitive DMP album, TriCycle has become a standard demo CD for stretching hi-fi loudspeakers to their limits.

CD-447: Tunnel, Flim & the BB's
Flim & the BB's second album for DMP voted best jazz CD of 1986 by readers of Digital Audio magazine. A collection of joyful, melodic songs superbly played and recorded.

CD-451: Incredible Journey, Bob Mintzer Big Band
A must for all jazz and big band lovers, Incredible Journey features Mintzer supported by some of America's finest jazz musicians – including Michael and Randy Brecker, Peter Erskine, Lawrence Feldman and Marvin Stamm.

CD-453: NY Cats Direct, John Tropea
Brilliant New York guitarist John Tropea plays bluesy, improvisational jazz which alternates between thoughtful, melodic passages and electrifying blues solos. Supporting musicians include Steve Gadd and David Spinozza.

CD-454: Big Notes, Flim & the BB's
Another tour-de-force from jazz quartet Flim & the BB's. Superb sound, joyous, uplifting music – and . . . (yup, you guessed it) . . . voted best jazz CD of 1987 by readers of Digital Audio magazine.

CD-455: Lighthouse, Billy Barber
One of the most popular DMP recordings, and rightly so – Barber's second album for DMP is full of beautiful melodies and heartfelt tunes. Barber's piano playing is stunning, accompanied throughout by an array of imaginative keyboard and synthesizer sounds.

CD-459: Braziliana, Manfredo Fest
Blind-from-birth jazz legend, Manfredo Fest returns to the world of recording with this stunning CD invested with the rhythms and melodies of Brazilian jazz. Fest's piano playing throughout is inspired, as are the pure vocals of Roberta Davis.

CD-460: Thom Rotella Band, Thom Rotella
DMP discovery Thom Rotella combines melodic acoustic guitar with funky electric solos on this mainstream jazz CD. Great sound – the recording was a prototype for one of the first Sony R-DAT demos.

CD-461: Spectrum, Bob Mintzer
Spectrum is still fired with the big band sound of Mintzer's earlier DMP albums, but also sees the acclaimed saxophonist and composer experimenting with quintet and quartet arrangements. A superb collection.

CD-462: The Further Adventures of Flim the BB's, Flim & the BB's
The BB's fifth album for DMP and perhaps their best to date. Once

again the band's characteristic blend of dynamic jazz, driving rhythms and pop melodies combine to form a memorable collection of songs.



TO ORDER DMP COMPACT DISCS

(Tick selections)

- CD-443: TriCycle, Flim & the BB's
- CD-447: Tunnel, Flim & the BB's
- CD-451: Incredible Journey, Bob Mintzer Big Band
- CD-453: NY Cats Direct, John Tropea
- CD-454: BigNotes, Flim & the BB's
- CD-455: Lighthouse, Billy Barber
- CD-459: Braziliana, Manfredo Fest
- CD-460: Thom Rotella Band, Thom Rotella
- CD-461: Spectrum, Bob Mintzer
- CD-462: The Further Adventures of Flim & the BB's, Flim & the BB's

PAYMENT

- I enclose my cheque/PO made payable to Dennis Publishing for _____ selections at £13.00 each
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ANOTHER FIRST FI

Following on from the legendary CD-1 compact disc player which has become the universal standard in CD player technology, comes the Cambridge CD-2. The world's first 16 bit 16 times oversampling CD player.

So what is so special about 16 times oversampling?



The explanation starts with the disc itself. Encoded with digital information, it is read by means of a laser beam. However, the speed at which the

information can be read depends entirely upon the speed at which the information can be processed.

The greater the oversampling, the faster the processing, the better the quality of the resultant sound.

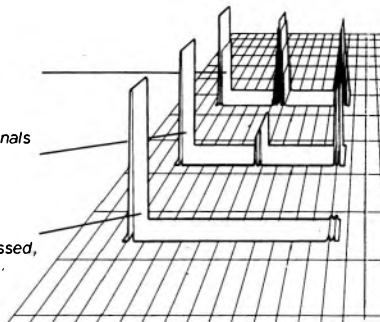
The problem that arises as the oversampling increases, is the speed of reaction of the components. Or more simply, will they respond fast enough?

While state of the art is generally accepted to be 16 bit 4 times oversampling, equivalent to a processing speed of some 2 million bits of data per second, Cambridge has leapt once

Conventional 16 bit linear conversion players generate spurious signals which can only be removed by the use of extremely high order analogue filters.

With four times oversampling these spurious signals are attenuated by about 50dB but analogue filtering is still necessary to prevent audible colouration of the music.

With the unique Cambridge 16 x 16 system the spurious signals are virtually completely suppressed, making further analogue filtering unnecessary.



again to the forefront of technology with a 16 bit 16 times oversampling machine.

Effectively this means that the CD-2 operates at a processing speed of not 2 million but 22 million bits of data per second.

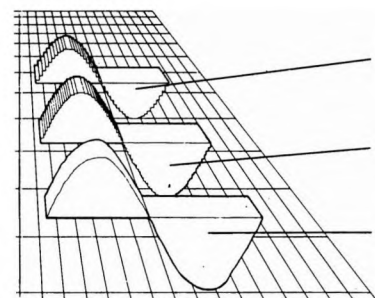
The additional refinement derived from this oversampling, negates the need for the usual imperfect analogue filters and an entirely digital filtering system can be employed.

This brings us directly to what the CD-2 does best. It reproduces a lot more information. So music reproduced from the CD-2 will get closer to the original recording than any other CD player commercially available.

Rarely has so much technology been so easy to use. The CD-2 harnesses the power of the microprocessor to bring such features as track selection, programmed memory replay



16 BIT 16x16 CAMBRIDGE

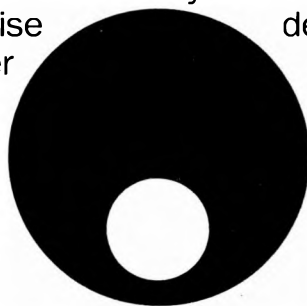


With 16 bit linear processing the original music waveshape is recreated as a series of large steps which have to be smoothed over by extensive analogue filtering.

With four times oversampling there are now four small steps in place of the original one but analogue filtering is still needed to remove the obvious roughness in the waveshape.

With the Cambridge 16 bit 16 times sampling system the original waveshape is recreated to virtual perfection without the need for sound degrading analogue filters.

and automatic search. The comprehensive display sets up the system, then after disc loading simultaneously shows the precise track and index information together with the elapsed playing time in minutes and seconds. Fast direct access to the music is offered through both track and index point skipping or search, in both the forward



and reverse directions.

Alternatively the new control microchip offers random access of up to 99 different tracks with the pre-programmed selection of 20 chosen tracks in any desired playback order.

All these convenience features lie at your fingertips on the infra-red remote control giving the freedom of relaxed armchair listening.

To audition this revolutionary new machine, you should go to your nearest Cambridge audio dealer.

And last but not least is a feature that we don't think needs repeating 16 times.

The price. It's just £649.



Cambridge audio

Cambridge Audio, Axis 4, Rhodes Way, Watford, Herts. WD2 4YW. Tel: (0923) 226499.

To Cambridge Audio, Axis 4, Rhodes Way, Watford, Herts. WD2 4YW.
Please send me literature on the Cambridge CD-2 and the address of my nearest dealer.

HFC 05/89

Name _____ Address _____



READERS WRITE CHOICE ANSWERS

THE SOUND OF THE ROSE

I have a system consisting of Marantz CD85, Musical Fidelity Digilog, Rose preamp, Quad 306 power amp and Townshend Glastonbury MkII loudspeakers. These are hooked up with van den Hul interconnects and Townshend /solda speaker cable.

The Rose RV23 is my latest purchase – a product I consider to be unbeatable value for money. I spent several weeks auditioning preamplifiers from the £400 price range and the Rose came out tops all round! I was therefore surprised to find a luke warm response in your *Directory* and no recommendation. Naturally, I appreciate that you will have had far superior equipment on hand with which to audition this preamp, and since I am only concerned with the CD and tuner inputs, perhaps it was the unimpressive performance on disc that prevented its being recommended?

On another note can you suggest what my next upgrade might be. I suspect that I could do with a better power amplifier but where should I start?

R. S. RABY,
STOCKPORT.

You are right, it was the Rose's performance on disc that held back its chances of a recommendation. However, this may have been because we had received a faulty sample as the disc overload margin was found to be 'woefully inadequate' in the lab tests. In fact, JB was highly complimentary of its capabilities when used with the digital medium and it's true that the Rose is one of the better preamps in its price range.

As for recommendations for a new power amp, why not go

glass in this department as well? We'd suggest you audition models from Audio Innovations, Croft and Beard. These are all esteemed British companies that produce sub £1,000 power amps of remarkable sonic capability.

GOBSMACKED

Help please! As a near penniless final year student I am rather disheartened by a recent discovery that was made when comparing my system to my brother's.

About six months ago I bought a system consisting of an Ariston Q-deck, Rotel RA820A amplifier and Monitor Audio R£52 loudspeakers, and until recently I was very happy with it. It sounds considerably better than the one it replaced.

However, when I hooked up my brother's SEAS kit speakers I was, to use an expression from my native Liverpool, 'gobsmacked'. These speakers revealed tracks on records which I hardly knew existed, and produced both bass and treble with a pure clarity that was neither harsh nor overpowering. My MAs sound muffled and near unacceptable by comparison, and have scarcely any bass. I have always been of the impression that once one reached a certain level, perhaps £130 plus, an upgrade in loudspeakers would do little to improve sound quality, and could even make matters worse. However, the SEAS speakers made phenomenal improvements, and I now find it difficult to listen to my own loudspeakers. What do you suggest short of giving my bank manager a cardiac arrest?

My brother bought the kit speakers from a friend who had built them about nine years ago

and knows practically nothing about them, except that they're a large three-way design. Do you have any ideas about their origins?

PETER CARTWRIGHT,
HULL, NORTH HUMBERSIDE.

So you've been turned off your R252s, by your brother's speakers – what price lost innocence? The price of a pair of new speakers, it would seem. Although loudspeakers can't reveal any more information than is presented to them, one model can be more transparent, ie less veiled, than another and the way different models present information can vary quite dramatically. Unfortunately few loudspeakers are very natural and totally without character and thus changing speakers on any system will always affect tonal balance, dynamics, imaging etc. Which as you've discovered makes loudspeaker selection very much a matter of taste. But don't despair, if you're sure that your brother's speakers are what you want why not build a pair yourself. The cost of kit speakers is hardly prohibitive and could be covered by the secondhand value of your MAs.

As far as tracing the model you want, the telephone number of SEAS is (0473) 37345. Although it's now discontinued making kits the company could give you details of the various components you'll need and where to get them from.

OUT OF THE GHETTO

One merit of your magazine is your coverage of borderline products like personals and ghetto blasters, on which little reliable guidance is otherwise available. John Bamford was probably right to single out the Sony D75 Yuppie blaster for review, but whether it deserves the accolade of audiophile product is more debateable.

On two points, Mr Bamford has done Sony less than justice. The D75 does have a 'mono button', but it is on the back and is called an 'interference suppression switch'. (When all else fails, read the instruction book!) Secondly, only part of the bass (in or out of

phase) is ducted through the front grilles. Most of it is radiated straight out of the back of the cabinet.

Megabass is certainly a fair claim for the amplifiers and speakers, despite their modest specifications. The more than adequate CD player, loaded with a *Hi-Fi News* test disc, produces an audible output down to 40Hz and extending above 10,000Hz. The cassette deck, though hardly hi-fi, is also above average for this type of product. It is the tuner, alas, which seems to let the side down. Even with bass cut and treble boost, Radio 3 produces boomy speech and very unsparkling treble.

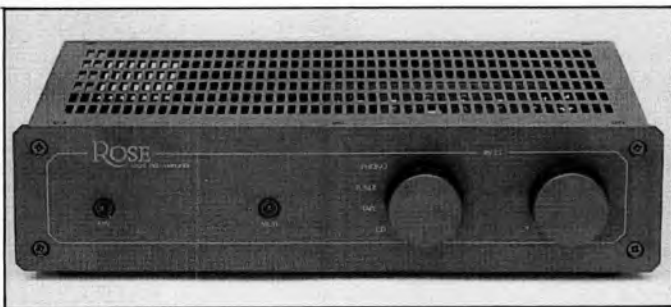
Perhaps it is unfair to judge the D75 as an overpriced cassette-radio. Consider it rather as amp, tuner, CD player, cassette deck, three speakers and a clock, all for £350 and be grateful that it is as good as it is. But I wish Portfolio Marketing would reconsider its decision not to import the 25W per channel Proton stereo radio. This would really do justice to the top-of-the-range Sony tape and CD 'Walkmen' many of us already own and provide truly audiophile portable sound.

G. PARRISH,
CROYDON, SURREY.

SHORTING OUT

I have been reading *Choice* for many years and have occasionally wondered about some of the technical matters discussed in it. I would be interested in an explanation of a point raised in a few reviews of the Philips CD473 and Marantz CD873 players in the December 1987 issue. It concerns the digital output now fitted to many players, and in your reviews it was stated that the sound quality improved when the digital output was shorted, yet no reason for this was given. Since I own a Philips CD473 I would like to know the following:

1. Will shorting the digital output adversely affect the unit in any way?
2. Is there any explanation for the improved sound quality that this tweak is supposed to produce?
3. Is the digital output of a CD



Affordable and sexy tube preamplification from Rose.

player a raw bit-stream, or is it formatted in some way? In other words is there a standard format for the digital output of all players and is it compatible with the likes of A&R Arcam's Black Box DAC.

Finally would investment in such a unit be worthwhile with my CD player?

DAVID MARTLAND,
CHESHAM, BUCKS.

SHORTING OUT II

I read with interest your review of the new Marantz CD65/IISE in the September edition of *Choice*. However, I was disturbed to read that the CD65's "digital output has a shorting plug fitted". According to Technics it's dangerous to short out the digital output, principally because it's designed to have an impedance of 75ohms, and not zero ohms as is the case when the output is shorted. Apparently shorting the output can actually impair the player's sound quality, by damaging the machine's electronics. Is there any truth in this, and should one avoid the CD65 for this reason?

MARTIN TRUKSA,
KENTON, MIDDLESEX.

In an attempt to clear up the shorting plug controversy we contacted our reviewer Paul Miller and Alan Ainsley of Technics who came to the following conclusions about the effects of these devices.

The output is a half volt 5.65MHz (RF) signal, the electronic effects of a zero ohm short are:

1. *The RF signal, which is in effect noise, is sent into the ground line of the player.*
2. *The signal is reflected due to mismatched impedance.*
3. *If the digital output isn't transformer coupled it may damage the TTL output.*

A 75ohm termination will minimise signal reflection but still direct noise into the ground line and with an unterminated output the opposite will happen. The best thing is to switch off the digital output if a switch is provided, as is the case with many dearer machines.

The effect upon sound quality will depend on the player in question; certain players seem to benefit whilst others just sound different, and some, especially older Sonys, will be quite put out. Another result of shorting is that demand on the power supply will be increased, which may have a long term effect on regulators. Basically, if a manufacturer advocates the use of a shorting plug then it's safe to use, but if not you may well

invalidate your guarantee.

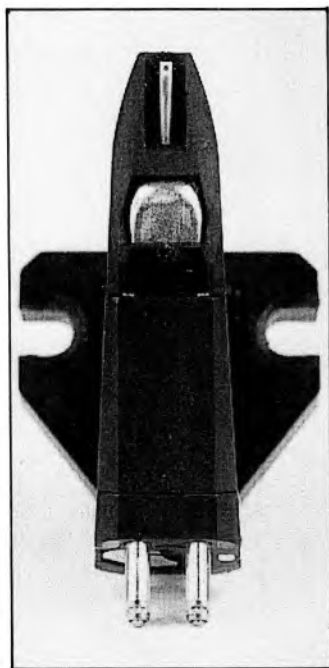
With regard to Mr Martland's points, the digital bit-stream output of all CD players is formatted at a sampling rate of 44.1kHz which corresponds to the inputs on all stand alone D/A converters. The effect of the Arcam Black Box on a Philips CD473 will be to make it sound smoother and richer; in a revealing system it will be improved. However, if it sounds mellow enough already, don't bother.

CLASSICAL TWEAKS

Until now I have been very pleased with my sound system which comprises a Pioneer PL320 turntable with an Ortofon OM10 cartridge, Technics SUV-IX amplifier and a pair of B&W DM110 loudspeakers. However, since discovering classical music I have become aware of the limitations of the turntable (ie rumble). To rectify the problem (to a certain extent) I purchased a Dual CS505-3. The cartridge fitted to this is a Dual/Ortofon ULM65E which suspiciously resembles my OM10. The question is which one is the better cartridge, or are they both the same?

Also, do you have any tips on adjusting the tracking weight?

C. RADFORD,
LETCHWORTH, HERTS.



Bottoms up, a record's eye view of the Ortofon OM10.

The cartridge traditionally supplied on the CS505-3 is indeed an Ortofon OM10 and theoretically therefore the least worn stylus will sound the best. However, because of sample variation you may find that one is noticeably better than the other, so why not try the other one and see what you think.

You can alter tracking force on the Dual with the calibrated downforce adjuster on the arm, but as these devices are nearly always slightly inaccurate it is best to fine tune tracking force by ear. Downforce for the OM10 should be set at around 1.5g.

A CHILD'S GUIDE TO CD

As I have many LPs and a good AR turntable I don't want to buy a CD player but may have to because LPs seem to be increasingly difficult to get. I haven't heard a CD player and must admit that they seem highly complicated contraptions with vast arrays of flashing lights - what do they all do? I and undoubtedly others would be grateful if you would

and use their energy to make the most of discs. Perhaps not surprisingly, Rotel makes one of the most straightforward, realistically priced machines. It's called the RCD-820B, retails for £210 and sounds very good for the price. In the light of your preferred amplifier there couldn't be a more suitable choice than this. Unlike many of the first generation CD players, the Rotel along with most contemporary machines has a reasonably civilised top end - in fact our reviewer found it quite sweet.

The fundamentals of CD player operation are similar to those of a cassette deck. The primary controls are open/close



A pair of user friendly compact disc players from Rotel.

publish a 'child's guide' to compact disc players clearly explaining what all the controls do.

My aim is to buy the best sounding player I can get for £250, whilst avoiding the screechy harsh treble which I believe is a CD vice, and similarly avoid an array of complicated controls, remote or otherwise which I shall never use. I should perhaps mention that my system consists of a Rotel RA820BX2 amplifier and Castle Lincoln loudspeakers.

So there it is: no more than £250, best possible sound and fewest possible lights, buttons and unnecessary complications. My old Sansui amp had all of these and I never touched them; the Rotel is far superior and has none of them. I feel there must be a comparative CD player.

A. H. SLADE,
LUDLOW, SHROPSHIRE.

As yet the only truly minimalist CD players are the expensive ones such as the Cambridge CD1 and the American California Audio Labs range which dispense with complex displays

for loading the disc, play, pause and stop which are self explanatory, and track skip and scan. Skip takes you from one track to the next in either direction, ie track one to track two or vice versa. On many machines it's possible to skip from the first track to the last by skipping backwards from one to fifteen or whatever it may be. Scan is more like fast forward/reverse as it moves the laser slowly through a track. Unlike cassettes, each 'track' on a CD has a number. This numbering system allows direct track access if a suitable keypad is provided and means that you can program the order in which the tracks are played; some players even have a random order button.

Whilst in stop mode, the display usually shows the number of tracks on the disc. When it's playing, it shows the track number and the elapsed time of that track.

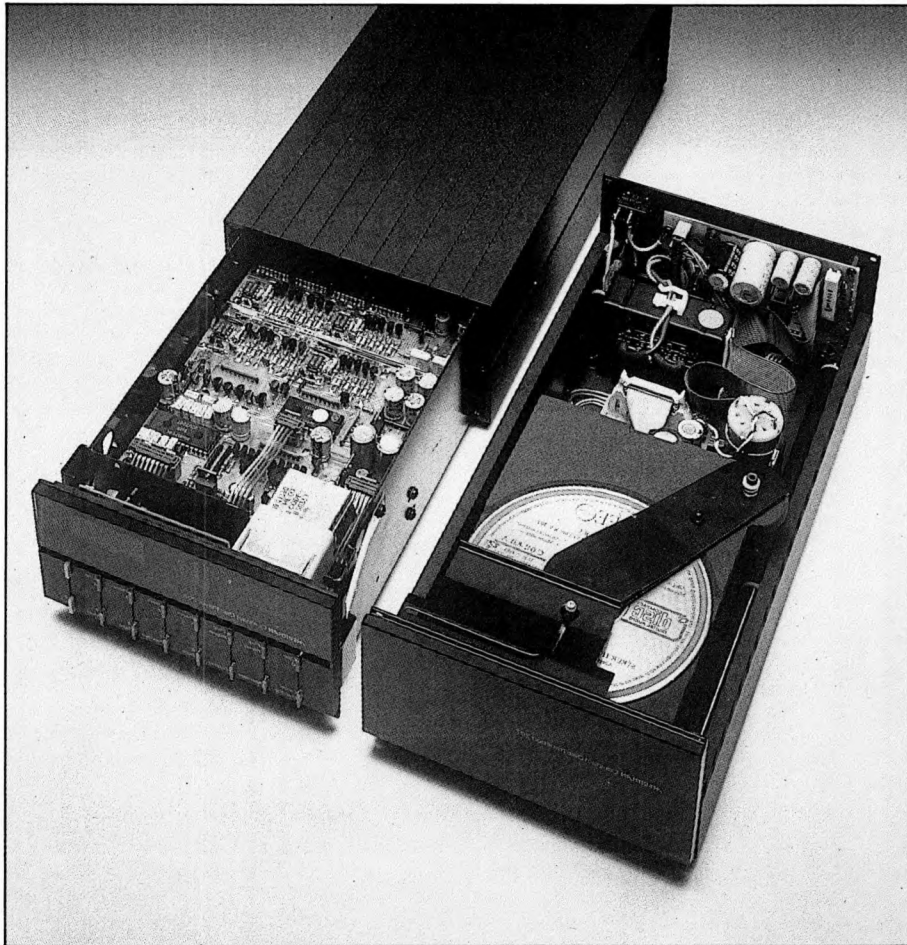
Compact disc players aren't as daunting to use as they may look and anyone familiar with a cassette deck should have little difficulty in playing silver discs.



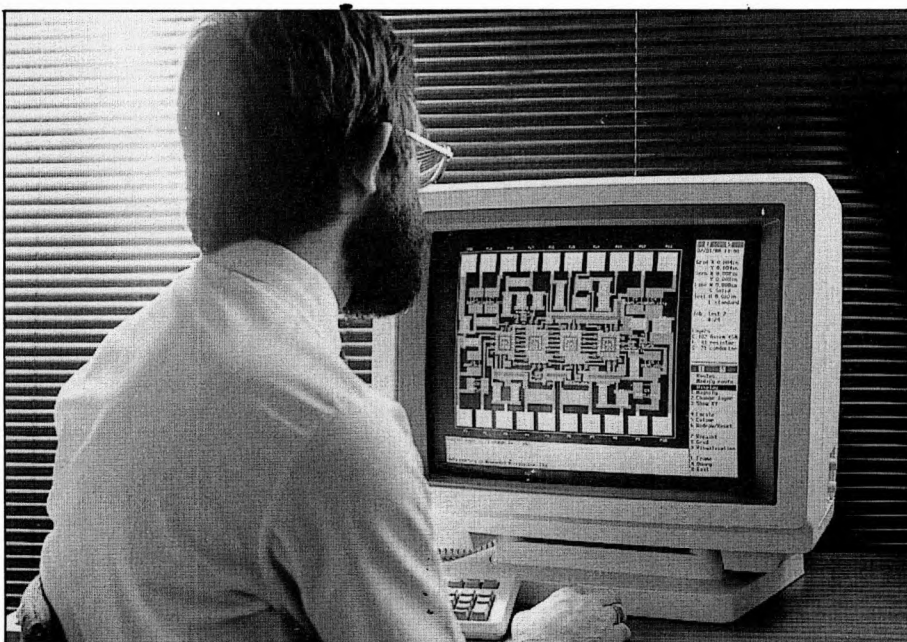
PERSPECTIVES

Richard Black gazes into his crystal ball and examines the course of microelectronics. What developments might be in store for audio technology as we approach the 21st century?

Vanishing into the future



The anatomy of a CD player – Meridian's 207 in the raw. Below, computer aided design (CAD) steers us towards the 21st century (pic courtesy Racal Group).



There won't be a single reader of this magazine who needs to be reminded that we live in the 'silicon age', the age of computers and electronic communication. Technology is now advancing so fast that even the technologists are having trouble keeping up; any computer design which makes it to market is practically obsolete almost as soon as it's launched, and audio threatens to follow suit.

As far as any domestic electronic product goes, the question is not what is possible but how much it costs. Possibility has invariably been proven years ago, at enormous cost, in military, industrial and research applications, and it's only when (not 'if') the relevant technology becomes widespread and cheap to manufacture that it finds its way into our homes.

A survey of what the leaders are doing at the cutting edge of electronics technology can give a fascinating glimpse of what may be done in the home in a few years' time. So let's see what actually goes on in all this 'space age' stuff, and where it's all going.

AS IT STANDS

First, a look at the present state of play. 'Hi-fi' has been around for about 40 years now, during which time advances have been made in every field. Transducers have benefited from new materials and construction techniques; even equipment cases are made today using methods not available a decade or two ago. Electronics has developed from valves to transistors to integrated circuits, getting smaller and more complex as it goes along. But the really big changes are in what electronics (in the shape of digital logic and computers) can be made to do, and the obvious example is compact disc, which we consider in more detail shortly.

Other audio devices may be dependent on microelectronics and computers, whether for alignment, digital signal pro-

cessing or front panel displays. But digital electronics is only half the story, and new types of transistor and analogue integrated circuit are appearing apace, to be used in every type of appliance. These might not have the high-tech appearance of computers, but they are every bit as important in making new ideas work.

THE ANATOMY OF A CD PLAYER

A CD player is actually a rather advanced piece of computer apparatus. A laser diode and detector produce a signal corresponding to the pattern of dots and dashes on the disc, and this signal is 'cleaned up' electronically so that it is compatible with standard digital logic. It is then examined to see if it makes sense; if not, the 'error correction' circuit attempts to correct any flaws. This done, the signal is presented to a converter which turns the numbers into voltages. This is now an analogue signal which, after some filtering, is presented to the outside world. 'Oversampling' CD players do some of the filtering on the numbers, before conversion to voltages, mathematically. The computer power needed to do all this is considerable, and the system would be unthinkable without modern integrated circuits to process the data.

The CD, in addition to carrying musical signal information, has 'subcodes' which tell the player which track it is playing and how much time is left on the disc. This information too is read from the disc, and has to be separated from the encoded audio signal. Meanwhile, a servo system is constantly monitoring the pickup output and adjusting the tracking to compensate for any disc eccentricity. Given that the data from the disc is coming out at around two million bits per second, and the disc is spinning at up to 500 revolutions per minute, it is obvious that some processes are happening pretty rapidly to keep the whole machine working. No problem for microelectronics!

THE BIG BOYS' TOYS

Compared with some of the current applications of computers, a CD player is almost child's play. The fact that CD players would have been enormous and vastly expensive only ten years ago gives some idea how far mass market computers have come in that time. The really powerful 'mainframe' computer market has not made such obvious leaps, although it is certainly moving fast, because such computers are large, complicated and expensive and will remain so. What is impressive, and what I regard as a key criterion of computer advance, is how much computing power one can get on a desk.

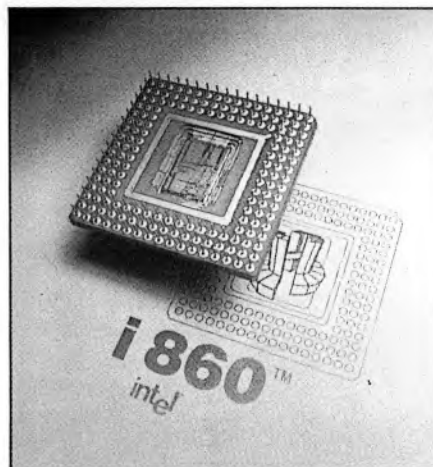
Most electronic computers are digital, using binary (on/off) signals to communicate internally and between each other. By organising sequences and patterns of on/off signals, complex information can be handled by very simple basic circuits. In a

digital computer, perhaps several million transistors are doing nothing but switching on or off, millions of times a second (each!), while producing an output in the form of numbers on a printout, or text, or pictures. In a desktop computer, the brain is the 'microprocessor', a single integrated circuit containing about a million transistors, connected to the outside world by up to 132 pins, which is surrounded by memory circuits (more ICs) in which it can store information.

Microprocessor system design is extremely simple (well . . . the basics are simple, anyway), since all one has to do is wire memory 'ports' to the memory circuits in the correct order, and address ports (to locate a bit of memory) likewise. Desktop computers costing less than £2,000 may now contain a microprocessor processing information, 32 bits at a time, at three Million Instructions Per Second (MIPS). Some microprocessors are aimed at a particular area such as Digital Signal Processing; others are for general computer use.

In an attempt to make computers run faster, many different approaches are being tried, for example the 'Reduced Instruction Set Computer', which has fewer program instructions available than traditional designs but executes them faster. Linn (big in computers) is backing the Enhanced Instruction Set Computer, which has more instructions in the hope of making more efficient programming available. Another type of device, the 'Transputer', is intended to be used in multiple arrays, and crunches numbers fearsomely fast.

Instead of a microprocessor, some designers prefer Application Specific Integrated Circuits or Gate Arrays, which are custom or semi-custom integrated circuits of microprocessor-like complexity and power, but dedicated to one job. Full marks to A&R Cambridge for getting one into its Arcam *Black Box* CD player add-on digital-to-analogue convertor. The CD majors, of course (particularly Philips,



Over one million transistors in approx 1sq inch!

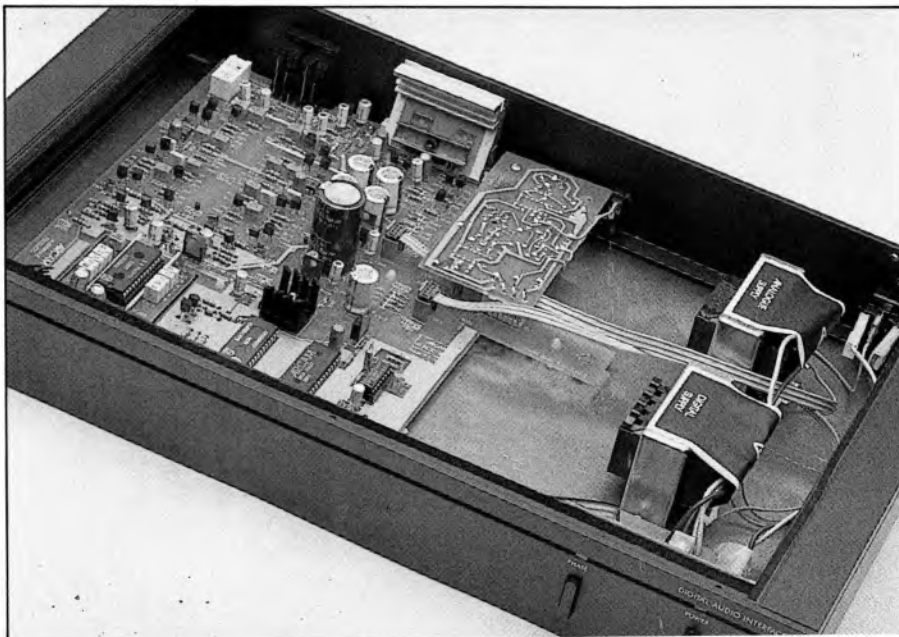
Sony and Yamaha), build their own dedicated ICs for error correction, oversampling etc, and these are capable of some quite impressive feats. The Philips oversampling filter, for example, effectively performs something like 3,000,000 multiplications per second and as many additions, to generate the interpolation samples.

HERE IT COMES . . .

The mind boggles when it comes to the thought of all this computing power appearing in domestic products. The cause of the boggling is not so much the applications envisaged as the question: "What applications actually need such power?"

One obvious answer is the enhancement of digital recording formats by increasing the sampling rate and resolution, but where it really comes in is the field of Digital Signal Processing, crunching numbers as an alternative to filtering signals (see Paul Messenger's report in *Choice*, March 1989). The advent of DSP has made available signal processing options – such as adding artificial reverberation – that previously would have required vast amounts of expensive hardware. It seems reasonable to predict that some of these will go the same way as the graphic equalisers

A&R's Arcam Black Box D-to-A convertor uses an ASIC.



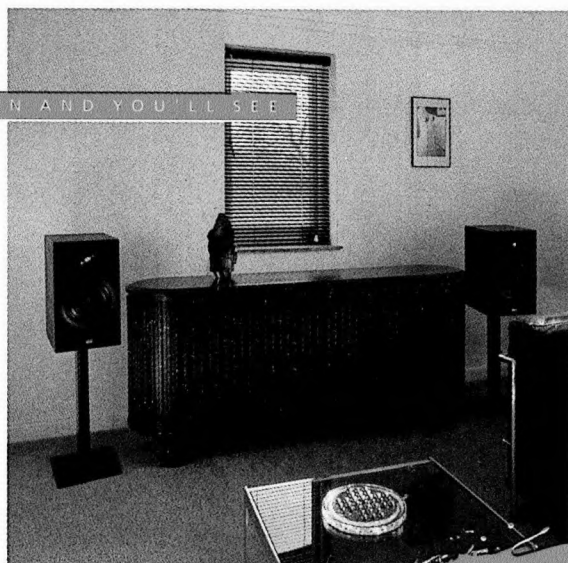
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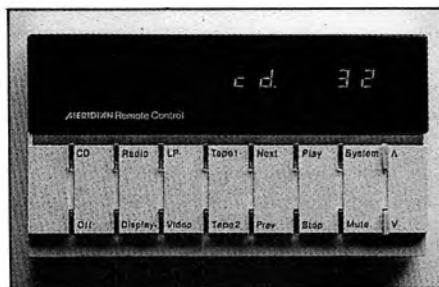
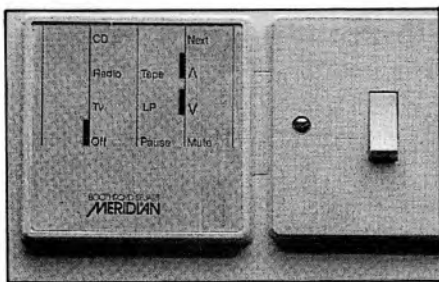
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Meridian's System D600 active loudspeaker contains an on-board DAC. The hi-fi system can be controlled from around the house

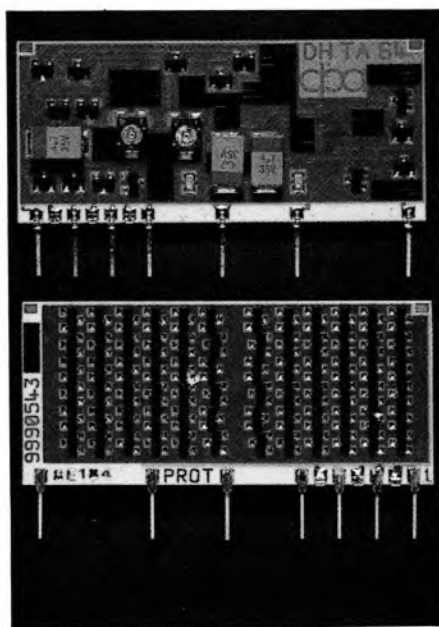


which had a brief vogue in the '70s and are now relegated to the status of tone controls on bottom-of-the-range midi systems. Potentially more beneficial is the application of advanced DSP techniques to the 'restoration' of historic recordings, as exemplified by Sonic Solutions' *NoNOISE* remastering process – although opinions vary on the success of such systems.

Some very interesting computer-based developments in audio are those dealing with ergonomics (in the broadest sense) of equipment. This goes much further than Unfavourite Track Rejection etc., and includes the distribution of sound around a house from a central hi-fi system.

Probably the most advanced equipment for this purpose comes from Meridian, which markets a system based on digital-input loudspeakers. Each loudspeaker enclosure contains a digital-to-analogue convertor and three power amplifiers for active drive. The speakers receive a digital signal from a control unit, and the whole system is controlled by a cordless handset which one points at the speakers. Control signals are relayed back from the speakers to the control unit to switch sources, change levels, and so on, and there is provision for linking to another system or a remote pair of (digital or active analogue) speakers. It seems highly likely that we shall see much more of this sort of thing in the future.

In Japan, experiments are being done with a 'House Bus', a cable-based system (using from one to six cables) which distributes audio, video, security, telephone and more around the house. Signals may be encoded and 'multiplexed', several onto one channel, so that one single cable carries a variety of signals. Such systems are also under consideration in this country and a few early designs have been made and sold, but there is as yet no standard format. Some proposals even suggest using the house mains wiring to distribute signals, thus requiring no additional cable



installation, but the principle is difficult to apply successfully.

I predict that we will also see a new digital recording format before too long. The present one is either perfect or wholly inadequate, depending on whom you believe, but it has come in for enough criticism that alternatives are at least under investigation. Whether these will be in any way compatible with the current format is anyone's guess. Higher sampling rates and more bits are both perfectly feasible already, and Nimbus (and others) are working on increasing the packing density on CDs, so the omens are there. I suppose the world might even revert to some sort of analogue system, as scientists are doing for storage of important archival data.

ANALOGUE ADVANCES

We hear so much about the advance of computer technology that it's easy to forget that 'ordinary', analogue electronics is on the move too. New varieties of transistor with better power handling, frequency response, gain characteristics etc. appear in the trade press every week, and passive components continue to get smaller, more accurate and more reliable. One major advance recently has been in electronics packaging, moving away from conventional components with legs or leads to 'surface mount' components with no legs but solder pads, which are soldered to the tracks on a printed circuit board. This gives all sorts of advantages. The components are much smaller than leaded ones, they can be mounted on both sides of a board, and they can be placed on the board by automatic machinery at a rate greater than one per second. This technology makes for smaller, more reliable circuits, and also makes possible what are termed 'hybrid micro-circuits'.

Conventional circuits are either 'discrete', using ordinary transistors and resistors etc, or 'monolithic integrated', with transistors and a small number of resistors and capacitors etched onto a semiconductor material. Hybrid circuits are basically small modular surface-mount boards, using a board material such as alumina on which resistors can actually be printed. This technology is a halfway house between discrete and monolithic, and makes possible miniaturisation beyond discrete circuits but more versatility than monolithic circuits can offer.

Hybrids are well suited to precision circuits such as audio, and in the UK one manufacturer has used it extensively with results which, if one reads the reviews, vindicate the approach. Deltec Precision Audio of Cardiff has designed and had built its own hybrid circuits which effectively

Deltec Precision Audio of Cardiff uses hybrid circuits in its hi-fi amplifiers. Shown here, the company's DH-TA64 ultra low noise input stage. Noise, they claim, is equivalent to a 10R resistor.

100001

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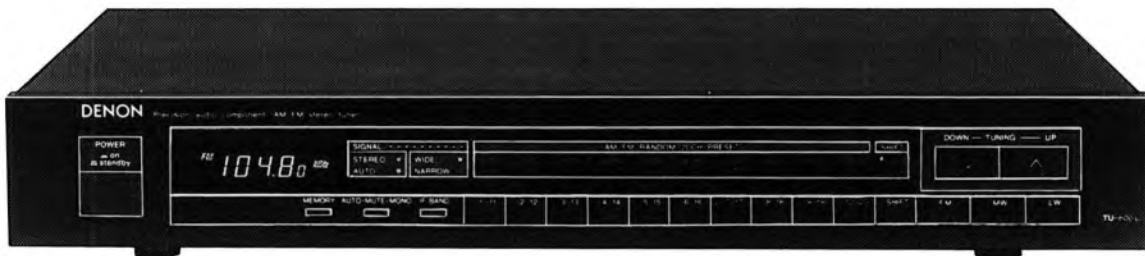
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gives the company building blocks with the specification it requires for audio, rather than the specification a semiconductor manufacturer requires for a general-purpose device. Costs of hybrid circuits are not unduly high and the technology is accessible to any good circuit designer. Apart from Deltec, and Murray in Australia (whose fine amplifiers are available here only in strictly limited numbers via Townshend International), I am not aware of any manufacturers using hybrids, but there will soon be more.

The advent of satellite television highlights the advances that have been made in high frequency semiconductors. Working at frequencies up to 20GHz (that's 20,000,000,000Hz – one million times the highest audio frequencies), this system relies on some very high-tech electronics; even the cables and connectors for use at such frequencies are highly specialised. Only a very few years ago all this was impossible at anything like domestic prices, although it was possible on armaments budgets, as usual, rather earlier.

Transducers will again become a major focus of interest as other equipment improves. The true 'digital loudspeaker', which accepts digital input signals and only converts them to analogue at the acoustic stage, is perhaps the herald of a new age of electronic-to-acoustic conversion. Or perhaps not – it does sound a trifle far-fetched. Still, it is unlikely that manufacturers of transducers (speakers and microphones) will be idle when they have the Joneses in the electronics industry to keep up with, and the results will be fascinating.

AND FOR THE NEXT TRICK . . .

So much for today's electronics in tomorrow's products. Tomorrow's electronics is already starting to take shape. What will it do? The greatest advances will be in computer technology, as that is where the greatest effort is concentrated. Basically, everything will go on getting smaller, faster, cleverer and cheaper.

Large integrated circuits can now contain up to about five million transistors, on what is called the '1 micron rule': 1 micron (one millionth of a metre) between adjacent conductor paths on the semiconductor chip. The current state of the art is the 0.3 micron rule. The major semiconductor manufacturers are working towards the 0.01 micron rule or smaller. Think about that. That means something like 50 times smaller than is now used, or 2,500 as much circuitry (in principle) on the same area of silicon. Circuit speed will also improve as things get smaller, so we will have 100-1,000 times as much thinking power running at maybe ten times the speed of today's electronic brains.

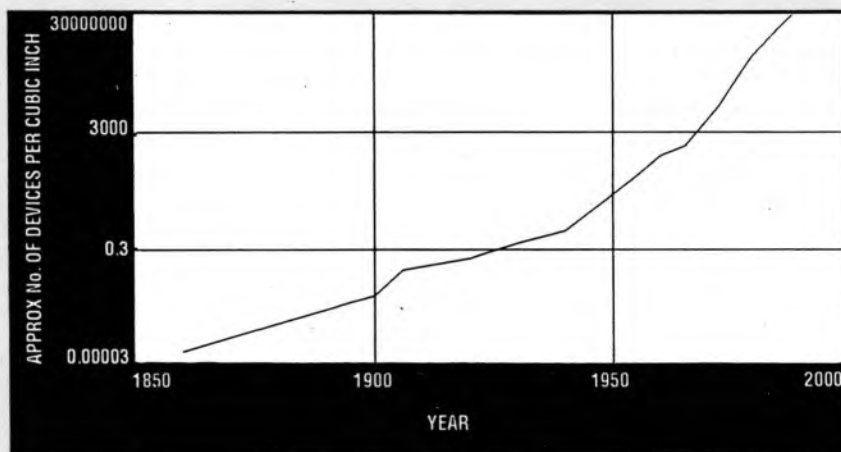
New semiconductor materials, or such completely new processes as Josephson junctions (superconducting circuits) or optical computers, could improve that still

THE MARCH OF THE MICROS

The American writer Brion Gysin has pointed out that man has been around for a million years or so, and in the latest one per cent of that time has come from stone axes to atomic bombs. What were we doing for the other 990,000 years? Gysin's theory that other civilisations existed and were wiped out is probably fanciful, though a fascinating thought. One can only conclude that progress, once started, accelerates rapidly. Nowhere is this better illustrated than in the field of electronics.

The first practical uses of electricity were discovered in the early 19th century. The first electrical relay was made in the 1850s and weighed 300lb. The first practical electronic amplification device, the triode, dates from 1906. The transistor (postulated, but not demonstrated, before valves) was invented in 1947. In 1961, the first practical Inte-

grated Circuit was made, and in 1972 the first IC microprocessor. That device contained a few thousand transistors; the present-day record is in excess of five million. To illustrate the advance of electronics, we have prepared a graph showing the decrease in size of electronic devices (switches or amplifiers), from relays through valves to discrete and integrated transistors. This criterion is only one of many we could have chosen, but it is more easily visualised than some. The measure is number of devices per cubic inch; note the exponential scale, from less than 1/10,000 (the original relay) to over 10,000,000 (the latest microprocessors, including package). A CD player has between 100,000 and one million devices. It is amusing to calculate what its size might have been a few decades ago!



further. What couldn't that do? Quite clearly, the limitations in audio recording are going to be the conversion from and to sound, and the storage of information; generating and manipulating it will become almost trivial. And the proposed 'optical tape', like a CD on a long tape, one reel of which can store up to 1,000 times as much as a CD, is a major step towards solving the latter problem.

Could we eventually see neural impulses being applied direct to the brain to simulate all the sensations of a concert? Alarmingly, this cannot be ruled out. It is a horrifying thought, though. Who would be a vegetable, dependant on machines for stimulation? Better leave that one to the science fiction writers; as long as we can laugh at it as ridiculous it is probably far off, and the further the better.

There is however a serious point to the above paragraph. In audio (as in everything else) science marches on and on . . .

and on. Just how far do we need or want it to go? The other day I attended a seminar on home automation. Arriving home in the evening, I tried quite hard to convince myself that I was dissatisfied with my completely non-automated home, without success. I admit the central heating timer is handy, but I find the effort required to light the gas with a match, put a record on the turntable and cue it, mash a few potatoes with a hand mash, etc, etc, is hardly distressing. Do we really need this sort of technology, or is it slowly becoming parasitic on us?

On the other hand, audio equipment has a history of benefiting obliquely from advances in technology. Let us hope, therefore, that the ever inventive designers can continue to turn the new electronics to suit their, and our, needs in what we really want: if I may quote a certain manufacturer, 'The Closest Approach to the Original Sound'.



MARKET RESPONSE

In our exclusive market survey Dan Houston polls specialist dealers about CD players, bringing you their comments on reliability and sales.

Compact disc technology is often praised for saving hi-fi, giving people a convenient and user-friendly medium with (often) a far higher sound quality than they were used to hearing from the poor-quality record players supplied with rack or midi systems. Sales of CD players are said to have boosted the whole industry, stimulating renewed interest in purely aural home entertainment, which might

here to stay. Statistics too, show sales of record players falling slightly while those of CD players are booming.

The Audits of Great Britain Group (AGB) told us that in terms of volume, unit sales had leapt up 37 per cent from 382,000 in 1987 to 524,900 in 1988. The CD separates (or standalone) market is now worth over £106m according to AGB market statistician Nick Parker. While

obviously different levels of perfection for this 'perfect medium'. And while improved sound quality is often the perceived gain one pays for, reliability also improves with price. Now That's Hi-Fi told us: "reliability seems to go hand in hand with price – the budget models give us the most problems."

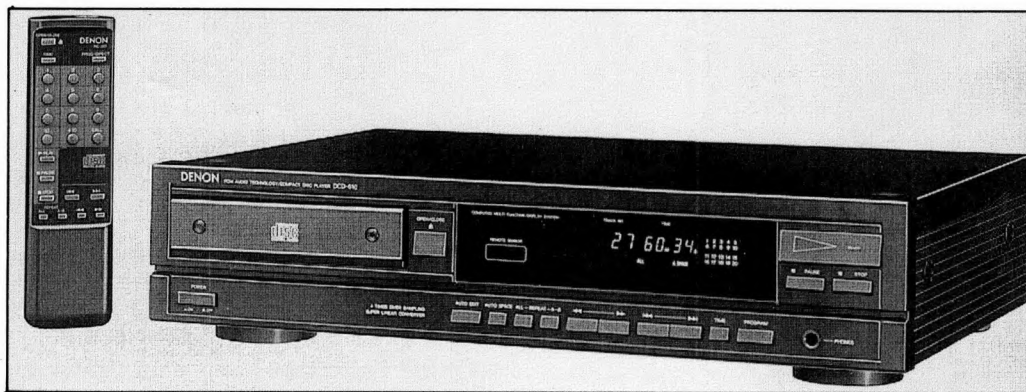
Being mechanically and electronically among the more

If your CD player does break down dealers can repair it in less than two weeks on average. Many replied that if they had the right parts in stock then they could turn repair equipment around in 48 hours but Steve Taylor of Beaver Radio told us that diagnosis of problems in CD players took longer than other hi-fi components. There doesn't appear to be an Achilles heel with players and both mechanical and electronic faults occur. Mike Long, service engineer for RPM, said that in the CD players he had recently repaired he had seen broken drive belts, faulty mechanical contacts on drawer mechanisms and awry circuitry component tolerances. He'd also had several digital filters "going down".

If dealers cannot repair the CD player, waiting time is longer while manufacturers (or their distributor) sort the problems out. Here we calculated an average turnaround time of just over three and a half weeks. Happily this is less common now as dealers familiarise themselves with CD technology – in our survey at this time last year many dealers were sending the majority of CD players back to manufacturers for repair.

To get an idea of which companies are on the ball at the moment we asked dealers for their fastest and slowest brands. Yamaha and A&R Cambridge came out top followed by Cambridge Audio, Technics and Mission. Slow companies were mentioned as Denon, followed (after a gap) by NAD, Marantz and Rotel. Rob Follis, for Hayden Labs who imports the Denon range explained that the firm was establishing its own transport operation at present and hoped to have everything running smoothly by the Summer.

We asked dealers for their most reliable and unreliable brands – calculating the results on a points system. Some dealers might favour a brand while others denigrate it so where points are given against a company we have subtracted them from the total. We should also point out that the more a dealer sells of a product the more likely he is to find faulty samples.



Denon's cheapest far outstrips the rest.

otherwise have enjoyed an epitaph like: 'Video Killed the Audio Mart'.

Roger Skillman, of Darby's Hi-Fi, explained that even his turntable sales, especially the more expensive models, had increased as a result of interest in CD. "Without CD players this trade was going to the dogs," opined Skillman, "but people are now realising that their old records can sound very good. Our sales of £500-plus turntables have doubled in the last year. It's due to the influence of CD that people are enjoying vinyl again." And this comment was repeated by several other dealers we spoke to and CD sound quality (while improving all the time) is still criticised when compared to vinyl for sounding brash or having limited soundstage capabilities. The host of cleaning gadgets also belie its original introduction under the guise of 'perfect'.

However, 22 of our dealers replied that they sold more CD players than record decks, while 18 gave the reverse answer. Several dealers also told us that customers are now replacing their original CD players, confirming that the medium is

volume is up 37 per cent, value is only up 32 per cent which reflects the incidence of cheaper players and price wars as companies vie for a hold on the market. As one would expect, most activity is at the cheaper end with 97 per cent of sales in the sub-£300 price bracket.

For this market survey we approached 41 dealers covering 37 brands of CD player available in the UK at present. On average our respondents stock seven different brands of CD player. This is a healthy sign; the less brands a dealer stocks the more he is likely to know about the capabilities of the models he is selling. The dealers we have spoken to are mostly independent specialists (they wouldn't sell fridges) and we don't have comment from multiple retail chains many of whom sell their own brands (such as Saisho from Dixons). The survey complements the main review topic of the magazine but concentrates on mostly different criteria such as reliability.

RELIABILITY

With CD player prices ranging from £82 to £2,600 there are

complex of hi-fi components CD players tend to be less reliable than the turntables they are replacing whatever their price. But it is the cheaper models especially which were criticised by dealers who are in the front line as it were and have to pick up the pieces. We heard that over the last year or so, as prices first dropped below £200 and then £100, so build quality suffered with players looking "more plastic". However, pressure (especially from the multiple retail chains) is on dealers to sell cheaper models in this burgeoning market.

Nevertheless our quality control findings – used as a first indication of manufacturers' commitment to reliability – are slightly down on previous figures. From dealers' replies we calculated an average 3.8 per cent of all players arriving faulty. Many reliability problems also seem to be of the batch type which dealers could quickly identify and which manufacturers can replace with as little inconvenience to the customer as possible. Of course someone, the customer in the end, has to pay the cost of these problems.

However, dealers are usually aware of this and give considered responses – often from their computer records.

Marantz came out top for reliability this month with 57 points overall followed by Denon (43), Yamaha (41), Technics (40), and Sony (31). Technics does especially well here – getting positive remarks from all but one of its dealers, and no negative comments. The other firms also did well in our Autumn survey last year which at least shows consistency. Unreliable brands according to dealers, are Philips and Cambridge Audio both of whom achieved 38 minus points. Readers should note that Cambridge had been taken over by new management just before this survey was compiled and things may well already have changed for the better. In November Mission had been found unreliable but this time it received several positive remarks for reliability.

TOUCH NOT . . .

. . . the disc but by its very edges, might be the motto of the CD clan. The original hype that one could spread marmalade on a disc before offering it toastlike to the machine would be ambitious to the point of fraud with today's players and the now mass-produced software.

Dealers told us that most of their problems with players were actually caused by discs which can get dusty or scratched just like vinyl. In fact one dealer told us that where a good record player would continue to track over dust or scratches transducing them as pops to the ears, CD players tended to stick on the music like a poorly set-up cartridge and tonearm. It seems therefore that you have to be just as careful with your CD collection as you would with vinyl. Dealers also said that dust on a CD will fly off inside a player and could build up on the laser lens which has to be cleaned periodically.

In light of, or perhaps in response to this fact Path plc is considering importing an American lens cleaner at a premium of £19.95 in this country under its Allsop or On accessory banners. The cleaner looks like a CD with a small brush of fine hairs near the centre on the 'reading' side. It apparently instructs the player to align the laser with the brush which then does the business for about ten seconds after which the disc stops spinning. Tracy Wischusen, for Path said the tool had been endorsed by several CD-ROM manufacturers such as Hitachi.

Keeping CDs clean is best done by replacing them in their jewel case in the best vinyl-audiophile fashion. Dust and finger marks can be removed with a variety of cleaners 'though several dealers say wiping with a soft cloth after breathing on the disc should do. One advised us that use of a mild detergent and running water was the best option. If you need to spend money, Hunt EDA's P3 CD cleaner was popular, with mentions for Allsop, Trackmate and Discwasher offerings as well.

If you scratch your disc there's not much hope (try stamping on the floor!).

REVERBERATIONS

Proper isolation for CD players is something manufacturers have been developing from the start, incorporating sprung feet and drive mechanisms within the player itself. However, several dealers said they could improve a player's sound by isolating it further with proprietary equipment tables or Sorbothane feet. Joe Lannigan of Cloney Audio recommended the latter as an immediate and reasonably cheap (£10) upgrade which "transforms the sound". One of our regular contributors, Paul Miller, reviewed and recommended some Audioquest Sorbothane feet (imported by A&R Cambridge) when used under a turntable (see issue No. 57).

Another method of improving sound quality is to buy some specialised interconnect cable to carry the purest signal between CD player and amplifier. Variations on the theme of interconnect are available from

the optic fibre or solid silver to the linear crystal oxygen free copper types. You can get something perfectly respectable from the (most popular) QED Incon range for around £20.

Tweak freaks can also invest in CD damping rings – marketed by Presence Audio of Horsham, Sussex or from the Monster range of accessories imported by Zenonlec of Newbury, Berks. These are stuck onto the label side of a disc and apparently reduce resonances set up by the outer edge of the disc as it spins, giving the laser an easier job.

THE BEST SELLERS

We asked dealers for their three top-selling players in each of three price categories. The results are calculated on a points system: five for the top seller, four for the second, three for the third and then added up.

Budget Best Sellers up to £200

1) Denon <i>DCD610</i>	109
2) Yamaha <i>CDX510</i>	35
3) Technics <i>SLP200</i>	27
4) Marantz <i>873SE</i>	20

While Denon is stocked by more dealers than other brands, that doesn't equate with its success here which is remarkable even when compared with former survey results.

Mid Price £201-£500

1) Marantz <i>CD65/IISE</i>	96
2) Denon <i>DCD 910</i>	59
3) Denon <i>DCD810</i>	55
4) Marantz <i>CD65/III</i>	53
5) Marantz <i>CD85</i>	31

Well folks in round three of this survey it's still Marantz and Denon who're slogging it out in this mid-range arena, though

again, the best seller is many points ahead.

Top Priced Best Sellers £500+

1) Marantz <i>CD94</i>	66
2) Cambridge Audio <i>CD2</i>	50
3) Meridian <i>CD 207</i>	33
4) Denon <i>DCD1700</i>	30
5) Sony <i>337ES</i>	30

Sony, Denon and Meridian were also listed best sellers in our last CD player report.

The aim of this survey is to give readers a distillation of dealers' views and comments, and we don't pretend the picture given is 100 per cent accurate for the UK at the moment. The nature of the survey, which is mostly random in its approach, also means that it tends to cover the most common brands stocked by specialist dealers. The survey is a poll and should be seen as such.

PARTICIPATING DEALERS

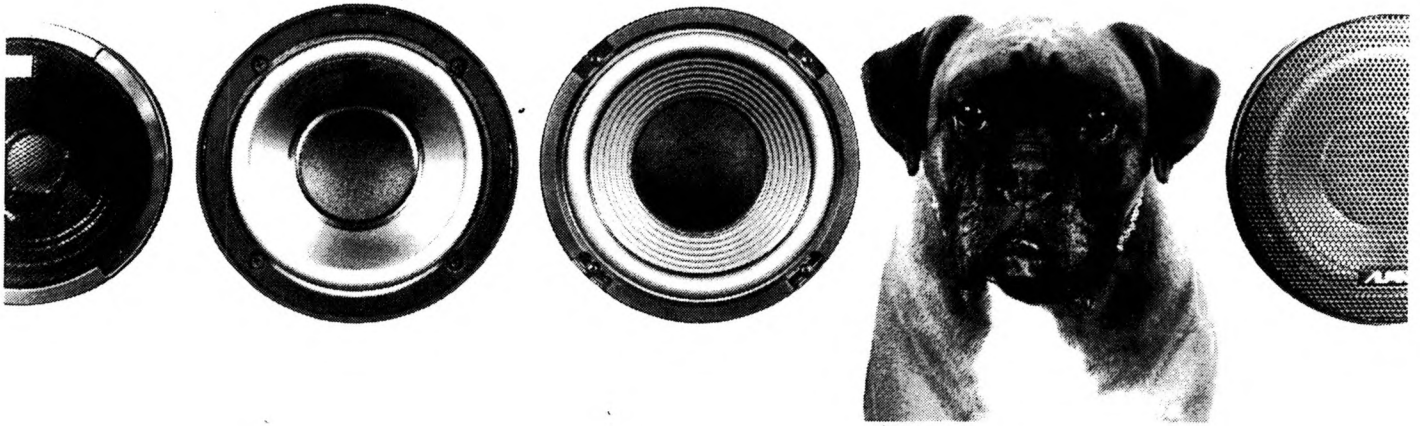
Our thanks to the following dealers for helping us compile this survey:

A. Fanthorpe Ltd, Hull, Humberside.
 Analog Audio, North Finchley, London.
 Aston Audio, Alderley Edge, Cheshire.
 AT Labs, Enfield, Middlesex.
 Audio Insight, Stony Stratford, Milton Keynes.
 Audio South, Farnham, Surrey.
 Bartletts Hi-Fi, Holloway Rd, N. London.
 Beaver Radio, Liverpool, Merseyside.
 Brentwood Music and Hi-Fi Centre, Essex.
 Cambridge Hi-Fi, Bedford, Beds.
 Chew and Osborne, Saffron Walden, Essex.
 Cloney Audio, Blackrock, Dublin.
 Covent Garden Records, London WC2.
 Definitive Audio, Brighton, Sussex.
 Doug Brady Hi-Fi, London WC2.
 Gilson Audio, Middlesborough, Cleveland.
 Grange Hi-Fi, Burton on Trent, Staffordshire.
 Hopkins Hi-Fi, Portsmouth, Hampshire.
 Horns Ltd, Oxford, Oxon.
 In Hi-Fi, Edinburgh.
 Lyon Audio, Stanway, Colchester, Essex.
 Moorgate Acoustics, Rotherham, Yorkshire.
 Newbury Audio, Newbury, Berkshire.
 Nottingham Hi-Fi Centre, Nottinghamshire.
 Now That's Hi-Fi, Portsmouth, Hampshire.
 O'Brien Hi-Fi, Wimbledon Village, London.
 Paul Green Hi-Fi, Bath, Avon.
 Peter Russell's Hi-Fi Attic, Plymouth, Devon.
 Pro Musica, Colchester, Essex.
 Radlett Audio, Radlett, Hertfordshire.
 Rogers Hi-Fi, Guildford, Surrey.
 RPM, Clapham, London.
 Selective Audio, Otley, W. Yorkshire.
 Stereo Stereo, Glasgow, Strathclyde.
 Steve Boxshall Audio, Cambridge.
 The Cornflake Shop, Windmill Street, London W1.
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Audioquest's Sorbothane damping feet.

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CHOOSING AND USING . . . CD PLAYERS

CD players are now the most popular component in the hi-fi chain and while prices slip gently downwards, quality moves up steadily.

Compact disc has come a long way in five years, and is now starting to represent a significant percentage of hardware and disc sales (particularly by value). Rather surprisingly, the UK has proved one of the slower growing markets, though this partly reflects a greater difference in price between a CD and its LP or musicassette equivalent than in some overseas markets. Whereas disc prices have only recently started to slip, player prices have dropped to a third of those charged when the system was first launched. £200 is now a typical budget price, some machines cost as little as £130, and cheap mechanisms are built into systems and portables. Yet at the same time there is a healthy demand for upmarket players offering improved sound quality and/or unusual features.

The arrival of CD has been a great stimulus to the hi-fi trade, not only by creating substantial sales of CD players themselves, but also in re-focusing attention on the various other parts of the hi-fi system. Visiting a hi-fi shop for the first time in years perhaps, customers are appreciating the steady advances which have taken place on all fronts, and are taking the opportunity for a general system upgrade. Even LP record players are selling well, sometimes after direct comparison with the new medium, as customers recognise the major investment they already have in vinyl discs and appreciate the fine quality now available from vinyl. Indeed, CD credibility was not helped by early claims for 'perfect sound forever', a perfection which has often fallen far short of the expectations of many hi-fi enthusiasts.

CD certainly has a number of advantages over its rivals. It is inherently rugged and unaffected by playing, free of surface and background noise and wow and flutter effects, while signals kept in digital form are theoretically immune from degradation. The addition of data channels allows complex pre-programming and accessing, while other CD

applications include adding video (CD-Video), interactive A/V (CD-I) and the CD-ROM computer software format. In-car, portable and personal players are in the shops, though there is still the nagging doubt that tape is inherently more immune to the shock and vibration of such applications, while the wide dynamic range and inaudible background noise can be almost an embarrassment in a noisy environment. Doubters notwithstanding, the format clearly is here to stay, which is an achievement in itself when one notes the enormous historic difficulties encountered by those trying to create a successful new domestic format, not to mention the current problems facing DAT, touted as the tape equivalent to CD. Indeed, DAT may well be a total non-starter now that CD-R (recordable CD) is just around the corner.

THE DISCS

Only five inches in diameter and attractively silvered, the compact disc currently costs up to twice the price of an LP or musicassette (in the UK) and should resist damage or wear. It can carry more than an hour of music and comes packaged in an irritatingly fragile and awkwardly designed 'jewel case', containing additional printed 'sleeve' information.

For record companies in particular, establishing a brand new format is an exceedingly difficult task, in view of the vast inventory needed to represent a play-only format effectively, and in this instance, the technical problems of pressing with necessarily great precision. Inevitably there was a learning curve in the disc manufacturing processes, and full quality potential is still not reached in many cases. However, the range of titles now available on CD has grown spectacularly, particularly in the classical and jazz fields, emphasising the commitment of the record companies to the format.

From the general consumer's point of view, price is still a

key factor. While early CD users were clearly prepared to pay a 100 per cent premium, it remains to be seen what sort of long term price premium compact discs can command over LP and musicassette rivals. History has shown that the broad base of recorded music sales is very price-sensitive but not especially quality conscious – musicassette purchasers who were attracted by the convenience of that medium were not deterred by sound quality substantially inferior to LP.

THE PLAYERS

The conventional CD player may simply be plugged into any hi-fi system, as one would a tuner or cassette deck. The amplifier's 'aux', or 'tape' inputs will be perfectly adequate, though the results might be a little loud through the speakers, and require a lower volume control setting than usual. Many more recent amplifiers have a 'CD' input, and this may have a more appropriate sensitivity. Some specialist amplifiers have taken the trouble to connect the CD input directly to the preamp volume control, so as to minimise the interference of the signal path.

There is also a mild risk that a CD user will find his amplifier no longer seems to go as loud. The reason for this is that the digital CD medium is better at preserving the high loudness peaks in music which analogue systems 'squash' downwards. Consequently for the same peak output, the mean (average) output from CD with the same recording will be slightly lower

than before. One can of course compensate by cranking up the volume, but if an amplifier is already being used close to its limits, the CD peaks could cause premature 'clipping', for which the only solution is a bigger amplifier.

The prospective purchaser faces a wide range of choice at wildly varying prices, starting below £150 and going up to above £2,000. Players are available for in-car use, are incorporated in large portables, and exist as tiny personals, with some doubling as unconventional domestic machines. The mains models can be manual or remote controlled, and simple or complicated in terms of ergonomics and programmability. Autochanger variations can accept and play from a caddy of half a dozen discs, selected and programmed remotely.

Despite protestations of 'perfect' sound, CD players show significant audible and measurement differences, and these are discussed in detail in our reviews. That said, most machines measure very competently, showing occasional weakness at the cheapest end of the market and among low voltage portable machines. Though correlation with measurement still proves elusive, listening tests prove quite capable of consistently distinguishing between the different decks. While the poorer examples can make the new medium sound quite unpleasant, the best can provide eminently satisfactory results with refreshing repeatability and the promise of longevity.



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BEST BUY



Like most companies, Akai has had its ups and downs over the years, but the recent trend all looks pretty positive. Following on from the *CD 52*, which was well liked in the last *CD player* edition of *Hi-Fi Choice* comes the more expensive *CD-62*. Priced as it is above the mainstream market, the competition is fierce and a player needs to offer a complete performance and styling package in order to compete successfully.

Akai's styling department is into big feet this year – as are many others. The variety found here are large, round and plastic, finished with a light gold band and rubber base inserts. The case which sits above has bent sheet steel panels with a wrapover U top. The front panel is a conglomeration of alloy panel built onto a plastic substrate; even the drawer front has an alloy facade. A section under the display slopes out from the line of the panel, giving a rather attractively chunky look and containing the majority of the controls. These have plastic buttons set into it with a pleasantly light but positive click action.

One complaint that could be made is that the nooks and crannies the stylists have created will soon fill with dust, and look difficult to clean. The variable headphone socket has a gold ring at its entrance to add the finishing touch.

The controls are sensibly grouped and easy to find. There is no index search but everything else is available from the 11-key track select, to the A-B repeat and auto space functions. Programmed play is available for up to 20 tracks, and full edit facilities might (or might not) make life easier. Auto edit is a further facility which edits CD tracks into programmes that fit within the recording length of each side of a cassette tape.

The infra red remote control covers almost everything – with the exception of headphone volume. The large fluorescent display conveys all the required information in a logical manner, with a track calendar to help the programming and various time modes.

The interior layout is standard but a large board ensures the components have plenty of room and are well spaced out. Copper plated

screws are used to hold things together. The power transformer is small but the reservoir capacitors are a reasonable size, and both chip and discrete regulated power supplies are used. An 8x oversampling digital filter drives a pair of the industry standard Burr Brown *PCM56P* 16-bit digital-to-analogue convertors. Plenty of attention has been given to the analogue output stage, which uses *JRC 5532* dual op-amps with selected electrolytic and copper foil polystyrene capacitors. The transport looks simple enough – it's basically rubber mounted plastic, with a sprung subchassis carrying an ordinary laser transport mechanism. It is also 8cm 'CD single' compatible.

LAB REPORT

There is nothing much special about this player's lab performance – in fact some aspects were fairly mediocre. Low level distortion isn't particularly good especially on the left channel, and full level white noise reveals some clipping, though the full level IM and THD results are OK. While channel separation is fine, the channel balance shows larger than average errors.

Error correction is only available up to 0.8mm gap and resistance to shock and vibration is also fairly average. The low level resolution and linearity is poor below –70dB, the left channel showing a negative 'kink' which causes a 12dB error at –90dB. This is poorer than the right channel's positive 3.5dB error at –90dB. This linearity limitation shows up on the –90dB sine wave and associated distortion graph.

SOUND QUALITY

This latest generation of Akai CD players all seem to be moving in the right direction. The trend started with the *72*, was firmly consolidated with the *52* and the *62* seems to be continuing the upward course.

Bass delivery is strong, forceful, quick and immensely able, capable of producing realistic detail and weight with commendable resolution and tune playing ability. The mid-range tonality is excellent, seemingly always in control and at home with any material thrown at it. It's smooth, natural and infor-

mative, collecting considerable detail from the disc and presenting it with great ability. However, the treble could become a mite exaggerated and 'zizzy', though it was never gritty or grainy.

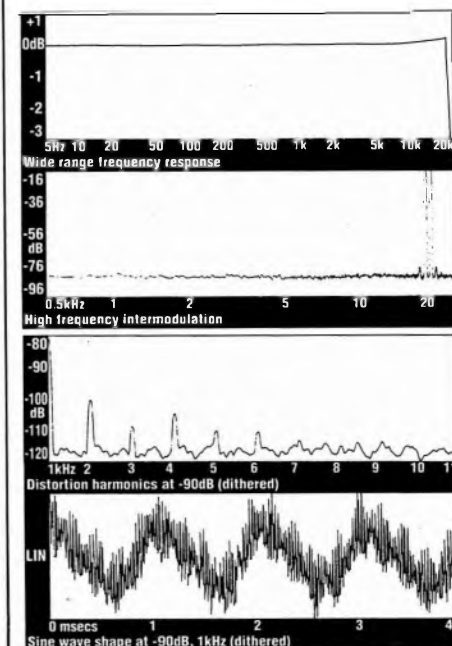
Stage width and depth are edging towards the top class. 'Layering' is revealed as few players can, and the images are constructed with a sense of ease and space. The player sounds transparent and you can hear through to the back of the soundstage quite convincingly.

CONCLUSIONS

The *62* looks expensive enough, the finish is up to standard, and the facilities cover all that most will want, with the exception of a remote volume control. The lab performance shows reasonable enough competence, but the sound quality moves this Akai right up into the very good category at a still reasonable price. A Best Buy rating is therefore appropriate.

TEST RESULTS

Test resolution (L/R av)		15.0 bits	
Output level, source impedance		2.16V, 0.67dB, 1kohms	
Effective dynamic range		97dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	–89dB	–88dB	–90dB
	(0.0036%)	(0.004%)	(0.0032%)
Ref –70dB		–24/32dB	
Stereo separation	126dB	114dB	90dB
Stereo balance L/R	0.40dB	0.39dB	0.39dB
Frequency response (20Hz to 20kHz)			±0.17dB
High frequency intermodulation			–91dB (0.0028%)
Electrical noise (CCIR ARM, 1kHz)			–98dB
Mechanical noise			low
Ultrasonic noise			–95dB
Error correction			0.8mm gap
Shock/vibration resistance			average
De-emphasis			+0.15dB at 5kHz
Track finding speed (15, YEDS2)			3 secs
White noise overload test			slight clip
Size (w x d x h)			42.5 x 34.5 x 10.9cms
Typical price inc VAT			£330



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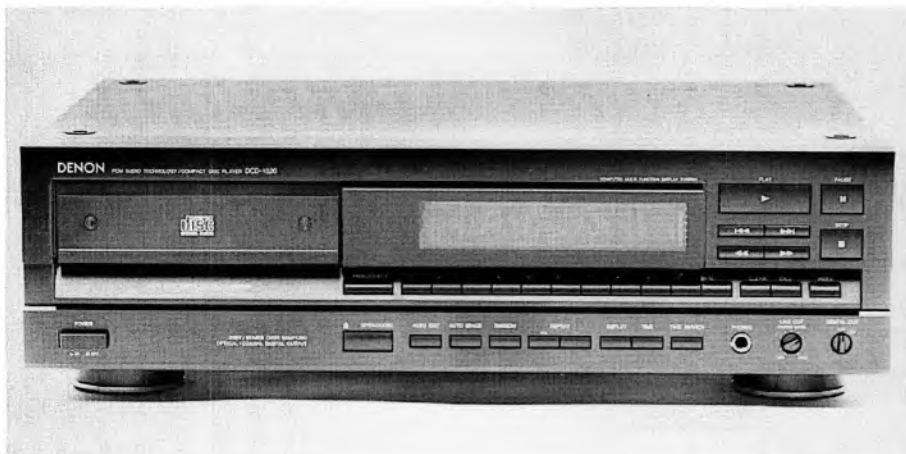
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I am always satisfied with the best'
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DENON DCD-1520

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RECOMMENDED



Although most Denon products are of Japanese origin, the company has recently installed itself in a German factory so we may see some European made products in the near future. In the meantime this latest in the large range of CD players replaces the much respected *DCD-1500* and variants, and is sourced well and truly from Japan.

The sample under test here was fresh into the UK, and represents the very latest in Denon's digital-to-analogue convertor technology, dubbed the *Delta* system. Not content with using 18-bit chips, the company has added extra circuitry around them to provide a further 2 bits. Denon doesn't range-switch the DACs like some other manufacturers; instead the extra 2 bits comes from adding a discrete subsidiary DAC and the design produces a genuine full 20 bits. In addition the latest 8x oversampling digital filter is installed, so the net resolution ought to be exceedingly high.

The front panel is neatly regimented with all the expected facilities befitting a machine of this price. Numbered direct track access keys are lined up under the display to back up the normal search methods. There are full programming facilities, versatile repeat and time search modes, track index selection and auto edit, auto space function, plus the obligatory random track play option. Fixed and variable outputs are available via gold-plated phono sockets, and the optical and coaxial digital outputs are switchable from the front panel. There is also a variable headphone socket.

External finish is of high calibre and the large display window is set into an alloy front panel. The basic case is plastic with lots of internal bracing, and is armoured with heavy steel plates to damp out vibration and lend extra strength and rigidity. There is a light exterior steel shroud over the basic construction and this has rubber damping material interposed between the layers.

The internal layout is familiarly Denon with the Sony 8x oversampling digital filter driving separate Burr Brown *PCM 64P* 18-bit digital-to-analogue convertors, plus the associated circuitry required to provide the extra 2 bits. The power supply is sizeable with

reserve capacitors of decent quality and plenty of on-board chip regulators and extra decoupling where required. The output filtering and drive comes from selected *NE5532* dual operational amplifiers. The transport is well made and smooth in operation, a linear motor mounted on a metal base controlling the laser tracking.

LAB REPORT

Some of the performance aspects of this player are first rate, yet surprisingly others are somewhat ordinary. Several orders of intermodulation products can easily be seen on the graph, yet harmonic distortion is state of the art. Stereo balance is perfect at all significant frequencies, and ultrasonic spurious are well suppressed. The noise floor of the player is well down, creating an impressive effective dynamic range of -114dB on the best channel.

The error correction capability is only moderately good, though resistance to shock and vibration easily exceeds normal standards. The de-emphasis shows a little error, but 'normal' discs are generally pancake flat. The -90dB sinewave is produced with unusual precision, virtually devoid of the usual electronic mush. The low level linearity of this player is quite remarkably accurate, extending right down to the noise floor. In the context of the 16-bit CD system, this is one of very few players to give full 16-bit performance.

SOUND QUALITY

The attributes of this player are immediately obvious on audition: it is clear and detailed in a very precise way. It also has the ability to 'chop up' poor recordings in an almost cruel fashion, and this clinical quality can take some of the romance away from performances.

In essence most things are done very well. The player retains good control in the bass at all times – if anything it's a little light, but is always lively and articulate with good extension when the music demands. The midrange is balanced and very detailed, while the low end of the treble range appears a trifle forward, whereas the upper treble is recessed to

the same degree. One characteristic accentuates the other to some degree, but the effect is the same whatever.

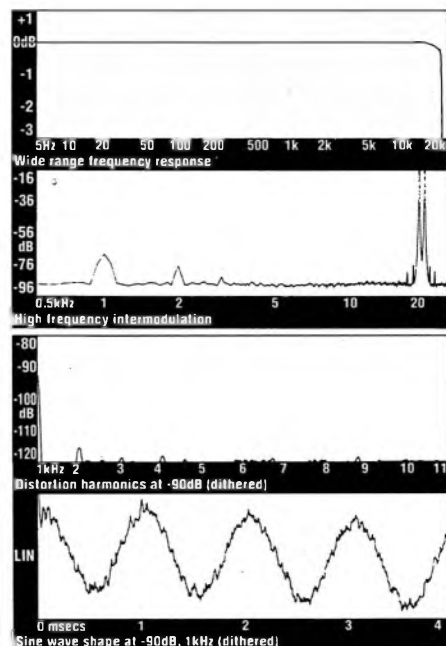
Stereo width is first rate with images appearing right out to the edges of the known soundstage. Depth is good too. Ambience recovery is well above average, albeit not quite achieving top rank status, and images are well formed with good separation and focus. There's a slight feeling of some added electronic 'edge' to the sound, and this could make the sound slightly 'forced' at times.

CONCLUSIONS

The *1520* represents a definite improvement on the *1500II*, even though the presentation is a little different. Sound quality moves up towards the first division, and in this respect it's the best Denon *Choice* has tested so far. Build quality is fine, lab performance generally good, and the facilities lavish. Expensive though it is, Recommendation is still deserved.

TEST RESULTS

Test resolution (L/R av)		16 bits
Output level, source impedance	2.45V, 1.76dB, 380ohms	
Effective dynamic range		-114dB
Harmonic distortion	20Hz 1kHz 20kHz	-90dB
Ref 0dB	-95dB -97dB -90dB	
	(0.0018%) (0.0014%) (0.0032%)	
Ref -70dB		-39dB
Stereo separation	106dB	91dB
Stereo balance L/R	0dB	0.05dB
Frequency response (20Hz to 20kHz)		$\pm 0.22\text{dB}$
High frequency intermodulation		-71dB (0.028%)
Electrical noise (CCIR ARM, 1kHz)		-109dB
Mechanical noise		low
Ultrasonic noise		-114dB
Error correction		1.25mm gap
Shock/vibration resistance		very good
De-emphasis		$+0.25\text{dB}$ at 5kHz
Track finding speed (15, YEDS 2)		2 secs
White noise overload test		OK
Size (w x d x h)		43.5 x 36 x 13.3cms
Typical price inc VAT		£500



GOODMANS GCD 300

GOODMANS LOUDSPEAKERS LTD., 1 & 3 RIDGWAY, HAVANT, HAMPSHIRE PO9 1JS. TEL: (0705) 492777.



Since CD's inception, player prices have fallen steadily. Complete music centres containing CD players are now available costing less than a decent standalone separates model, so it's only realistic that the cheapest players now cost little more than £100.

The *GCD 300* is one such beer budget model. It is made in Korea for Goodman's, which historically is more famous for loudspeakers than electronics, though it has recently diversified into all sorts of new product areas. As you might expect it is a very basic player, with a total of only nine buttons including on/off and open/close. In its defence, however, there is more than enough for ordinary use; the standard play, pause, stop, track skip and manual search modes are accompanied by a 15-track programmable memory, and a two-mode repeat system.

The display has the dubious distinction of being the smallest in this issue. Ordinarily it shows the currently playing track number, but it may be switched to indicate the elapsed time of the track being played, the remaining time of the current disc or the total time of the whole disc. Indicators are included for various operating modes, backed up by LEDs for play and pause.

The pretty front panel is a plastic moulding, styled with gently curving buttons, loading drawer front and a styling bar along the bottom. Finish is to a totally acceptable standard. The chassis is an open plastic box with some moulded bracing, to which light steel and plastic panels are screwed.

All the important circuits are found on a single board, including a Yamaha digital filter and Sony control chips. The output operational amplifiers are in-line types and the analogue filtering is based on LC circuits. The disc transport is made on a decoupled steel plate, and everything works on the multi cog and rack system.

LAB REPORT

A mixture of good and bad results are combined with a few quirky features. The maximum output level is close to the standard 2V and comes from a reasonable 1kohms source impedance. The machine isn't too happy at full level: the white noise test reveals clipped

peaks and harmonic distortion is quite high. The intermodulation test results also show obviously higher than average distortion.

Stereo separation is fair and midband balance is generally very good. The good ultrasonic noise results show the advantages of steep analogue filtering, which more modern players have given up in favour of simpler, more gradual filters that have better high frequency phase responses. Error correction is respectable, shock and vibration resistance good, and mechanical noise is not too high. The frequency response reveals a high frequency rise above 3kHz and some channel imbalance. Linearity at low levels is fine down to -90dB, but the noise floor was higher than most. The -90dB sinewave is modulated by a spurious signal with a frequency of about 10kHz, which is rather obvious on the distortion graph.

Track access time is amazingly slow. Skipping to the next track took so long that I thought that the player had gone faulty. After some five seconds wait the display fires up a countdown time to the start of the next track. This time is a yawning 15 seconds - all the other players reviewed are instant by comparison.

SOUND QUALITY

This player sounds like something from an earlier generation of electronics where no or low order digital sampling made 'brick wall' analogue filtering necessary. Bass sounds light with a lack of precision, differentiation and tunefulness. The mid is too sharp, hard and a touch thin and forward, with a lack of detail which sours the tonal quality of bowed stringed instruments. The treble shows more than a hint of grain and edge, and was slightly dulled at the top end.

This machine becomes congested on loud passages and shows virtually no stereo depth whatsoever, though it must be said that width was reasonable enough. Images are formed with average quality and placement along a one dimensional sound stage.

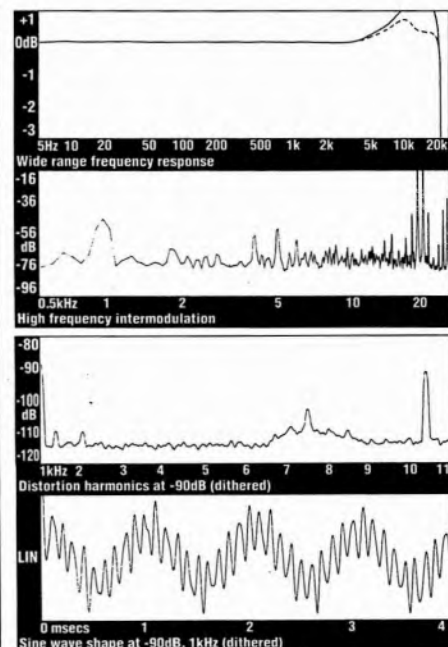
The *GCD 300* was found to be far more at home on rock and wall-of-sound pop recordings than with expansive, textured, classical material.

CONCLUSIONS

This is the cheapest model reviewed this month, and it's also the worst sounding. With other more modern designs available at prices down to £150, the quality obtainable here is unable to produce more than a lukewarm reaction, despite the low price.

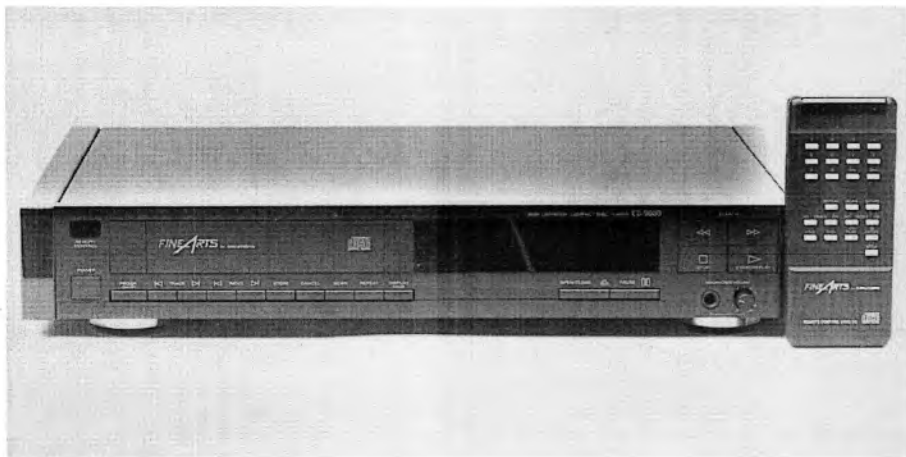
TEST RESULTS

Test resolution (L/R av)		15.5 bits
Output level, source impedance	2.12V, 0.51dB, 1kohms	
Effective dynamic range		91dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	-64dB -63dB -62dB	
	(0.063%) (0.071%) (0.079%)	
Ref -70dB	-35dB	
Stereo separation	74dB 74dB 72dB	
Stereo balance L/R	0.02dB 0.07dB	1.21dB
Frequency response (20Hz to 20kHz)		±1.3dB
High frequency intermodulation		-57dB (0.14%)
Electrical noise (CCIR ARM, 1kHz)		-84dB
Mechanical noise		average
Ultrasonic noise		-112dB
Error correction		1.5mm gap
Shock/vibration resistance		good
De-emphasis		+0.05dB at 5kHz
Track finding speed (15, YEDS 2)		12 secs
White noise overload test		slight clip
Size (w x d x h)		35 x 31 x 9.2cms
Typical price inc VAT		£130



GRUNDIG FINE ARTS 9000

GRUNDIG INTERNATIONAL LTD., MILL ROAD, RUGBY, WARWICKSHIRE CV21 1PR. TEL: (0788) 77155.



Grundig doesn't have much of a track record in the UK hi-fi market. In the mind of the buying public the company is probably best known for televisions, radios and associated mainstream consumer electronics, having built up a solid long term reputation despite the odd hiccup (remember *V2000*). Now Grundig is marketing a range of hi-fi systems which include both this CD player and a DAT (digital audio tape) machine. Although the *9000* is marketed by Grundig as part of a system, some dealers may be prepared to sell it as a separate which is how we have reviewed it here.

The case is slim and well finished in dark gunmetal coloured steel, with solid wood endcaps. The front panel is a flat and simply styled black alloy extrusion. Despite the large, round, gold finished feet, the overall effect is gentle enough.

The control layout seems a little haphazard. Play, stop and search controls are assigned large buttons at the right hand end above the variable headphone socket and close to the smaller pause and open/close keys. All the rest are located under the loading drawer on the left.

Track and index search are provided along with normal programme repeat and scan facilities. The remote control keypad covers all these and has a 12-button track selector which includes +10 and +20 keys. The remote layout is easy to use even if the front panel isn't as sensibly arranged. The display is large with reminders for most of the functions. A 25-track calendar doubles for index number identification, and another segment can be switched between track/index numbers, time of tracks up to the present position, time of track played and total time.

There are nine separate circuit boards inside, and in this respect it is rather unlike the latest Philips designs. The boards are mainly linked by ribbon cable and the interior is reasonably neat. All the interesting electronic circuitry takes place on a standard earlier generation Philips board, using the conventional parts inventory with nothing added in the search for sound quality apart from the *A* grade digital-to-analogue converter. Unlike the Philips' latest, this

machine doesn't use the latest *B* grade digital filter. The transport is the simple plastic *CDM2*, also of Philips origin.

LAB REPORT

The output conforms to the 2V standard from a sensible source impedance. Intermodulation and all the total harmonic distortion results at full level are exceptionally good, and the white noise test reveals no clipping, but the slight asymmetry shows one of the effects of the old 'A' digital filter. This is also reflected in the high distortion products of the -90dB tone (see graph) and the rough looking sinewave.

Electrical and mechanical noise are commendably low, and a 3mm gap error correction test was passed, which is well up to standard. The frequency response is typical Philips, and de-emphasis response shows little error. Linearity was poor below -80dB, with errors up to -10dB at -90dB.

SOUND QUALITY

Based as it is on standard Philips parts, one might imagine that the better overall build quality and Grundig's circuit board rearrangement might have changed the subjective performance for the better. However, as far as the panel were concerned the changes had very little effect. The sound quality score was very close to that obtained by previous generation Philips plastic players (*CD460* etc), and the steel case may actually have had a slightly detrimental effect here.

Although still managing a marginally above average score, this emphasises the point that the sound quality of CD players in general has advanced over the past year or two, so the sonics must be regarded as disappointing when its highish price is taken into account.

Although some of the normal Philips qualities came through, negative aspects were also apparent. The sound is a little processed and unnatural with slightly strained dynamics in comparison with more up to date examples. The midrange is fairly fast and accurate with an above average tonal quality, but misses out on some of the fine detail. The bass comes over as slightly slowed, lacking in

ultimate slam and exuberance, though quite rhythmic nonetheless. The treble is undoubtedly the finest feature, being articulate, detailed and demonstrative with only very mild coarseness.

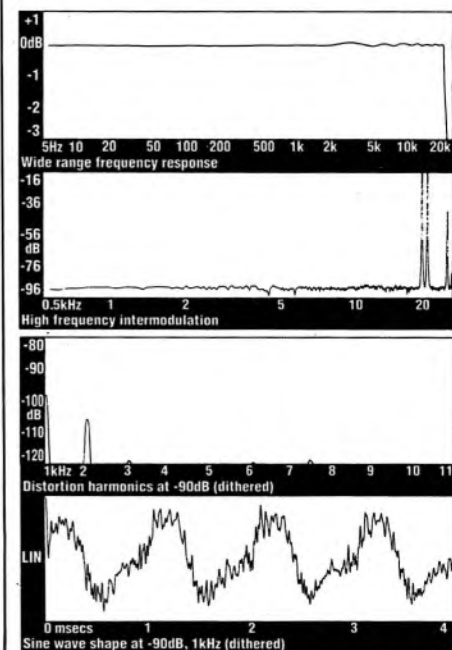
Stereo width is good, but depth is only average and the lack of detail means that the images have no more than reasonable competence.

CONCLUSIONS

Undoubtedly a stylish player in a reserved sort of way, this Grundig will fit in many houses without clashing with the decor. External finish is fine, but until the latest series chips are used the lab performance will continue to show the limitations discovered. This model is not for those who are looking primarily to maximise the sound per pound equation, but its competent sound quality and other attractions still have undeniable appeal.

TEST RESULTS

Test resolution (L/R av)		15.2 bits
Output level, source impedance	2.06V, 0.25dB, 200ohms	
Effective dynamic range		104dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	-95dB -90dB -91dB	
	(0.0018%) (0.0032%) (0.0028%)	
Ref -70dB		-32.5dB
Stereo separation	121dB 104dB 82dB	
Stereo balance L/R	0.06dB 0.05dB	
Frequency response (20Hz to 20kHz)		±0.05dB
High frequency intermodulation		-100dB (0.001%)
Electrical noise (CCIR ARM, 1kHz)		-107dB
Mechanical noise		low
Ultrasonic noise		-111dB
Error correction		3mm gap
Shock/vibration resistance		good
De-emphasis		-0.15dB at 5kHz
Track finding speed (15, YEDS 2)		3.5 secs
White noise overload test		no clip, slight asymmetry
Size (w x d x h)		47.6 x 33.5 x 8.0cms
Typical price inc VAT		£450 if available separately



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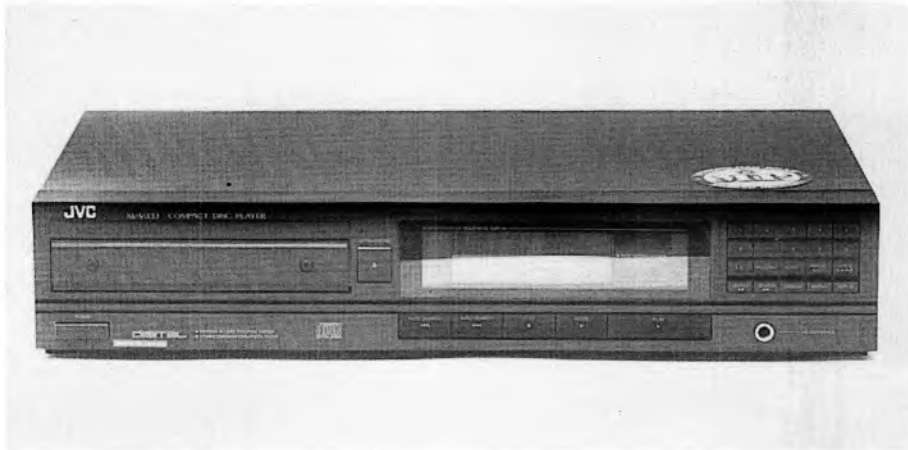
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Telephone 0923 225235

JVC XL-V333

JVC (UK) LTD., ELDONWALL TRADING ESTATE, 12 PRIESTLEY WAY, STAPLES CORNER, LONDON NW2. TEL: (01) 450 3282.

BEST BUY



Although a subsidiary of the mighty Matsushita organisation, the JVC brand has remained autonomous and maintains an important presence in the low to mid priced separates market. No fewer than three JVC players are tested this month, the 333 being the cheapest by some margin.

Finished in the usual satin black, you would expect to find a fairly basic model, even though the front panel facilities suggest otherwise. Close inspection reveals that this is made of plastic, not the anodised alloy implied by the fake socket-head 'screws' moulded into the loading drawer front. However, the case is made of steel panels and makes a solid box. A headphone socket is provided but it has a fixed output; the gold trim is no substitute.

The primary set of operating control buttons underneath the display window cover all the essentials. A bank of calculator-sized pushbuttons contain the keypad track selection array which can select any track number up to 99 with the aid of the +10 key. Also included are search, random play, intro, repeat all/one, A-B repeat, display, editing and programme (up to 32 selections).

Pressing intro produces the first 15 seconds of each track or programmed selection. When you find the track you want, pressing intro again instigates normal play. Editing creates a specified play time interval which is designed to make taping easier. A compulink-1 synchro facility for which terminals are found on the back panel is designed to perform synchronised recording and edit recording with a similarly equipped cassette player.

The orange display has indicators for all the features available, a 20-segment track calendar, as well as the normal track and index numbers. The time indicator has 4 modes - track time, track time remaining, and total elapse or remain time of disc or programmed selection.

Technically this player uses a time-shared 16-bit Burr Brown *PCM56P*, run at 4x oversampling rate from a Yamaha digital filter. Simple analogue output filtering is performed around the industry standard *NE5532* operational amplifier and construction fol-

lows normal practice for modern CD players. The transport is moulded plastic, decoupled from a steel baseplate which is joined to the chassis. An adaptor is needed for 8cm discs.

LAB REPORT

The convertor provides very good low level linearity with hardly any error right down to -105dB, and the -90dB sinewave is clean with a good shape. All the distortion results are first class too, especially at low levels. Ultrasonic noise is well suppressed and the signal-to-noise ratio respectable. The frequency response shows a slight treble rolloff, with only a small error on the de-emphasised response test. Error correction is slightly below the current average, but is still fair.

SOUND QUALITY

This is a good issue for sub-£200 players, which appear to be catching - and in some cases beating - more highly priced players from the same ranges.

The 333 is a case in point. It's a genuinely gutsy player, thanks to a tight and tuneful bass plus above average dynamics and impressive weight and slam. The player also manages to preserve a large proportion of midrange harmonic structure, and differentiates well between different instruments. Voices come over well balanced without added sibilance, and the sound fills out correctly into the lower octaves. Orchestral string sections could reveal some smearing and a hint of leanness, but the treble is fairly clean with only a trace of grain and tizz, and communicates plenty of detail.

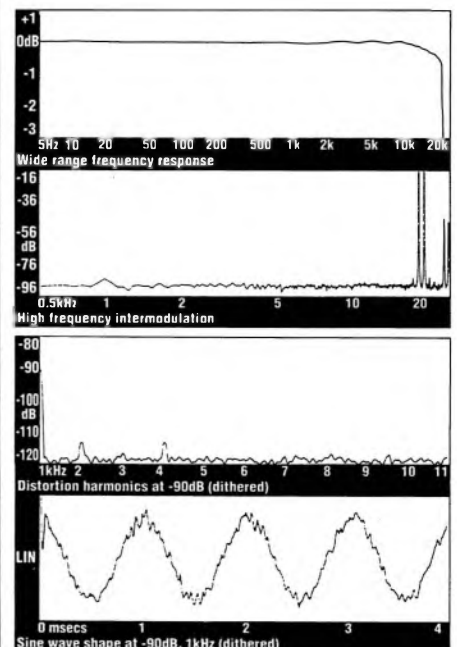
Layering effects are quite well portrayed and the transparency was rated a firm good, though the soundstage doesn't go as far back as it might despite being quite wide. Focus is reasonably tight in all bands and it images out to the edges of the space created.

CONCLUSIONS

This interesting player has a large number of facilities, reasonable build quality, and a fine lab performance. The sound is above average in all respects and one of the best ever from JVC. At the price it is something of a bargain and easily merits a Best Buy rating.

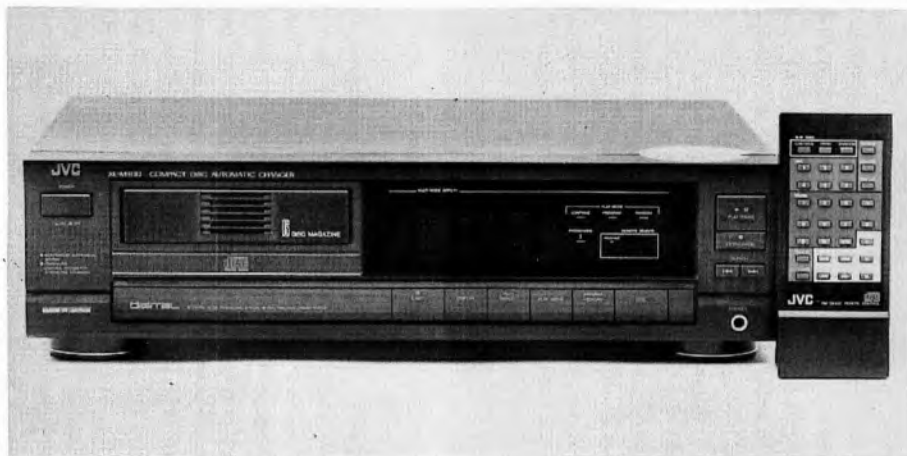
TEST RESULTS

Output level, source impedance	2.07V, 0.30dB, 660ohms		
Effective dynamic range	104dB		
Harmonic distortion	20Hz	1kHz	20kHz
	Ref 0dB	-95dB	-87dB
	(0.0018%)	(0.0045%)	(0.0025%)
Ref -70dB		-37.5dB	
Stereo separation	99dB	97dB	83dB
Stereo balance L/R	0.08dB	0.06dB	1.25dB
Frequency response (20Hz to 20kHz)			-0.5dB
High frequency intermodulation		-89dB	(0.0035%)
Electrical noise (CCIR ARM, 1kHz)			-96dB
Mechanical noise			low
Ultrasonic noise			-104dB
Error correction			1mm gap
Shock/vibration resistance			good
De-emphasis		+0.2dB	at 5kHz
Track finding speed (15, YEDS 2)			3.5 secs
White noise overload test			no problem
Size (w x d x h)	43.4 x 29.5 x 8.6cms		
Typical price inc VAT	£170		



JVC XL-M400

JVC (UK) LTD., ELDONWALL TRADING ESTATE, 12 PRIESTLEY WAY, STAPLES CORNER, LONDON NW2. TEL: (01) 450 3282.



This JVC player is aimed at the autochanger market, and uses the popular magazine system which can be pre-loaded with up to six discs before insertion into the player. Spare magazines can be acquired, so, like all of this breed, an entire CD collection can be stored in groups of six and ready for play.

Auto-changers equipped with six pack magazines have to be taller than normal players, which explains why this JVC stands 12cm high. The case is made from black painted prefabricated sheet steel and the front panel is a high quality plastic moulding. For a change, there aren't a lot of buttons, as most of the controls have been left for the remote handset.

Play/pause, stop/cancel and track skip buttons are placed to the left of a clear perspex panel which covers the display and subsidiary indicators. Underneath this are eject, display mode switching, repeat all/one, play mode select, memory and disc select.

The red and orange display is quite small but covers all the essentials. A numbered stack of discs is illustrated with a marker depicting which one is in use. Disc, time and track numbers are also provided and play, pause and repeat symbols are enclosed by illuminated outlines. The three different play modes are continuous, programmed and random, all of which have separate indicator LEDs. Other LED indicators denote programmed status and remote sensor receiving. A gold trimmed but invariable headphone socket is also included.

The remote control has two separate keypads for instant access. One selects the required disc (six keys), the other the track number (11 keys). All the front panel features you would want are duplicated on the remote control pad, including an audible fast search facility.

The auto-changer mechanism takes up half the available space inside, stretching right to the back of the box. The power supply transformer and reservoir capacitors are small and a minimum number of supply regulators are used. All the important circuits are on a single printed circuit board including all the transport control, digital and analogue components. Ribbon cables join this

board to the rest of the player and the wiring harness is kept neat and tidy. A Yamaha digital filter runs at 2x oversampling and drives a single time-shared Burr Brown *PCM56P* DAC. A single integrated circuit takes care of all the analogue domain requirements thereafter.

Located on the back panel are a standard set of line output phono sockets and a pair of 'compulink-1 syncro' connectors, the latter for interfacing with JVC system controls.

LAB REPORT

The frequency response shows some slight treble droop and filter unevenness but the two channels are quite well balanced at all frequencies. The output level is close to the CD standard, from a reasonable 1kohm impedance. No problems are encountered on the white noise test and the total harmonic distortion and intermodulation distortion figures are respectable.

Stereo separation is adequate, if falling slightly as the frequency is increased. The ultrasonic spurious suppression and the signal-to-noise ratio shouldn't cause concern even if these are down a little on normal single disc players. Audible mechanical noise during play was around average and error correction circuits work well, accommodating a 1.5mm gap before any clicks are heard. The low level linearity test shows some minor level error discrepancies between the channels, a left channel kink producing a +2dB error at -80dB and thereafter while the right channel is good at -80dB but too strong by -90dB and below. The -90dB sine wave is reproduced with fairly low distortion, even though some high frequency noise makes it look a little 'furry'.

SOUND QUALITY

I generally like autochangers but this one was rather disappointing. The bass isn't boomy, but has a transient imprecision which creates a 'damped' quality and the player doesn't always remain faithfully locked to the dynamic information on the disc. It sounds a touch lightweight, such that voices and instruments don't fill out correctly in the lower octaves, with consequent perceived

coloration. The midrange too was considered undynamic, with an underlying hardness and extra 'edge'. This is not manifest as glare or ringing, but is a little 'sharp' and it became fatiguing after a while. The treble displays some 'grit' and grain, although at no time does it sound sibilant or bright - quite the converse in fact.

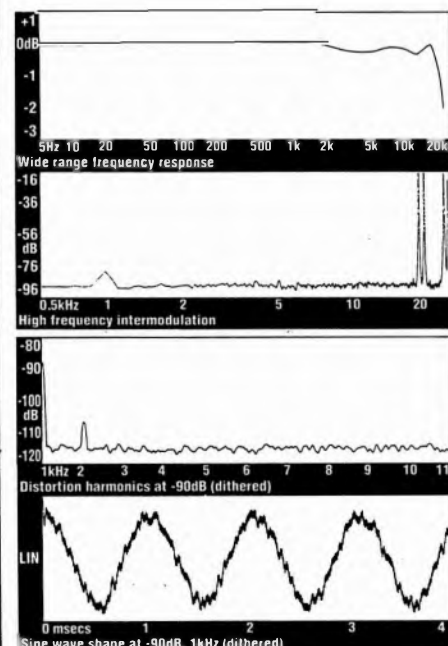
Focus could be somewhat phasy with difficult material, and the 400 has a tendency to smear the images of instruments rich in harmonic texture. It is unable to create natural soundstage perspectives properly, being lacking in depth and width alike.

CONCLUSIONS

Auto-changers are always appealing and their mechanics work well, but they rarely sound as good as ordinary players from the same range, probably because (with one or two exceptions) manufacturers tend to use last year's circuitry. This player follows that pattern, so unfortunately the net result is last year's sound.

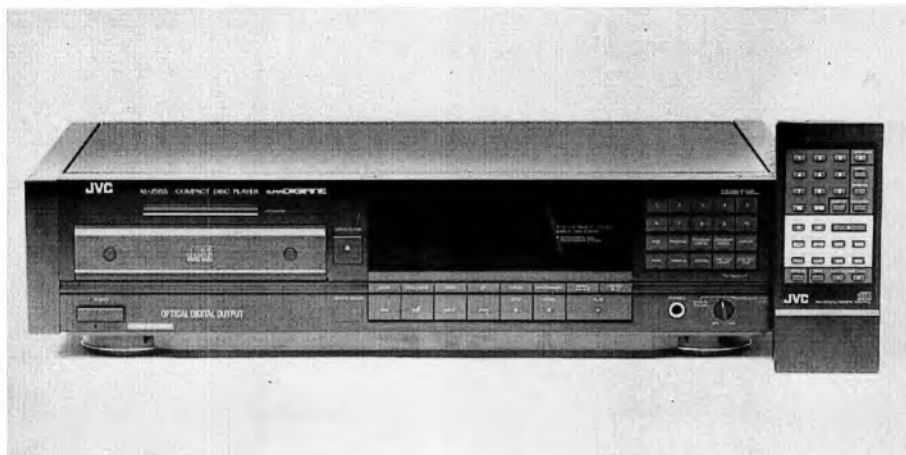
TEST RESULTS

Output level, source impedance	1.93V, 0.31dB, 1kohms		
Effective dynamic range	104dB		
Harmonic distortion Ref 0dB	20Hz	1kHz	20kHz
	-87dB	-88dB	-83dB
	(0.0045%)	(0.004%)	(0.0071%)
Ref -70dB	-31dB		
Stereo separation	105dB	100dB	70dB
Stereo balance L/R	0.09dB	0.11dB	0.22dB
Frequency response (20Hz to 20kHz)	-2.1dB		
High frequency intermodulation	-82dB (0.0079%)		
Electrical noise (CCIR ARM, 1kHz)	-92dB		
Mechanical noise	average		
Ultrasonic noise	-82dB		
Error correction	1.5mm gap		
Shock/vibration resistance	very good		
De-emphasis	+0.3dB at 5kHz		
Tracking speed (15, YEOS 2)	7 sec		
White noise overload test	OK		
Size (w x d x h)	43.4 x 32.5 x 12.0cms		
Typical price inc VAT	£300		



JVC XL-Z555

JVC (UK) LTD., ELDONWALL TRADING ESTATE, 12 PRIESTLEY WAY, STAPLES CORNER, LONDON NW2. TEL: (01) 450 3282.



Although not outrageously expensive, JVC's '555 is a flagship model in all other respects. Labelled as a 'super digifine product' and with a window marked 'optical link' above the loading draw, this indicator seems to serve little purpose. It flashes when reading a disc and lights when ready to start, thus bringing some extra visual stimulation to the front panel. The case is well made from nicely finished steel panels, while the base is stamped with spherical indentations and an inverted centre section on order to break up vibration modes.

There are two banks of control buttons angled out from the panel. The 11 instant track access keys and programming controls are extensive and easy to use; they include intro (first 15 seconds of each track) and random play plus multiple time display switching. Then there's a variable, gold trimmed headphone socket, and an indicator which blinks when the remote volume is operating. Beneath the huge display window is the normal disc transport control section, which includes index search and several repeat modes. The 32-track random access programming system also allows a 10 alphanumeric character title or message to be entered and stored in a memory that has a capacity to handle up to 512 discs.

The orange display is a *tour de force* of revealing both useful and totally inessential information. It has a track calendar, a track and index number section, multiple time options, flags for all the major functions and a multiple character display zone. In large letters the machine relays messages about its function, spells out the track titles and does a bit of JVC advertising as well.

In contrast, the remote control is small and sensibly discrete. Yet it manages to fit many of the front panel facilities within its compass. The back panel has gold-plated fixed and variable analogue output sockets, optical and coaxial digital, and the 'compulink-1 syncro' connections for automatic system control (including synchronised recording) with similarly equipped JVC components.

The essential circuits are all fairly standard and there is no sign of any audiophile

tweaking, although intrinsically good quality parts are used. A Yamaha digital filter drives a pair of Burr Brown *PCM56P* 16-bit digital-to-analogue converters, followed by simple filtering and *JRC 5532* dual operational amplifiers. The remote volume control uses a motor driven potentiometer and can also be adjusted by the front panel knob. Extra circuit boards have been added to control the comprehensive display, and ribbon cables link it all together. The transport is a fairly simple plastic device with a worm drive laser mechanism. A (supplied) adaptor is needed to play 8cm CD singles.

LAB REPORT

The *Z555* has above average ability lab performance in most respects. It's particularly good in signal-to-noise ratio, ultrasonic spurious suppression and intermodulation distortion. The full level total harmonic distortion figures are fine but mediocre at -70dB. Channel separation falls as the frequency increases, but the stereo balance is generally good. Frequency response is accurate and de-emphasis worked well. Error correction is adequate, audible mechanical noise fairly low and the machine demonstrates very good resistance to shock and vibration. The -90dB sine wave shows some distortion, and low level linearity has a positive error below -70dB on both channels - about 4dB at -90dB and deteriorating thereafter.

SOUND QUALITY

In many ways this JVC typifies much of the product from mainstream Japanese companies. While the performance represents an improvement over that available from earlier models at this price, it has not succeeded in keeping up with the best of the rest. A year or so ago it would have offered competitive aural stimulation, but does not convince in the context of latest competition.

The bass is superficially able, but under detailed scrutiny fails to provide the necessary proficiency in all areas. The sound just doesn't come together quite right, as there is some loss of rhythmic timing, it's slightly boomy and is not fast or agile enough. Male

and female voices can come over as a bit 'breathy': the sound isn't prone to sibilance or aggressive tendencies, but harmonic structures aren't reconstructed with full richness. Put simply - it seems to lose a few. The treble is not detailed enough to convey the full information available from good recordings, and can be airless and a mite brittle, ultimately lacking in dynamics.

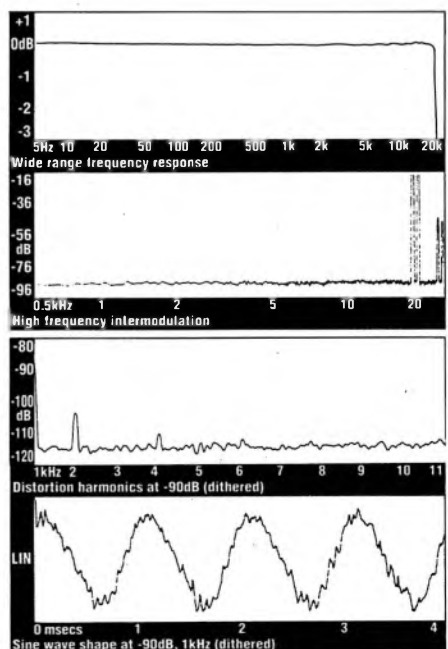
The acoustic is a little dry and the depth plane rather limited. A wide soundstage provides detail out to the edges of the system, but some muddle is created on complex material and focus is less than the best.

CONCLUSIONS

This JVC is well built and carries a host of facilities for a reasonable outlay. The display is different and interesting in its conception, although I'm not sure that all the advice given is necessary. Sound quality and lab performance are reasonable enough but a little more is expected at this price level.

TEST RESULTS

Test resolution (L/R av)		15.6 bits	
Output level, source impedance	2.07V, 0.3dB, 450ohms		
Effective dynamic range		101dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-89dB	-85dB	-88dB
	(0.0035%)	(0.0056%)	(0.004%)
Ref -70dB			-30dB
Stereo separation	106dB	92dB	74dB
Stereo balance L/R	0dB	0.0dB	0.64dB
Frequency response (20Hz to 20kHz)			±0.1dB
High frequency intermodulation			-97dB (0.0014%)
Electrical noise (CCIR ARM, 1kHz)			-103dB
Mechanical noise			low
Ultrasonic noise			-106dB
Error correction			1mm gap
Shock/vibration resistance			very good
De-emphasis			+0.2dB at 5kHz
Track finding speed (15, YEDS 2)			3.5 secs
White noise overload test			OK
Size (w x d x h)		47.5 x 30 x 11.5cms	
Typical price inc VAT			£350



KENWOOD DP-8010

KENWOOD TRIO UK LTD., 17 BRISTOL RD., THE METROPOLITAN CENTRE, GREENFORD, MIDDX UB6 8UP. TEL: (01) 575 6030.



This is the latest player from the Japanese Kenwood brand, formerly marketed in the UK under the Trio brand name. Since re-financing and re-organisation a couple of years ago, the company has created a product line up which combines good value for money with fine build quality.

This new £450 model is heavy in weight and strong on facilities. Finish and build quality is generous to say the least, with damped steel and alloy panels making up the case. The physical bulk of this player tells you that it's an upmarket model, and superficially it looks easily worth the money.

The fascia is visually divided into three sections. The drawer is sited alongside the on/off switch and digital output switching, near to 20 keys for instant track access, a variable output headphone socket, play/pause, track skip, index and search buttons. The centrally located display is crystal clear, indicating track, index, time (four modes) and including a 20-segment track calendar. An output level indicator has five steps and function reminders. Alongside the subsidiary controls, the play and programme mode keys are back-lit to denote operation. Output level can be adjusted by two buttons, the repeat functions include A-B repeat, alongside check, clear, space and edit for programming.

The large remote control keypad covers all the front panel facilities except on/off and digital output switching. The back panel carries both fixed and variable analogue outputs, together with both optical and coaxial digital outputs.

Primary vibration isolation is handled by the sprung feet, and the top panel is laminated. The transport is more elaborate than normal too, using a disc clamp that mechanically moves down onto the disc and a cast alloy chassis. A linear motor powers the subchassis-mounted laser drive. All control circuits are on one board. The audio board is mounted vertically at the side and screened from the rest of the player. This contains the Kenwood digital filter and two 18-bit Burr Brown digital-to-analogue converters, the latter contained, with decoupling and linearity trimming potentiometers, in its own tin

enclosure which provides even more screening.

The power supply isn't over large, but uses good quality Elna capacitors and discrete transistor regulators. Cerafine capacitors are found in the audio stage, a good quality operational amplifier is used, and the output is muted by relay. Even the display is screened from the rest of the enclosed parts, so there has clearly been plenty of sensible attention paid to design details.

LAB REPORT

The 0dB output level is exactly to the CD standard, and comes from a sensibly low output impedance. Both the high level total harmonic and intermodulation distortion figures are exceptionally low, although THD at -70dB is unremarkable. Channel separation is exceptionally good at all frequencies, stereo balance likewise. Both electrical and mechanical noise is low and ultrasonic spurs are well suppressed.

Resistance to shock and vibration is good, while the error correction circuits cleared a 1mm gap test before failing. The frequency response displays some treble rolloff, but the de-emphasis circuits are quite accurately aligned. Low level linearity is good, and the -90dB sine wave is reproduced accurately.

SOUND QUALITY

On simple material this player performs well, and the panel's comments were encouraging. But as soon as the going got tough, on high level and complex material, the comments were less complimentary. The 8010 tends to 'clog up' to some extent, losing detail in the process. The upper midrange starts to glare at times, so the ease of presentation is lost and the sound becomes a mite fatiguing. It didn't matter what type of material was presented. Be it voice, strings or brass, when the music got loud the machine showed its failings.

The treble is slightly hazy, with some added tizz, and appears a touch over-exposed and up front. Although its rhythmic structure is fine, the bass is a little heavy and wasn't fast enough or able to produce complex detail convincingly. In general, the 8010

sounds constrained, almost choked at times, and dynamics were compressed.

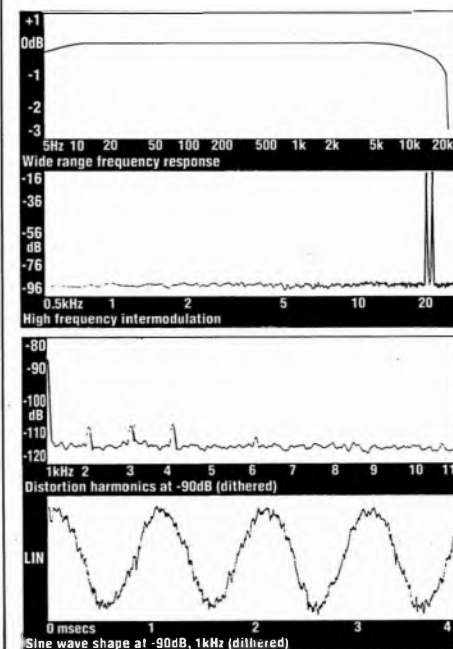
Focus is slightly muddled and the stage sounds generally shut in, with a distinct lack of depth, ambience, and transparency. The panel perhaps was a little over-critical, but the general character of the sound is well described. It's just more average than the outward appearance of the player might suggest.

CONCLUSIONS

There is plenty of attention to detail in this player, both inside and out. Ergonomics and build quality are most certainly up to standard, and the lab performance is good too. However, the results from the listening test are rather disappointing, as it only achieved a 'moderately good' rating for sound quality.

TEST RESULTS

Test resolution (L/R av)			15.8 bits
Output level, source impedance			2.0V, 0dB, 100ohms
Effective dynamic range			103dB
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-93dB	-93dB	-91dB
	(0.0022%)	(0.0022%)	(0.0028%)
Ref -70dB			-31dB
Stereo separation	118dB	117dB	110dB
Stereo balance L/R	0.05dB	0.06dB	0.01dB
Frequency response (20Hz to 20kHz)			-2.35dB
High frequency intermodulation			-100dB (0.0001%)
Electrical noise (CCIR ARM, 1kHz)			-105dB
Mechanical noise			low
Ultrasonic noise			-106dB
Error correction			1mm gap
Shock/vibration resistance			good
De-emphasis			-0.12dB at 5kHz
Track finding speed (15, YEDS 2)			3 secs
White noise overload test			OK
Size (w x d x h)			44 x 36.5 x 12.2cms
Typical price inc VAT			£450



MARANTZ CD583

MARANTZ AUDIO (UK) LTD., 15-16 SAXON WAY IND. EST., MOOR LANE, HARMONDSWORTH, MIDDX UB7 0LW. TEL: (01) 897 6633.

BEST BUY



This is Marantz's current basic player. It's born of the Philips breed and consequently began life in the Hasselt factory in Belgium. With a price tag of only £150 you probably wouldn't expect a lot in either performance or facilities, but budget models from that factory seem to defy logical assumption most of the time, so this review is no forgone conclusion (? - Ed).

The CD583 is a midi sized player, devoid of such features as a remote control, FTS, digital output, gold trims or gold plated phono sockets - at first sight it is as basic as its price would suggest. However, there is shuffle (random order) play (called TSP by Marantz), and AMS, which plays the first ten second of each track in turn. When you find a track you wish to hear, press AMS once again and the player reverts to normal play. There is also repeat and full program facilities for up to 20 tracks. All the 'standard' features are also all there - pause, play/replay, stop, track skip and audible search. All controls are accessed by small lozenge shaped buttons which are grouped around the display. A headphone socket is also provided, but of the fixed level variety so its use is strictly limited.

The display itself indicates track number and the elapsed playing time of the current track; if the disc is indexed, index numbers are shown. There are also flags for TSP, programme, error, AMS, play, pause, recall (which lights up when reviewing a programme) and repeat. On the back panel are the phono analogue output sockets, a multi connector for linking up to a Marantz midi system and the familiar 2-pin mains socket. Ergonomically the player is easy enough to use, with one or two minor complaints. The drawer action is rather slow - or am I just impatient? - and the requirement to press play before tracks can be skipped needs remembering.

In common with other players in the same series the 583 is a basic plastic box with a plastic front panel moulded to look like brushed alloy, and a wraparound steel top panel. Finish is adequate. The transport is the latest Philips CDM4 type which accepts both 12cm full sized CDs and 8cm CD singles. The printed circuit board is of the latest

series too, with very little off-the-board wiring. This latest board places the digital filter and DAC closer to the output operational amplifiers than on previous models, so shortening the signal path. One surprise with this player, especially considering its price, was the inclusion of both selected A DACs and B digital filters, which should ensure good low level linearity. Marantz assures me that all production will be similarly equipped.

LAB REPORT

I was hard put to find much fault with this unit. At this price the technical performance is exceptionally good. Stereo balance and separation may be bettered by some more expensive models, but these figures are pretty impressive nonetheless. The error correction capability is the best I have ever encountered, passing all the most difficult faults my test disc simulates, including a 4mm gap.

The linearity of this particular 583 is amongst the best I have measured from a machine based on the Philips DAC digital filter combination - one channel is virtually perfect down to -100dB and the other shows a maximum error of 2dB at -90dB before improving again at the -100dB level. The frequency response is flat from 20Hz up to 20kHz, with the usual ever-so-slight high frequency ripple.

SOUND QUALITY

Not only does this player measure well, its sound quality is in the top class as well. The bass is firm, extended and dynamic, the mid-range sweet and clear. Although the treble is slightly brash and grainy, it's also fairly detailed and communicative. The panel found it particularly natural on both male and female voice, commenting on a clear, detailed midrange with only mild complaint of some loss of ambience. The bass could sound just a little wooden, and is not quite up with the best on articulation, but is firm and good nonetheless.

Width and depth are both very good, and while some detail is lost when compared with the best players around it's not weak in this region either. Personally I found that the 583

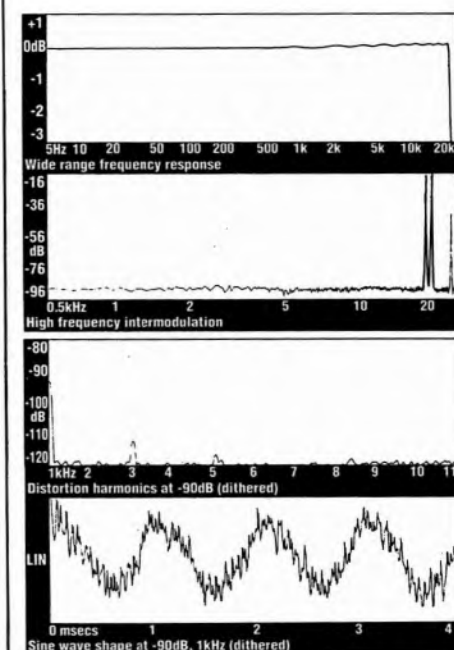
didn't pull detail from the soundstage and separate strands of information quite as well as I would have liked, but stereo separation is very good and the machine shows considerable transparency given the right material.

CONCLUSIONS

This must be one of the bargains of the year. Its technical performance is exceptionally good, and is also matched by the sound quality. When the price of £150 is taken into account an unreserved Best Buy can be the only conclusion.

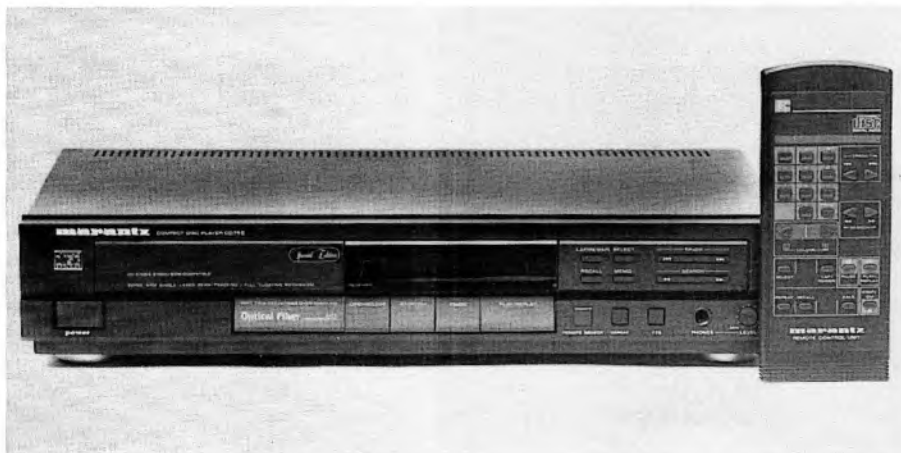
TEST RESULTS

Test resolution (L/R av)		15.8 bits	
Output level, source impedance	1.95V, -0.27dB	200ohms	
Effective dynamic range		107dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-92dB	-87dB	-87dB
	(0.0025%)	(0.0045%)	(0.0045%)
Ref -70dB		-36dB	
Stereo separation	125dB	125dB	100dB
Stereo balance L/R	0.11dB	0.11dB	0.09dB
Frequency response (20Hz to 20kHz)			±0.04dB
High frequency intermodulation		-101dB	(0.00089%)
Electrical noise (CCIR ARM, 1kHz)			-102dB
Mechanical noise			average+
Ultrasonic noise			-104dB
Error correction			4.0mm gap
Shock/vibration resistance			good
De-emphasis			-0.1dB at 5kHz
Track finding speed (15, YEDS 2)			3.5 secs
White noise overload test			OK
Size (w x d x h)			36 x 30.5 x 8.3cms
Typical price inc VAT			£150



MARANTZ CD75 MkII SPECIAL EDITION

MARANTZ AUDIO (UK) LTD., 15-16 SAXON WAY IND. EST., MOOR LANE, HARMONDSWORTH, MIDDX UB7 0LW. TEL: (01) 897 6633.



In last November's *Choice* the *CD65/IISE* stole the show by attaining a very high rating in the listening tests, eclipsing the 'ordinary' (already good) *CD65/III* for only £50 more. And in my opinion the 'ordinary' *CD75* has never quite matched the performance of the *CD65* - for which the blame must be placed on its permanently in-circuit volume control. This *SE* variant has both options, allowing either fixed or variable output, and with the increasing availability of outboard digital processors Marantz has seen fit to provide an optical as well as a coaxial digital output.

The player derives from Philips' basic plastic production. However, on this version the front panel is a solid alloy extrusion and the major controls have improved feel and finish, though the player is still stuck with the standard display. FTS (favourite track selection) is included, along with a volume controlled headphone socket.

The programming feature provides an ordered selection (20 tracks or the equivalent) which can consist of track numbers, index numbers or start and stop times. Once programmed into the short term memory this can also be transferred into the FTS.

The comprehensive remote control handset actually provides some extra facilities which have been left off the front panel including a track select or keypad, remote volume control and an AMS button. The latter instigates the playing of the first ten seconds of each track until the routine is interrupted.

The basically ordinary box has some extra adornments such as gold feet and extra damping applied to the top cover. The latest transport type uses a cast alloy sub-chassis/laser swing arm mount, though the tray is still plastic. The printed circuit board is not the one used in the *583* but one which is I believe of slightly earlier origin, with the DAC and digital filter quite a distance from the audio outputs (although this may have something to do with the inclusion of FTS).

The 'turbocharging' that makes this a *SE* model includes the substitution of Elna Cerafine selected capacitors in the power supply, local decoupling and audio coupling. The standard *LM883* operational amplifiers for the

current to voltage converter and active output filtering have been replaced by *JRC5532s*. The volume control has been moved onto a separate board which is attached upside down above the audio section. The optical output is also an add on, with its own subsidiary circuit board screwed at the top the back panel. The headphone drive has its own buffer operational amplifier too, sited on a separate board.

LAB REPORT

The lab tests show that this is another very able player. The figures produced are in keeping with a top class machine in virtually every respect. There may be one or two slight anomalies such as the stereo separation reducing at low frequencies, but the magnitude of these is very small. On the error correction test it fared less well than the cheaper *583*, managing only 3mm where the other managed 4mm; 3mm is still first class but I wonder why the difference.

The selected DAC/digital filter combinations used here seems to have got rid of the poor low level linearity suffered by all earlier Philips-based machines once and for all. These are not quite perfect, as there appears to be a slight kink in the linearity curve around -80dB to -100dB, but they are now comparable to almost every other affordable CD player, with maximum errors of around -3dB at the -90dB level.

SOUND QUALITY

Played through the variable sockets the unit sounds much like the standard *75*, with a hint of hardness in the midrange and a loss of some of the dynamic quality and staging ability of *CD65*.

However, on the direct output the player really comes into its own. It's not as precise as some, but what is lacking in that department is made up for elsewhere. Consequently, it impresses some listeners more than others. The bass is fast and rhythmic, with plenty of control and good slam. Some rock tracks explode from this player in a truly lifelike manner, while lesser machines merely go through the motions.

The midrange is clear and detailed with

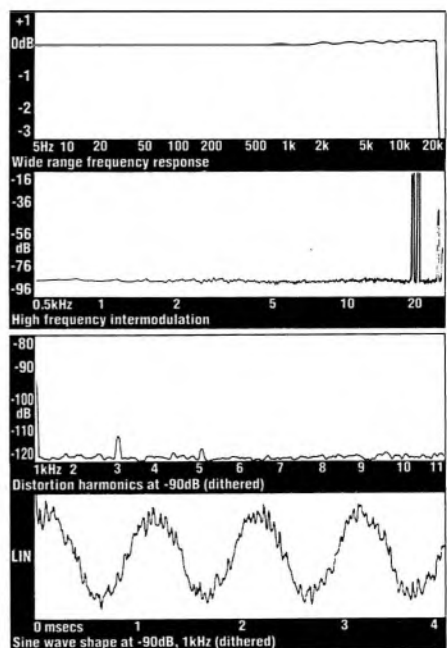
plenty of ambience, equally at home with either gently bowed strings or hyped up rock. The treble is accused of being a mite untidy and possessing a little extra gloss by some, but the value judgement here rests on the words little and mite, for it's better than the majority of players in this department too. It does have some grain, but only to a minor extent which is easily forgiven for the sake of the detailed and lively air.

CONCLUSIONS

Whether its sonic qualities take it above the *65/IISE* may ultimately depend on the actual samples under review, as the two rank very closely. Whether it's worth an extra £50 for the optical digital output and the convenience of a remote volume facility which undoubtedly degrades the quality will depend on the application to which it is put. But both technically and sonically it is one of the better players around at *any* price, so it certainly deserves to find buyers.

TEST RESULTS

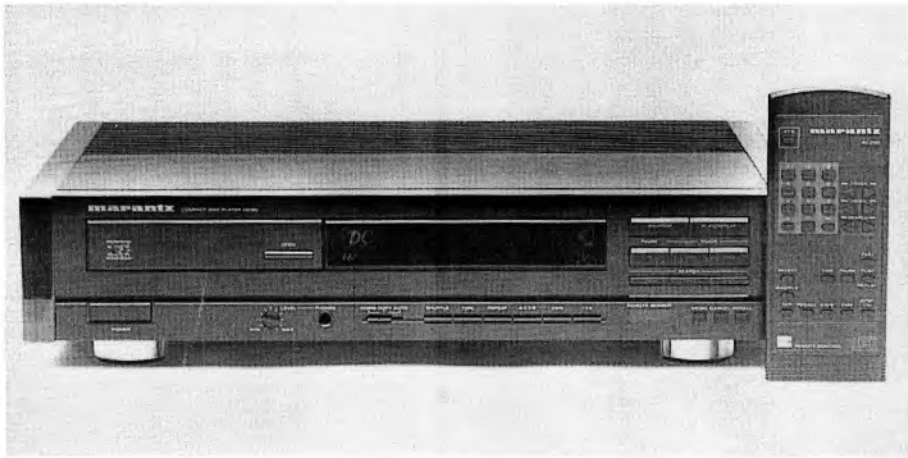
Test resolution (L/R av)	15.8 bits	
Output level, source impedance	2.0V, 0dB, 200ohms	
Effective dynamic range	104dB	
Harmonic distortion	20Hz	1kHz
Ref 0dB	-92dB	-90dB
	(0.0025%)	(0.0032%)
		(0.0045%)
Ref -70dB		-33dB
Stereo separation	109dB	118dB
Stereo balance L/R	0.11dB	0.10dB
Frequency response (20Hz to 20kHz)	±0.05dB	
High frequency intermodulation	-102dB (0.0008%)	
Electrical noise (CCIR ARM, 1kHz)	-103dB	
Mechanical noise	average	
Ultrasonic noise	-107dB	
Error correction	3mm gap	
Shock/vibration resistance	very good	
De-emphasis	-0.08dB at 5kHz	
Track finding speed (15, YEDS 2)	3.5 secs	
White noise overload test	OK	
Size (w x d x h)	42 x 28.5 x 8.3cms	
Typical price inc VAT	£350	



MARANTZ CD85

MARANTZ AUDIO (UK) LTD., 15-16 SAXON WAY IND. EST., MOOR LANE, HARMONDSWORTH, MIDDX UB7 0LW. TEL: (01) 897 6633.

RECOMMENDED



With the *CD94* starting to get a bit long in the tooth and with an unfilled market slot in the \$500 price region, other manufacturers were in a position to take advantage, so Marantz has now launched the *CD85* which competes head on with some highly regarded established players in this price group.

In complete contrast to the light plastic boxed siblings that Marantz is so good at – and in true Japanese fashion, for an upmarket player needs to be weighty – the company has invested in some heavy engineering here. The heavy diecast zinc alloy chassis forms the very rigid structure upon which the player is founded. The top panel is another two-piece alloy extrusion, and some of the steel panels are copper plated, along with the screws that hold it all together. The front panel is yet another high quality alloy extrusion, but the buttons and end caps are plastic. To complete the effect, the side panels are solid wood with a high gloss finish, and the whole thing sits on four large round metal-finished feet.

There are all the facilities you would expect from a machine of this type – apart that is from a variable line output. FTS (favourite track selection) is available for a total of around 150 discs, plus all the normal track, index and search facilities (two speeds), full programming for up to 24 tracks or extracts, full edit facilities, AMS (which plays the first 10 seconds of each track) and full repeat facilities. Everything is duplicated on the remote handset, which also has a track select keypad.

Internally the player is very interesting. It has an entirely different board layout from Marantz's cheaper offerings, and represents a completely new computer optimised design, using multi-board construction techniques with ribbon cable linkages. The power supply uses a large transformer, ample audio quality supply capacitors and multiple chip regulators attached to a proper heatsink. The main board is covered with audiophile Cerafine electrolytics for decoupling and a variety of film caps elsewhere, including copper foil polystyrene types.

The wiring around the transport control section looks a little messy, but apart from

that the design is well sorted. A selected 'B' grade digital filter drives the similarly selected *TD1541A/S1* digital-to-analogue converter, with good quality film decoupling.

The audio section is arranged in a straight line down one side of the board, with all components mirrored positionally for left and right channels. Single op-amps are used in place of the normal dual types for the audio current to voltage conversion, filtering and the final stage, which is direct coupled to the output. Output muting is by relay but de-emphasis is FET-switched.

The transport is one of Philips' better types, with an alloy laser deck mounted on a foam-damped spring suspension. Even the loading draw is metal rather than plastic and is smoother in operation, but the disc clamp looks standard and it's no quicker than normal.

LAB REPORT

It's difficult to find fault with this player as there seems to be no performance area where it falls down. The intermodulation distortion results are excellent, ultrasonic noise is well suppressed and the signal-to-noise ratio is better than most. Low level linearity is not perfect, but is good nonetheless. The –90dB sinewave shows a little triangulation and some harmonic distortion artefacts may be seen on the spectrogram. Both left and right channels have a slight negative linearity error starting at –70dB, reaching about 3dB at –90dB before correcting itself lower down – there was hardly any error at –110dB. On this evidence *S1* DACs appear little better than standard *A* selections in this respect. Error correction didn't quite match its cheaper stablemates, but is good enough nonetheless.

SOUND QUALITY

The *85* sounds basically like a *CD75SE*, with a few small if important differences. The background doesn't sound quite as clean: it is somehow more amorphous. Whereas on the *75SE* instruments and singers alike can be clearly and precisely located in space, the *85* smears them slightly, thickening and removing some of the dynamic edges of tran-

sients and sounding to some extent more rounded. The stage isn't as finely etched as it could be, but depth and width, in the normal sense, are very good.

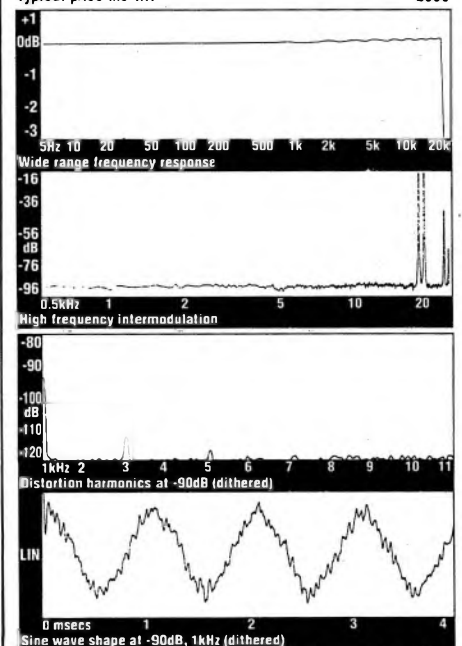
Whereas the *85* seems to sacrifice some fine detail, on the plus side it offers a convincing sensation of authority and creates a big sound with plenty of slam and weight. Separation of images in all planes just isn't as clearly defined; harmonic textures are also glossed over to a small degree, and some emotion is lost from voice. Very nice – yes, it's just not as interesting or involving; is dynamically dulled and doesn't hold my attention to the same degree as the *75/IISE*.

CONCLUSIONS

Marketing strategies are sometimes perverse, since this fairly expensive player is beaten for sound quality in some ways by two of its cheaper stablemates. There is no doubt concerning the high quality construction and fine lab performance, and as it stands it deserves Recommendation, but listen first as the presentation is slightly different.

TEST RESULTS

Test resolution (L/R av)		15.9 bits	
Output level, source impedance	1.93V, –0.30dB, 200ohms		
Effective dynamic range		108dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	–95dB	–93dB	–88dB
	(0.0018%)	(0.0022%)	(0.004%)
Ref –70dB		–34dB	
Stereo separation	122dB	120dB	100dB
Stereo balance L/R	0.08dB	0.08dB	0.07dB
Frequency response (20Hz to 20kHz)			±0.07dB
High frequency intermodulation		–104dB	(0.00063%)
Electrical noise (CCIR ARM, 1kHz)			–105dB
Mechanical noise			low
Ultrasonic noise			–112dB
Error correction			2.5mm gap
Shock/vibration resistance			very good
De-emphasis			–0.08dB at 5kHz
Track finding speed (15, YEDS 2)			3 secs
White noise overload test			OK
Size (w x d x h)			46 x 35.0 x 10.6cms
Typical price inc VAT			£550



AKG

ACOUSTICS

Mission

Phase 1

Design headphones that set a new standard by taking a new approach inspired by satellite technology to open up new dimensions of sound and spaciousness.

Phase 2

Said headphones shall provide optimized transient response on the basis of an accepted mathematical model.

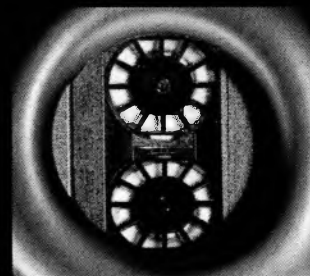
Phase 3

Said headphones shall be very comfortable, light, and cost efficient.

...Completed K 280 PARABOLIC

Phase 1

An "acoustic lens" using two dynamic transducers per channel focuses the sound waves into the ear canal. The result is a new dimension of fullness and spaciousness of sound.

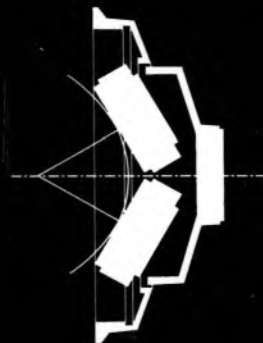


Phase 2

Utilizing the "Wigner distribution", a mathematical model for describing sound events, we made sure the K 280 Parabolic will handle the most demanding of transients without introducing colouration.

Phase 3

Optimum comfort is ensured by a spring steel wire headband with an inner headband that automatically adjusts to any head shape, and special soft ear cushions. Weighs a mere 250 grams. Single cable. Available now at your dealer.



Sectional view
of "acoustic lens"



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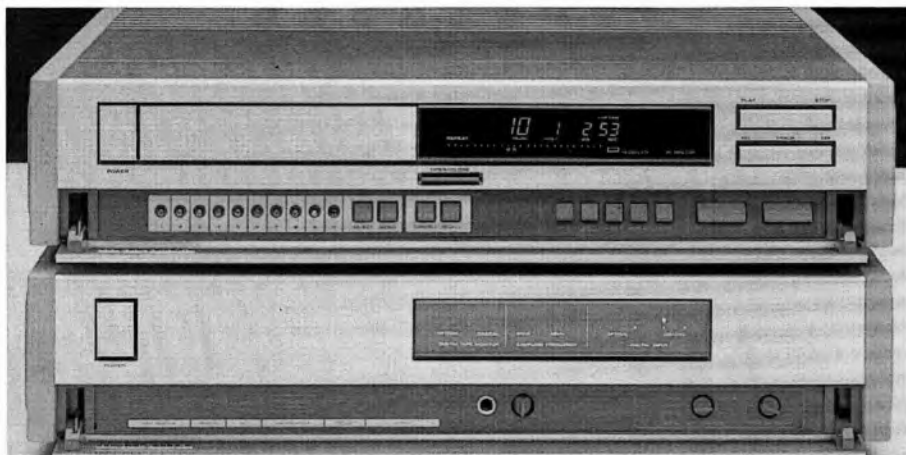
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MARANTZ CD12LE

MARANTZ AUDIO (UK) LTD., 15-16 SAXON WAY IND. EST., MOOR LANE, HARMONDSWORTH, MIDDX UB7 0LW. TEL: (01) 897 6633.

RECOMMENDED



The Marantz *CD12* is a two-box player; one unit contains the CD player transport and associated disc operating circuitry and controls, the other houses the digital processor. The styling is rather reminiscent of the *CD94/CDA94* units, but the *CD12* is finished in a fine champagne gold with a pink tinge.

Both chassis use thick copper-plated die-castings. Alloy extrusions make up the exterior and both units share the same dimensions and styling. Visible on the front panel of the player section are play/stop, track skip, open/close and power on/off buttons. The Perspex display window is the same size on both – on the converter it shows what input is in use and at what sampling frequency it's operating. A flip down cover runs along the length of the machine and may expose the variable headphone socket and output selector rotary controls, covering the digital tape monitoring facilities. The back panel has balanced 600ohm Canon and standard phono socket analogue outputs. For digital there are two coaxial inputs, two optical inputs, and digital tape monitoring connections – coaxial in/out and optical in/out.

Flipping down the matching front hinged panel on the other unit reveals a row of ten small round gold-plated track selector buttons, the standard track and index search, FTS, time display button, A-B repeat and pause. The standard Marantz programming facilities are also available. The display is the same as on the *CD85*, with a small 24-track calendar display, track and index numbers, several time modes, plus the normal flags confirming various operational states.

The processor has no fewer than three separate power transformers feeding the various analogue, digital and display sections. Each area is divided off from the others by copper-plated metal boxed sections. Even the outputs at the back have a copper plated cover. Digital acquisition and lock is improved by the addition of an extra phase lock loop (now two) to keep down the jitter rate. The audio power supply uses selected Elna supply caps of 6800µF capacity and Cerafine audiophile electrolytics are found all over the board in coupling and decoupling applications.

The digital-to-analogue conversion path is a *TDA7220P/B* digital filter followed by an *SI* selected *TDA1541A* DAC. High grade film caps are used for current decoupling and the filter circuits use copper foil polystyrene types. Balanced 600ohm output is provided by transformer coupling.

The player section has virtually the same construction and uses a predominantly alloy transport mechanism which is smooth in operation. The interior has the various sections screened from each other by copper plated metal. There is only one transformer, but extra care has been taken over the power supplies. Two coaxial digital outputs are provided along with one standard optical connection. Everything is held together by the familiar copper-plated screws.

Finally, the *CD12* comes with a bulky 'intelligent' remote control handset which can be programmed to control a whole entertainment system, not just the CD player.

LAB REPORT

Almost every test was passed without trouble and the *12LE* produced a generally excellent set of results. Points of note include the exceedingly good intermodulation distortion results, signal-to-noise ratio and ultrasonic spurious suppression. Error correction could have been better, but the 1mm capability shouldn't produce any problems. Stereo separation was exceptional at high frequencies but less good (though perfectly acceptable) at lower frequencies, which is the converse of most players. Low level linearity was very good right down to the noise floor below –110dB.

SOUND QUALITY

This is the best Marantz I have yet heard, which must place it well up in the top 10 of currently available players. The familiar high class Marantz sound found in the best of cheaper units is refined in every area, delivering more of everything wanted. Considering the price differentials involved, this refinement hasn't produced as large a change as might have been expected, and the law of diminishing returns is obviously at work. Compared to a *CD75/IISE*, the bass is

just a little more tactile and agile, the mid develops detail and etches out the soundstage more cleanly with more precise edges and more authority. The treble is cleaner, more delicate, less grainy and just slightly more detailed.

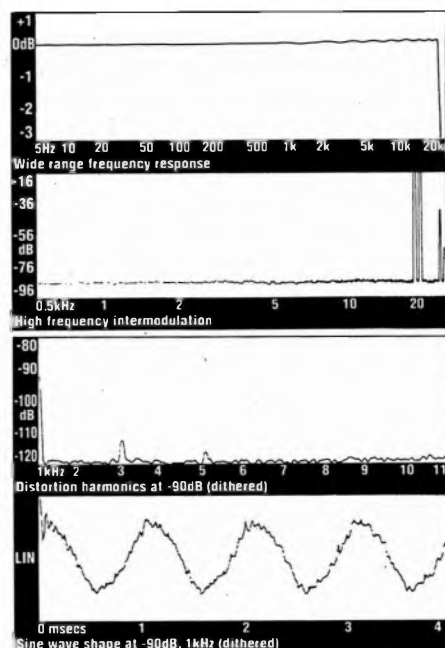
The sound is more solid, losing some of the characteristic brashness of the cheaper models and underpinning every performance with authority, controlled articulation and weight. The total balance is excellent, not highlighting nor tempering any particular aspect of the fundamental neutrality.

CONCLUSIONS

Technical and sonic performance place the *CD12LE* indisputably at the top of the exceptional Marantz range, so it can be Recommended despite its high price. However, whether it's worth so much more than some of its cheaper family members will require some contemplation on the part of the prospective purchaser.

TEST RESULTS

Test resolution (L/R av)		15.9 bits	
Output level, source impedance		2.07V, 0.30dB, 58ohms	
Effective dynamic range		105dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	–94dB	–88dB	–93dB
	(0.002%)	(0.004%)	(0.0022%)
Ref –70dB		–34.5dB	
Stereo separation	102dB	110dB	122dB
Stereo balance L/R	0.01dB	0.02dB	0.03dB
Frequency response (20Hz to 20kHz)			±0.03dB
High frequency intermodulation		–106dB	(0.0005%)
Electrical noise (CCIR ARM, 1kHz)			–112dB
Mechanical noise			very low
Ultrasonic noise			–109dB
Error correction			1mm gap
Shock/vibration resistance			excellent
De-emphasis		+0.04dB	at 5kHz
Track finding speed (15, YEDS 2)			3 secs
White noise overload test			OK
Size (w x d x h)		45.5 x 35.0 x 10.1cms	
Typical price inc VAT			£2500



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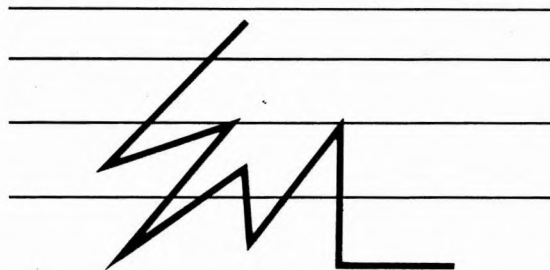
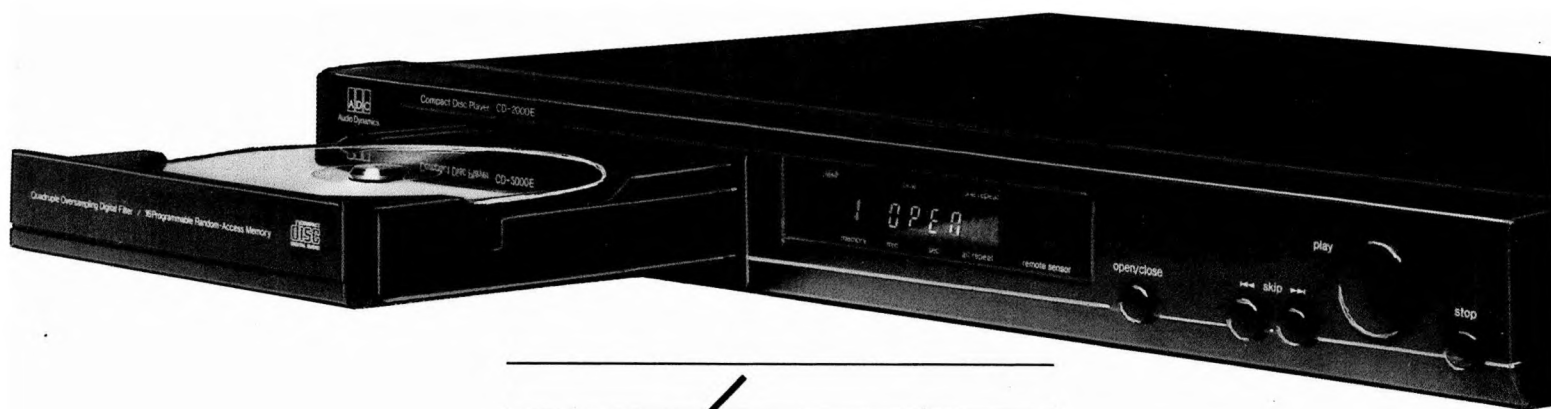
After all, with triple-beam laser pick-up, 16-bit, 4 times oversampling and 3rd order active filtering and, as standard, a 12-function remote control, featuring repeat, cue, time remaining, memory, track skip, open/close, pause, stop and play – it is hardly low key in the hi-tech department.

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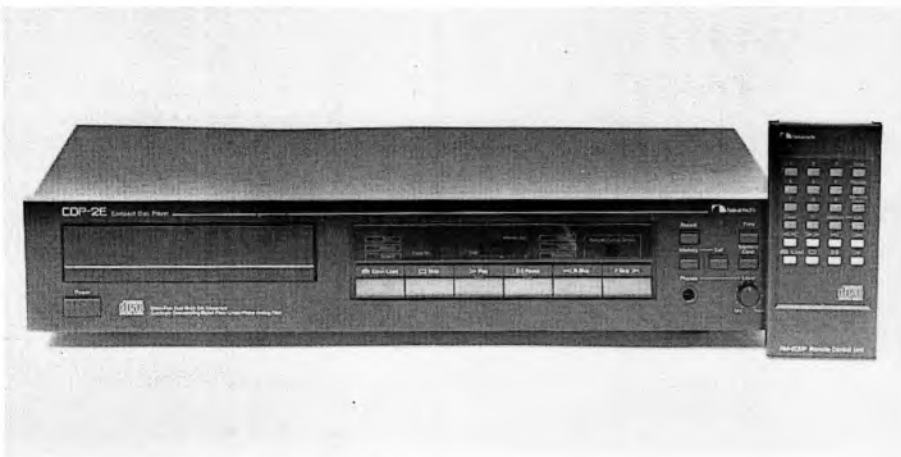


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Nakamichi made its name with top quality cassette decks, and subsequently established itself at the top end of the hi-fi separates market, emphasising build and performance quality. The products have always been able to carry a premium for their high perceived value. The company entered the CD stakes fairly early, and while it has not produced any players of earth shattering sonic excellence to rank above the mainstream manufacturers, the products have been pretty well received nonetheless. Their production life tends to be longer than that of most Japanese brands, so customers can rest assured that their purchases won't be replaced in the normal short timescale others seem to find necessary.

The *CDP2* is the very latest in the line up, arriving on our shores with a price tag of £495 and available in the shops when this magazine comes off the presses. The slim unit itself has a minimum of controls, and consequent stylish simplicity; although scant, there are enough buttons for efficient operation. Logically enough, Nakamichi's engineers have transferred many controls, such as the keypad track select and cueing to the remote handset. The uncluttered front panel makes something of a contrast with some of the company's cassette decks, and even the remote isn't overburdened with gadgets, relying on those required only for effective operation.

There are of course memory (24 tracks) and repeat facilities, plus all the essentials. And the front panel does have a variable headphone socket, and a comprehensive display which lights up a vivid shade of green. Although this lacks an index facility, track number and playing time, track time, elapsed time etc are displayed as selected, along with information in programme mode and telltale flags for major functions.

Finish is to a very high standard, with gold lettering on the obligatory black background. The box is built from steel panels, sitting on reasonably small and tapered feet that make no concession to the current fad.

Inside, all the major functions are handled by a single printed circuit board. From the top it appears that most of the chips come

from NEC, save for the selected *TDA1541A* DAC from Philips. Peering underneath the board reveals several surface mounted chips brought in from Sony, including the 4x oversampling digital filter. The audio circuits look fairly standard but at least the capacitors are of above regular quality.

LAB REPORT

The output is 0.5volts up on the normal CD standard, so it is important to adjust the volume control if making A-B comparisons, since it's all too easy to be fooled by a 'louder' player. All the measured distortions are low at all levels. Stereo separation drops a bit at high frequencies, but 80dB at 20kHz is still good. Both electrical and mechanical unwanted noise is commendably low, and resistance to shock and vibration is above the norm. The error correction might have been more accomplished – the 1mm gap attained is now pretty ordinary.

The frequency response is ruler flat to almost 20kHz, neither channel deviating from the line. However, the de-emphasis network produced a surprising error of 0.25dB at 5kHz. Low level linearity is exceptional, showing very little error right down to -110dB.

SOUND QUALITY

While putting on a decent showing the *CDP2E* didn't achieve the performance attained by the best machines in the test group. Some hardness creeps in on loud passages and there's a loss of detail and ambience. The treble is a mite accentuated – detailed yes, but regarded by some as over the top. This is not in an aggressive sort of way, but the treble register did tend to draw more attention to itself than the other bands. There's also a hint of grain, which is all the more obvious due to the overexposure. The midband is undoubtedly sweeter than average and never clogs or becomes nasty, but the slight hardness made the brass section of an orchestra sound a little too severe.

At first the bass appears impressive with reasonable weight, but further listening reveals that difficult bass lines are not with absolute authoritative resolution. At the end

of the session, listeners felt that there was some inadequacy in the slam and drama department.

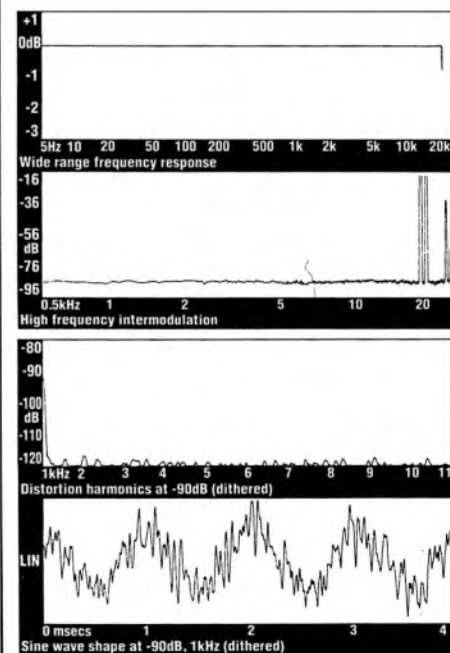
Stereo width and depth are above average, but for the price I would like to have been a little more convinced. The high frequency exaggeration makes the soundstage too 'up front' where spaciousness would be the preferred prescription.

CONCLUSIONS

The *CDP2E* generally performed well in the lab, the controls and build quality have a nice feel, making the player a pleasure to use. Sound quality is above the group average, but then so is the price, which consequently places it in the worth considering category.

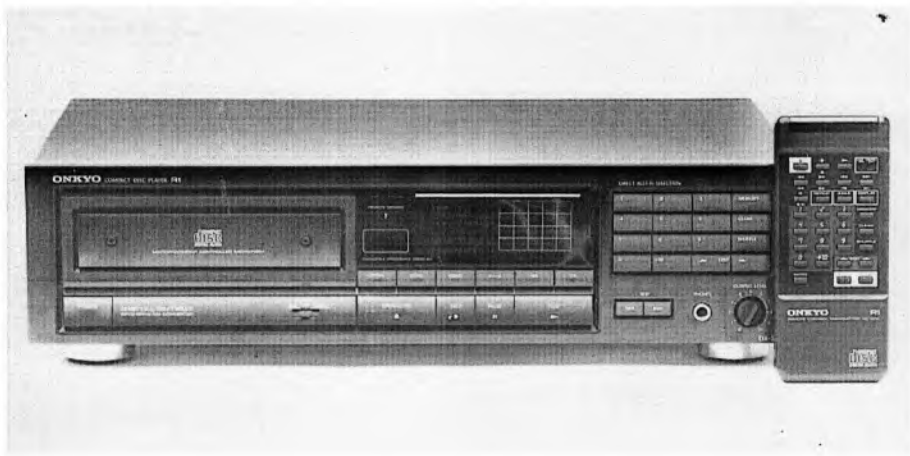
TEST RESULTS

Test resolution (L/R av)	15.7 bits		
Output level, source impedance	2.5V, 1.94dB, 150ohms		
Effective dynamic range	106dB		
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-93dB	-92dB	-90dB
	(0.0022%)	(0.0025%)	(0.0032%)
Ref -70dB	-40dB		
Stereo separation	128dB	106dB	80dB
Stereo balance L/R	0.04dB	0.03dB	0.02dB
Frequency response (20Hz to 20kHz)	-0.25dB		
High frequency intermodulation	-96dB (0.0016%)		
Electrical noise (CCIR ARM, 1kHz)	-105dB		
Mechanical noise	low		
Ultrasonic noise	-106dB		
Error correction	1mm gap		
Shock/vibration resistance	very good		
De-emphasis	+0.25dB at 5kHz		
Track finding speed (15, YEOS 2)	3.5 secs		
White noise overload test	OK		
Size (w x d x h)	43 x 33 x 8.6cms		
Typical price inc VAT	£495		



ONKYO DX-3500

NATURAL SOUND SYSTEMS, AXIS 4, RHODES WAY, WATFORD, HERTS WD2 4YW. TEL: (0923) 226499.



For many years unrepresented over here, Onkyo naturally doesn't have much of a UK track record, though the company has strong distribution in other countries. As an important specialist Japanese hi-fi company with a strong presence in its own domestic market, and with Natural Sound Systems taking on the UK marketing, availability is likely to become increasingly widespread.

The DX3500 is an impressive looking player with an interesting front panel design, with sculptured areas set into a plain flat metal panel. It has more curves than most, notably to the main bank of control buttons and loading drawer, and this sets it refreshingly apart from the average industrial designer's concept of what a CD player should look like. That apart it is finished in the ubiquitous satin black with silver grey lettering.

The box is made from well finished panels resting on four round plastic feet with silver finish and cork inserts, but the top cover is a bit rattly. There's good attention to detail, for example where a screw protrudes through the base from inside, a plastic covering washer has been placed to stop it scratching the surface on which it is mounted. Unfortunately this washer isn't quite thick enough and the point still protrudes a little; however, the feet maintain good clearance.

This Onkyo is endowed with plenty of features. The large curved buttons operate open/close, stop, pause and play; smaller ones skip tracks. Larger than average size keys provide direct track access, shuffle play, memory, clear and edit. Up to 20 tracks can be programmed, while clear eliminates wrongly programmed tracks with the aid of the edit facility. Intro (7 seconds only for each track), repeat, A-B repeat, fast search and the time display option keys are located immediately under the display.

All of these are also available on the infra red remote control, alongside a remote volume control. The remote control will also operate certain Onkyo cassette decks via a cable link when the remote is switched to tape. An external timer may be used too, and a further switch on the front panel selects between random and ordinary play modes.

The display has a 20-track calendar which helps when programming and editing besides showing the current selection playing and the number of tracks on a disc. A standard track number display and multiple time modes are included, along with the normal indicators to confirm various operations.

The player is technically interesting too. It uses an 8x oversampling digital filter to drive a pair of Burr Brown PCM56P 16-bit digital-to-analogue converters. Since aliasing products are kept well out of band, the analogue output filtering can be kept very simple (with better phase characteristics). Optical coupling is used between the digital filter and the DACs, providing excellent electrical isolation here.

The power supply size and complexity is limited by the price, but some Nichicon electrolytics are found in important decoupling/coupling applications, and copper foil polystyrene capacitors in the output filter. The remote volume control uses a motorised Alps potentiometer which is also adjustable from the knob on the front panel, to control the headphones and one set of phono sockets. The transport is 'CD single' compatible and has a fairly compliant suspension system. Both coaxial and optical digital outputs are included.

LAB REPORT

It's hard to find much fault with a lab performance as good as this. The error correction capability might have been better, as 0.8mm is at the lower end of the attainment range of modern players. High frequency stereo separation is also worse than average, but this is one of the CD format's strong points: 66dB is fine compared to other types of equipment. The -90dB sinewave is well formed and the low linearity was almost perfect down to -110dB.

SOUND QUALITY

This player suffers from softened dynamics, a loss of attack, and the bass hasn't enough drive, weight or extension. Although the overall balance was good, the mid loses out on detail and has a slightly 'pinched' quality in the upper midrange, noticed on female

voice in particular. The same problem was probably the cause of a mild metallic tinge to violin. The treble is reasonable - probably the player's best area in fact - but even here there is some grain. On loud passages the sound becomes harder and even less interesting.

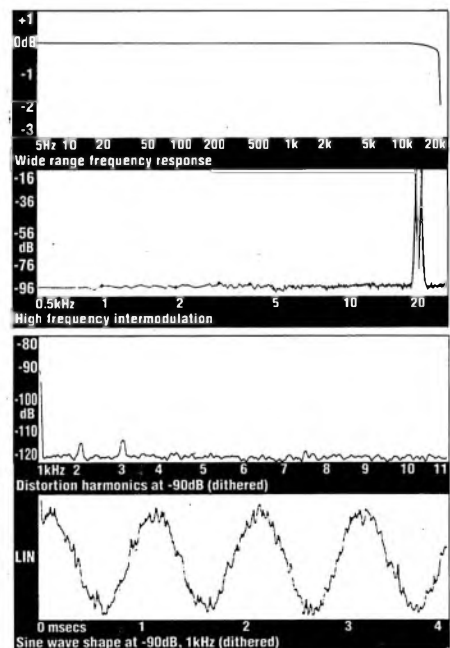
Width and depth are only average and the way images are formed isn't anything special. On musical crescendos the soundstage closes in further, while the lack of speed results in a rather bland, small sound.

CONCLUSIONS

Onkyo provides an awful lot of player for the money asked. The facilities wouldn't be out of place on a unit at twice the price, and the lab performance is very good too. The trouble is that it failed to excite the listening panel, actually scoring a below average mark overall. So despite many attributes, it lacks one very important ingredient.

TEST RESULTS

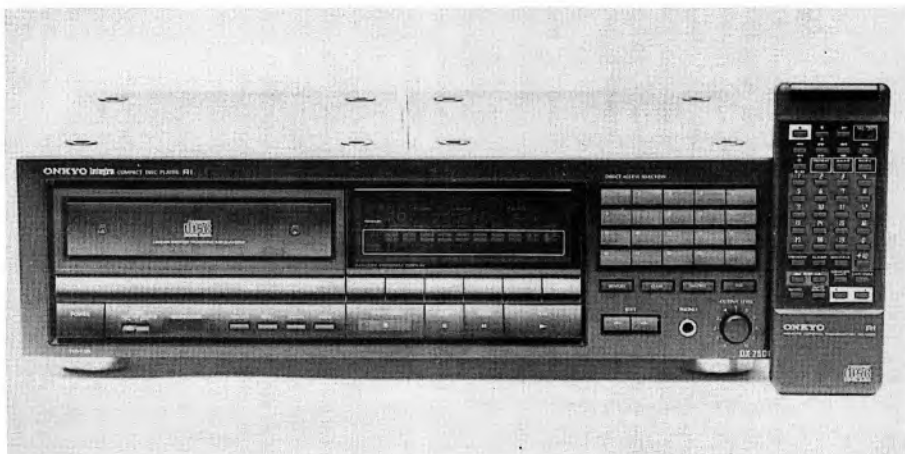
Test resolution (L/R av)			16 bits
Output level, source impedance	2.08V, -0.34dB		370ohms
Effective dynamic range			106dB
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-93dB	-91dB	-91dB
	(0.0022%)	(0.0028%)	(0.0028%)
Ref -70dB			-37dB
Stereo separation	118dB	95dB	66dB
Stereo balance L/R	0.01dB	0.04dB	0.08dB
Frequency response (20Hz to 20kHz)			±0.16dB
High frequency intermodulation			-97dB (0.0014%)
Electrical noise (CCIR ARM, 1kHz)			-101dB
Mechanical noise			low
Ultrasonic noise			-106dB
Error correction			0.8mm gap
Shock/vibration resistance			very good
De-emphasis			-0.22dB at 5kHz
Track finding speed (15, YEDS 2)			3.5 secs
White noise overload test			OK
Size (w x d x h)		43.6 x 30.5 x 11.9cms	
Typical price inc VAT			£250



ONKYO DX 7500

NATURAL SOUND SYSTEMS, AXIS 4, RHODES WAY, WATFORD, HERTS WD2 4YW. TEL: (0923) 226499.

RECOMMENDED



This impressive player is obviously related to the cheaper *DX-3500*. It costs an extra £200 but is bigger, heavier, has even more buttons, a larger display and more advanced technical features.

Styling is the same as the *DX-3500*, but some of the controls have been moved around and the result looks altogether more imposing. Finish and build quality are up to the standard expected at this price level, with metal panels all round, plus those same plastic feet with cork inserts. The bottom of the player has a double skin and the top cover is split into two halves. Although the panels aren't damped, this construction method makes them less prone to vibration.

A 20-button keypad track selector makes programming the 20-track memory easy, and there is also full programme edit facilities. Play modes include shuffle, repeat, A-B repeat and intro. Index search is available alongside the normal track skip and music search. Time edit may be useful for both editing and recording – as the cassette length is entered the display indicates the number of tracks on sides A and B.

Technically this player is very interesting. It uses a Sony digital filter to drive two 18-bit DACs housed in plastic modules at an 8x oversampled rate. These are linked through opto-couplers to ensure good electronic segregation. Although basically of single board construction, the digital section is screened from the analogue circuits by a steel plate riveted to the board. Each DAC has four associated adjustment potentiometers for adjusting low level linearity. Two separate power supplies are used, one for the analogue and one for the digital section. Ordinary chip regulators are used but the decoupling capacitors are selected Nichicons. A low pass output filter with a slow roll-off is included, but a direct, unfiltered output is also available. The variable output uses a remotely controlled motorised Alps potentiometer. Muting and de-emphasis switching is performed by relay and everything looks well designed.

A central bracing panel divides the transport and twin transformers from the electronics, adding greater rigidity as well as electrical screening. The vibration-decoupled

transport uses a linear motor to drive the laser across the disc and the 8cm 'CD single' compatible drawer slides in and out reasonably smoothly. Besides the analogue phono, optical and coaxial digital outputs are included, next to a system remote link.

LAB REPORT

Track access time is very quick, the error correction capacity is close to average and resistance to shock and vibration is good. Stereo separation is fine, if reducing a little at high frequencies, and channel balance is always closely matched. Total harmonic distortion is excellent at high levels but is less good at -70dB. Intermodulation and noise performance are admirable.

The frequency response is a little rolled off in the treble but the de-emphasis circuits work correctly. Low level linearity is slightly awry on both channels, with up to -10dB error on the right at -90dB. Since the DACs have dedicated presets for fine adjustment, this could – and should – have been corrected by the manufacturer.

SOUND QUALITY

We tried the ordinary filtered outputs first, and the player gave a good if not outstanding account of itself. There's fair weight and scale to the sound, resulting in a full and strong performance. The midrange is quick, punchy and forceful, with a tendency to highlight voices to some extent – which are actually pleasantly lifelike in the case of this player. Although fairly immediate, it lacks the ultimate in dynamics and became a little untidy on high level, complex material. The bass is soft in the sense that it could have been more tuneful and had more impact. The treble is slightly splashy, but in keeping with the rest of the performance. Stereo width is a strong point, while ambience, depth and space are all good and images are firm.

Using the variable output, the performance suffers to some extent, with the bass softer and the treble and mid less articulate.

However, it is when using the direct output that this player really scores, moving right up into the very good range which very few players achieve. The sound is now dyna-

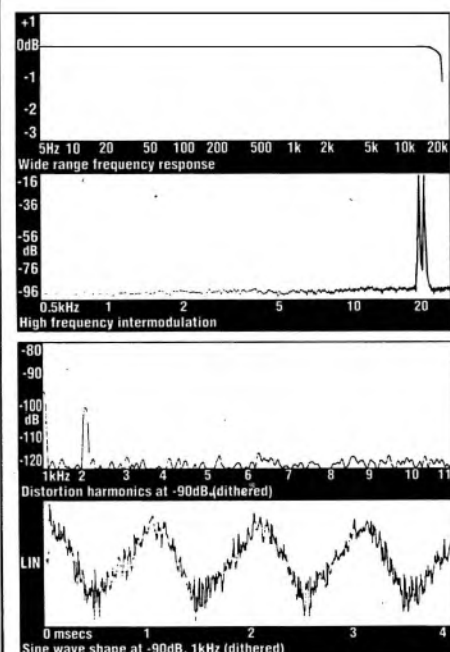
mic and lively. The bass loses its softness and becomes detailed and tactile, albeit without the weight and scale achieved by those players which excel in this area. The midrange now has exceptional detail and sounds more balanced without any accentuated bands. The machine is so lucid and revealing of tonal character and texture that it must be considered a true audiophile product in this respect. The treble is now delicate, detailed and extended, with firmer focus, and the already good soundstage is improved even further.

CONCLUSIONS

The Onkyo *DX 7500* really delivers the goods in every aspect of its performance. For the price it exhibits a completeness which others find difficult to match, and the midrange is quite exceptional. At a slightly lower price it would have achieved Best Buy status, but at £450 it can only be strongly Recommended.

TEST RESULTS

Test resolution (L/R av)		15.3 bits
Output level, source impedance	2.08V, 0.34dB, 200ohms	
Effective dynamic range		102dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	-93dB -93dB -90dB	
	(0.0022%) (0.0022%) (0.0032%)	
Ref -70dB		-29dB
Stereo separation	124dB	95dB 70dB
Stereo balance L/R	0dB	0.01dB 0.05dB
Frequency response (20Hz to 20kHz)		±0.1dB
High frequency intermodulation		-96dB (0.0016%)
Electrical noise (CCIR ARM, 1kHz)		-98dB
Mechanical noise		low
Ultrasonic noise		-104dB
Error correction		1.25mm gap
Shock/vibration resistance		good
De-emphasis		-0.18dB at 5kHz
Track finding speed (15, YEBS 2)		2 secs
White noise overload test		OK
Size (w x d x h)		43.5 x 36.5 x 13.0cms
Typical price inc VAT		£450



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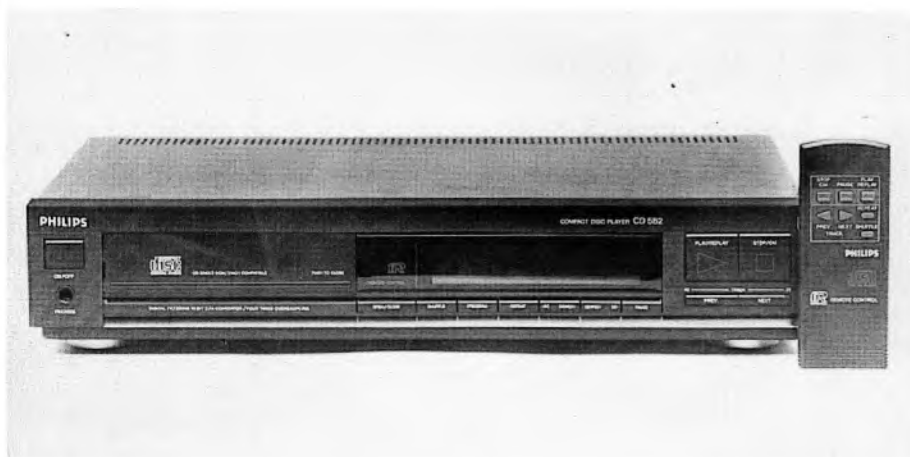
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BEST BUY



The inventor of the CD format, Philips is seemingly ever busy creating generation after generation of players. Despite help from an EEC tariff barrier on imports from the Far East, the company isn't resting on its laurels and has tried as hard as any to refine the medium – with considerable commercial success.

The *CD582* is a full width version of the current cheapest remote control range, and is a replacement for the *CD472* reviewed in May 1988. Not surprisingly, it's the same familiar Philips formula – moulded plastic box, grained plastic front panel pretending to be an alloy extrusion and failing dismally, and an undamped wrap-around steel lid. The attempts at styling garnish are limited to a thin chrome strip along the apex of a triangular section under the controls.

The Perspex covered display dominates the fascia, and a fairly limited set of controls have decent sized buttons. For once the arrangement is entirely logical: the minor controls have the row of smaller buttons under the display, while the most used play/replay, stop and track skip have a size in keeping with their priority status. There is no index, keypad track selector, or even options on the time display, but there is a simple 20-track memory facility, repeat and shuffle play.

The remote control is small and handy (or more easily lost depending on your perspective). It mimics all front panel controls with the exception of programming and open/close. The display is large, and some of the biggest track numbers available on any player are easily read from the other side of the room. The total playing time is shown when a disc is loaded, defaulting to the track elapsed time. Function reminders cover all eventualities.

The outputs are limited to a fixed output headphone socket on the front panel, phono analogue sockets on the rear and Philips' system remote interface (*RC5*). The transport is Philips' latest plastic type which is 8cm 'CD single' compatible, alongside the most recent double-sided printed circuit board on which the digital-to-analogue convertor and digital filter are placed very close together, right

next to the analogue filtering and output section.

The parts used are standard commercial grades, apart from the ubiquitous audiophile Nichicon electrolytic.

LAB REPORT

The capability of this cheap player on the laboratory test programme isn't far short of amazing. It's up with the leading players and in one respect it equalled the best on test. It passed all the error correction tests, including a 4mm gap which was handled fine, with only a slight 'click' at the beginning of the track. All the distortion tests provided virtually state of the art performance at all levels, and the dynamic range is a wide 107dB.

Stereo separation and channel balance are both good, the noise performance likewise. The frequency responses are very accurate, resistance to shock and vibration is very good, and mechanical noise isn't a problem. The –90dB sinewave is well constructed and linearity errors are small right down to the noise floor.

SOUND QUALITY

This player is marginally better than the more expensive *CD782*, though it takes some concentrated effort to establish the small differences. It has the normal Philips attributes of good dynamics, speed, slam and immediacy, but these have been taken a stage further. The bass is very good, 'bouncy' and tuneful with sufficient extension and weight. The midrange is equally at home on all types of material – refined, sweet, detailed and lively. The treble too is precise with little grain, and attracted very little in the way of adverse comment from the panel.

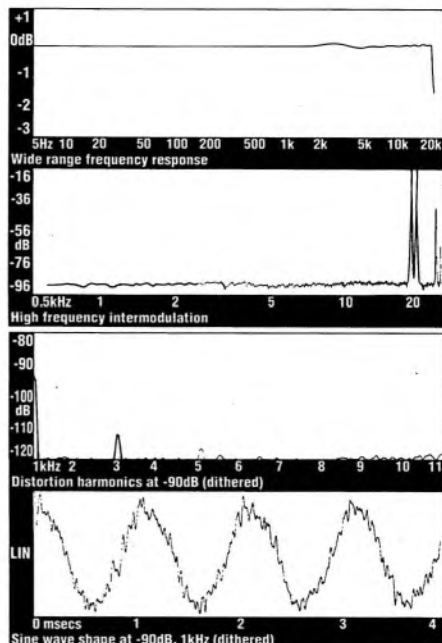
Good depth and layering information, fine focus and transparency with ample soundstage scale are a selection of comments made by the panel. The *582* stands above the normal achievement of players in its price range. On able systems it will delight and inspire an involvement in music beyond the capabilities of many other machines, and will be happily at home in systems which look like a price mismatch on the face of it.

CONCLUSIONS

Bordering on audiophile CD player territory, this player is a sonic bargain. If you're prepared to put up with the cheap plastic exterior, you will be rewarded with a player of fundamental class – yet another comfortably Best Buy rated player for Philips.

TEST RESULTS

Test resolution (L/R av)		15.9 bits
Output level, source impedance	1.94V, –0.26dB, 200ohms	
Effective dynamic range		107dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	–96dB –89dB –90dB	
	(0.0016%) (0.0035%) (0.0032%)	
Ref –70dB		–35dB
Stereo separation	123dB	101dB
Stereo balance L/R	0.09dB	0.13dB
Frequency response (20Hz to 20kHz)		±0.04dB
High frequency intermodulation		–100dB (0.001%)
Electrical noise (CCIR ARM, 1kHz)		–104dB
Mechanical noise		good
Ultrasonic noise		–104dB
Error correction	4mm gap (after initial glitch, some clicks)	
Shock/vibration resistance		very good
De-emphasis		–0.09dB at 5kHz
Track finding speed (15, YEDS 2)		3.5 secs
White noise overload test		OK
Size (w x d x h)		42.0 x 28.0 x 8.4cms
Typical price inc VAT		£200



PHILIPS CD782

PHILIPS ELECTRICAL LTD., CITY HOUSE, 420-430 LONDON RD., CROYDON, SURREY CR9 3QR. TEL: (01) 689 2166.



The £230 782 is a more expensive version of Philips' ever popular plastic player. It's a midi sized unit although full width versions with the same innards are available too. should size be important to the aesthetics of the system.

Ergonomics aren't great. Apart from the three main control buttons, the rest are all very small and have a rather spongy feel. I don't particularly like the remote control handset either. It's too big for one thing, the buttons have a vague feel, and you have to press play after selecting a track via the keypad.

Apart from these slight gripes, the player does everything most will want, and has close to every facility going. The front panel is fairly simple, leaving off such things as select, repeat, review, pause, keypad track select and control of line output volume. But it alone has FTS, open/close and a headphone volume control. FTS (favourite track selection) allows the storage of a chosen track selection from up to 150 or so discs in a long term memory. Ordinary programming is available for 20 memory blocks, covering any combination of track numbers, index numbers, and start and stop times within a track. Scan plays the first ten seconds of each track and can be used when programming, along with the review and clear editing facilities. A-B and whole disc repeat are accommodated, and search operates at three different speeds, depending on how long the button is held. The display is fairly small by modern standards, but it crams a fair amount into the space provided and includes indicators for many of the functions.

Build quality is standard Philips, and quite what we have come to expect from the Belgian factory. The finish is adequate, but the plastic fascia looks a bit dull - yet maybe that's intentional. The open topped plastic box has a wrap-around, undamped steel lid which doesn't rattle too much. The back panel boasts seven phono sockets covering fixed output, RC5 (for remotely controlled systems), digital out (coax only) and the variable line output.

The transport is one of the latest types, with 8cm 'CD single' compatibility. The PCB

layout looks much the same as earlier models, except a couple of smaller boards are added for the remote volume control. This is a coarse volume control with only six 3dB steps, but unlike earlier versions which used a MUX and discrete resistor chain, the latest series use a thick film assembly. There's the odd good quality capacitor, but no other particularly special passive components though like most of current production, the more recent B digital filters and A DACs are incorporated. Apart from that, it looks much like any earlier Philips 4x oversampled 16-bit player.

LAB REPORT

The printed measurements refer to the fixed line output, but those from the variable socket were little different. None of the tests showed up any problems, and the performance now rivals the best of Japanese production in almost all respects. Areas like high level distortion, intermodulation distortion, channel separation and stereo balance have always been good. Now the low level distortion measurements and ultrasonic noise suppression are equally competitive. Error correction is very good and the frequency response with and without de-emphasis is first class. The Philips bugbear used to be poor low level linearity, but the latest chip sets ensure this too is now approaching perfection, and the -90dB sine wave is well constructed.

SOUND QUALITY

Right from the start Philips players have always been very competitive on sound quality - taking on and often beating much more expensive rival machines. While other firms have made strides to close the gap, Philips has also managed to refine its established technology continuously, and increase the sonic performance steadily to maintain its strong position.

The CD782 continues this tradition, and for the price there isn't much around that can compete, save some Philips clones. This player only just fell short of the very good category, which is exceptional for the price. It is lively and open with good dynamics and

gives an even performance in all areas.

The sound is just a little brash and a tiny bit untidy, but it takes a very good player indeed to show this up. The bass is firm and clear and very able, the mid sharply defined with plenty of life and detail, while the treble is almost devoid of sibilance and unwanted edginess - it's clean, clear and tidy, with hardly any grain.

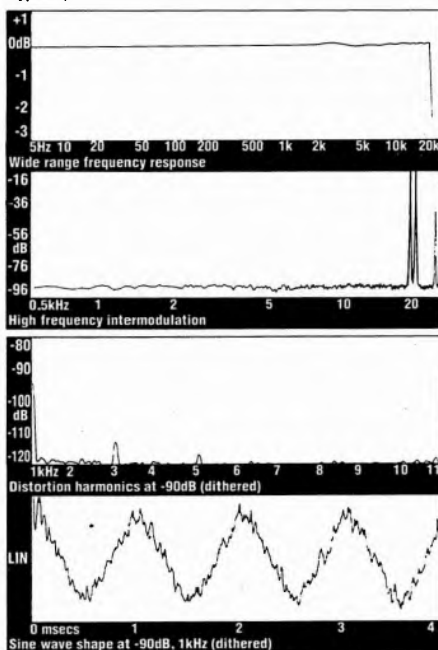
The soundstage is full and expansive with images extending right out to the edges. Depth and width are very good, subtle layering detail is revealed quite convincingly, and transparency is good. Although the variable output does have a detrimental effect on the sound, it still remains firmly in the good category.

CONCLUSIONS

Along with the 582 this is the best Philips machine to date at any price. Not only does it sound good, but it also measures very well. Bearing in mind the ample level of facilities and adequate build quality, there can be no hesitation in a Best Buy rating.

TEST RESULTS

Test resolution (L/R av)		15.9 bits
Output level, source impedance	1.90V, -0.45dB, 200ohms	
Effective dynamic range		108dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	-95dB -87dB -91dB	
	(0.0018%) (0.0045%) (0.0028%)	
Ref -70dB		-35dB
Stereo separation	115dB 117dB 99dB	
Stereo balance L/R	0.06dB 0.05dB 0.05dB	
Frequency response (20Hz to 20kHz)		±0.03dB
High frequency intermodulation		-101dB (0.00089%)
Electrical noise (CCR ARM, 1kHz)		-102dB
Mechanical noise		low
Ultrasonic noise		-108dB
Error correction		2.5mm gap
Shock/vibration resistance		very good
De-emphasis		-0.03dB at 5kHz
Track finding speed (15, YEDS 2)		3.5 secs
White noise overload test		OK
Size (w x d x h)		36 x 30.0 x 8.1cms
Typical price inc VAT		£230



PIONEER PD-4100

PIONEER HIGH FIDELITY (GB) LTD., FIELD WAY, GREENFORD, MIDDLESEX UB6 8UZ. TEL: (01) 575 5757.

BEST BUY



The £170 PD-4100 is a cheap player and offers only basic facilities. But it shares with several of the most expensive machines the distinction of an exterior which is not necessarily black. Although it is also available in black, our review sample had a silver finish, which makes rather a pleasant change these days.

From the outside (colour excepted) this looks like a PD-5100 with some of the front panel facilities left off, and more important the lack of remote control. In place of the track entry keypad there's an advertisement for the technology inside, and replacing the headphone socket is a label advising of the 20-step random access program. That apart, the layout of controls and the facilities available are the same: random play, repeat, track search, play, stop, pause, manual search and timer start. A control socket on the back allows linking with other suitably equipped Pioneer components, for automatic and system remote operations. The manual supplied is particularly clear, concise and well illustrated.

The display is simple, lacking both track calendar and index numbers. It does have the normal flags for operational functions and various time readouts appear whenever the 'time' key is pressed.

The front panel and keys are plastic but the silver finish is good and the package looks smart enough. The case is of steel, built on a honeycomb base. The transport is shared by the PD-5100 and PD-7100, with the disc stabiliser and 8cm 'CD single' compatibility. The linear tracking laser transport uses four point rubber decoupling. However, the internal electronics are not the same as the PD-5100, the 4100 having a different board layout, with almost all the integrated circuits sourced from Sony - including the 4x oversampling digital filter, and as far as I could tell the digital-to-analogue convertor. The power supply is small - indeed minimalist in nature - which is only to be expected at this price.

LAB REPORT

Although the full level white noise test reveals no clipping, this player is not at its

best at high levels (0dB). The distortion here (both IM and harmonic) is fairly high for a CD player, but as music is rarely recorded at these levels the significance is limited. At lower levels distortion is reasonable.

Stereo separation is fair and channel balance good, with the only deviation occurring at high frequencies. The signal-to-noise ratio is good and ultrasonic noise is well suppressed. Error correction is around the group average, while shock and vibration resistance is very good. The frequency response reveals no real anomalies save for some high frequency ripple with and without de-emphasis. The low level sinewave has a good shape but is modulated with some noise. Low level linearity is virtually perfect down to -80dB with only a small 2dB error at -90dB - a good result.

SOUND QUALITY

After a few bars it was immediately obvious that the PD 4100 has its own character, which was one which the panel liked; it was ultimately scored the best Pioneer in this issue, which is a little surprising as it's also the cheapest. Presentation is fast, interesting and open, with plenty of life and detail. The bass is firm and rhythmically 'boppy', coupled to good extension and fair slam and weight. The mid sounds open, if a mite brash perhaps, but able nevertheless to present information in a coherent fashion.

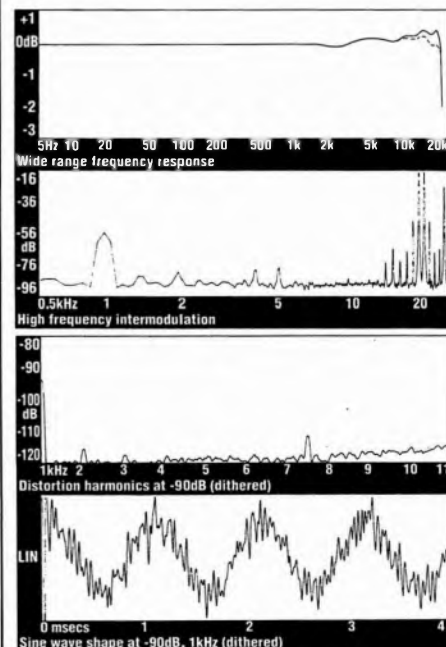
The treble is a little forward and grainy, but is detailed nonetheless and the criticisms are easily forgiven for the underlying make-up is good. Depth is generous for the price and width is well above average. Images are well formed and presented confidently within the soundstage, and the player also has its fair share of transparency and ambience.

CONCLUSIONS

This is a most presentable player. Though simple in terms of controls and facilities, sound quality is good rather than merely average, which is quite enough to achieve Best Buy status at this price level.

TEST RESULTS

Test resolution (L/R av)			15.4 bits
Output level, source impedance			1.93V, -0.31dB, 1kohms
Effective dynamic range			100dB
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-75dB (0.018%)	-74dB (0.02%)	-58dB (0.13%)
Ref -70dB			-27dB
Stereo separation	108dB	103dB	77dB
Stereo balance L/R	0.03dB	0.06dB	0.33dB
Frequency response (20Hz to 20kHz)			±0.5dB
High frequency intermodulation			-55dB (0.18%)
Electrical noise (CCIR ARM, 1kHz)			-98dB
Mechanical noise			average
Ultrasonic noise			-100dB
Error correction			1.25mm gap
Shock/vibration resistance			very good
De-emphasis			-0.02dB at 5kHz
Track finding speed (15, YEDS 2)			3.5 secs
White noise overload test			OK
Size (w x d x h)			42 x 32.5 x 8.9cms
Typical price inc VAT			£170





Speakers like these don't come rolling off conveyor belts, nor are they bought because they are photographed in moody looking settings. They are chosen by music lovers, because they are made by a company dedicated to hi-fi craftsmanship. A company also known for innovation and an uncanny ability to produce award-winning products that cost much less than . . . well, a great deal less than you might expect.

The HB100 speakers above are an example of painstaking development, design and construction. Suitable for a wide range of systems they provide clean dynamic and balanced sound. The technicalities? An 8in bass unit, phased to integrate with a 19mm metal dome tweeter, a cabinet built to eliminate resonances; outstanding transient response; brilliant mid range clarity; superb musical detail and seamless integration between the drive units.

The participating stockists, listed below, will tell you more about the watts, the ohms and the kHz's. They will also demonstrate why the Heybrook HB100 speakers were *made for music*.



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Heybrook Hi-Fi Ltd., Estover Close, Estover, Plymouth PL6 7PL
Telephone 0752 780311. Fax 0752 793954

ADDITIONAL DEALERS:-
LONDON - Sound Sense 01 402 2100
NORTHAMPTON - Listen Inn 0604 37871

Heybrook HB100 participating stockists

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BASINGSTOKE
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Sevenoaks Hi Fi 01-658 3450
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North Cornwall Electronics 08405 248
BRIGHTON
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BRISTOL
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Radford Hi Fi 0272 428247
BURTON-ON-TRENT
Grange Hi Fi 0283 33655
CAMBORNE
Camborne Audio Centre Ltd 0209 714286
CAMBRIDGE
CamAudio 0223 60442

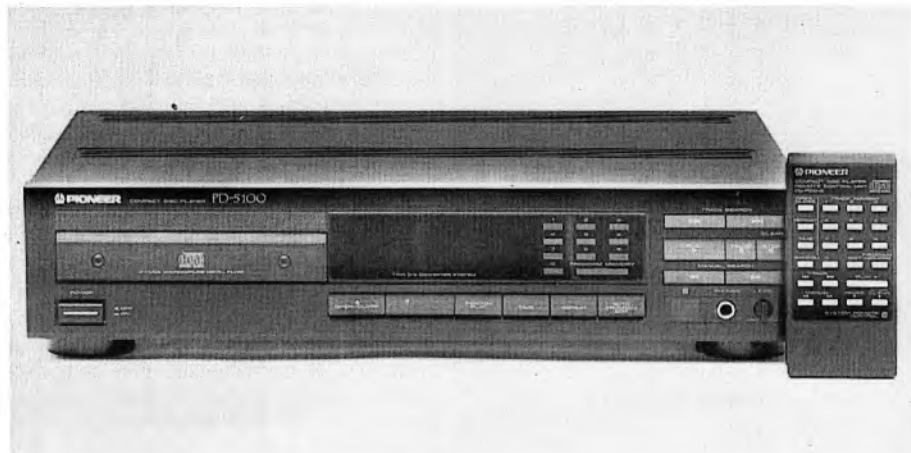
CANTERBURY
Westgate Hi Fi 0227 60329
CARDIFF
Audio Excellence 0222 28565
CHATHAM
Sevenoaks Hi Fi 0634 46859
CHELTENHAM
Absolute Sound & Video 0242 583960
COLCHESTER
Pro Musica 0206 577519
COVENTRY
Frank Harvey 0203 525200
DOVER
Dover Hi Fi 0304 207562
DUNSTABLE
Technosound 0582 663297
EASTBOURNE
Jefferies Hi Fi 032331336
GLASGOW
Stereo Stereo 041-248 4079
GLOUCESTER
Audio Excellence 0452 300046
GRIMSBY
Manders Hi Fi Ltd 0472 351391
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Beaver Radio (L'pool) Ltd 051-709 9898
LIVERPOOL
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LONDON N1
Grahams Hi Fi 01-837 4412
LONDON W9
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Studio 99 01-624 8855
LONDON W2
H L Smith 01-723 5891
LONDON SW1
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Sevenoaks Hi Fi 0732 459555
SALE
Sound Decision Ltd 061-969 1074
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SOUTHPORT
Hi Fi Systems Ltd 0704 25079
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Frank Harvey 0798 413345
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Audio Excellence 0792 474608
SWINDON
Absolute Sound & Video 0793 38222
TRURO
Truro Hi Fi ETS Ltd 0872 79809
TUNBRIDGE WELLS
Sevenoaks Hi Fi 0892 31543
WILMSLOW
Wilmslow Audio 0625 529599
WOOLWICH
Sevenoaks Hi Fi 01-855 8016
WORCESTER
West Midlands Audio 0905 58046
YORK
The Sound Organisation 0904 627108

PIONEER PD-5100

PIONEER HIGH FIDELITY (GB) LTD., FIELD WAY, GREENFORD, MIDDLESEX UB6 8UZ. TEL: (01) 575 5757.



Pioneer continues to produce an enviably up to date CD player line up aimed at all areas of the market. Whereas the last CD player issue of *Choice* may have given the impression that the company is primarily an autochanger specialist, the balance is now redressed as the *PD-5100* is one of three 'normal' models reviewed this month. This one sits fair and square in the hotly contested mid price sector, and looks more than competitive taken at face value.

It's a relatively slim unit, but a decent level of facilities are packed within the constraints of the front panel. The main control buttons are set an angle away from the flat front panel, while the less essential controls include random play, repeat and auto programme edit, but there's no index search. Up to 20 tracks can be pre-programmed, and a timer start facility which is active at all times, so if there's a disc in the tray when the player is turned on it will immediately start playing. There are track entry keypads on the front panel and the remote, which, incidentally, mimics all front panel controls without becoming unhandleable. The headphone socket has a level control and is buffered from the normal output.

The display is small by recent standards, but it's helpful nonetheless, with a 20-track calendar as well as all the normal track, index, time and operational displays. Display time can be switched between track elapsed time, the disc's total time, the programme total playback time and the remaining time of the disc. Indicators are included for all appropriate operations.

Once Pioneer adopts an idea it quickly finds its way into products throughout the range. This is the case with the honeycomb chassis, which not only looks the part but is claimed to improve vibration resistance and energy dissipation. Most of the rest of the case is made up from steel panels, but the fascia is a high quality plastic, which looks good but lacks a certain feel.

There's nothing special inside – just solid, well sorted standard electronic engineering. After the digits have been acquired, they are fed to a Sony 4x oversampling digital filter which drives a pair of Burr Brown 16-bit

PCM56P DACs located on a sub-board tacked on the main PCB. The power supply transformer must be one of the smallest around, the reserve capacitors aren't exactly large and there are few regulators. The transport is 8cm 'CD single' compatible, has a rubber decoupled subchassis for the worm drive linear tracking laser and an 8cm disc clamp. There is no digital output.

LAB REPORT

The lab performance of the *PD5100* can best be described as average, for while it excelled in few areas there was nothing particularly untoward either. The response shows a mild high frequency rise, stronger on the left than the right channel, but no extra error of much consequence is found on the de-emphasised response.

The total harmonic distortion results are average but some low level down band products of a single 20kHz tone are present. The low level linearity curve shows a slight kink below -70dB on both channels boosting output a couple of dBs from -80dB downwards. Low level distortion is a little high at five per cent, and the -90dB sinewave demonstrates some asymmetry.

SOUND QUALITY

Bass weight is good but there's some loss of slam and tactility, and complex bass structures are not reproduced too well, the machine tending to gloss over the recorded detail and failing to remain fully faithful to dynamic transients. The midrange is not too detailed, though it's congenial enough. There's an occasional slight hardness when loud passages coincided with the offending frequency band, but the sound in general isn't fatiguing. There was some sibilance on vocals, but only sufficient to distract the most critical.

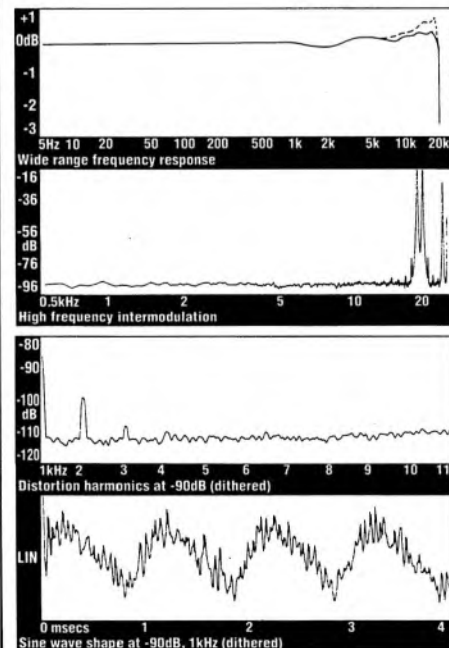
The upper treble is a mite recessed, but elsewhere the treble sounds a little exposed and suffers from mild grain. Some focus imprecision is noted especially away from centre stage, and the soundstage itself is a little smaller and more shut in than expected, with some lack of ambience and depth.

CONCLUSIONS

This is Pioneer's basic remote control player, and is typical of many from Japan. Build quality, specifications and finish are certainly up to the mark, but economies are found inside the box. Hence the sound is really only adequate, which isn't enough for Recommended status.

TEST RESULTS

Test resolution (L/R av)		15.0 bits
Output level, source impedance	2.06V, 0.26dB, 1kohms	
Effective dynamic range		96dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	-89dB -87dB -79dB	
	(0.0036%) (0.0045%) (0.011%)	
Ref -70dB		-26dB
Stereo separation	106dB 103dB 83dB	
Stereo balance L/R	0.02dB 0.04dB 0.67dB	
Frequency response (20Hz to 20kHz)		±2.18dB
High frequency intermodulation		-93dB (0.0022%)
Electrical noise (CCIR ARM, 1kHz)		-96dB
Mechanical noise		average
Ultrasonic noise		-105dB
Error correction		1.5mm gap
Shock/vibration resistance		very good
De-emphasis		±0dB at 5kHz
Track finding speed (15, YEDS 2)		3.5 secs
White noise overload test		OK
Size (w x d x h)		42 x 33 x 9.8cms
Typical price inc VAT		£220



PIONEER PD-7100

PIONEER HIGH FIDELITY (GB) LTD., FIELD WAY, GREENFORD, MIDDLESEX UB6 8UZ. TEL: (01) 575 5757.



At £300 the PD 7100 is by no means an expensive player, yet it manages to look quite imposing due to the physical size and gadget-packed front panel. As well as looking the part, it is endowed with advanced control and technology features, and looks something of a bargain on initial perusal. The overall impression is very much that of a 'flagship model' on the cheap.

The front panel is packed with buttons, configured with virtually every conceivable use in mind. The Pioneer manual lists no fewer than 28 such features. The remote control duplicates all front panel facilities as far as possible, and is also equipped with a remote volume selector, covering a range of 25dB in 1dB steps. That will be enough for most applications, but not really for straight to power amplifiers connection without an extra attenuation facility.

Other facilities include programming for up to 24 tracks, index, manual and track search, random play, repeat, auto space (3 second pause between tracks), keypad track selection, plus all the standard controls. Then there's auto programme editing, which allows the programming of time of play rather than track numbers, and variable length (0 to 9 seconds) fade in and fade out. Music window programming can be used to specify the start and end points for the desired selections from a disc and then these can be pieced together smoothly with fade in and fade out.

The display is large and comprehensive with a track calendar, track index, time (3 mode) and attenuation level – both graphically and in dBs. There are flags for the other functions.

This machine is technically interesting under the skin too. It must currently be one of the cheapest to use an 8x oversampling digital filter, though it is only when the top cover is removed that the whole story is revealed. In order to keep the price as competitive as possible, the internals are put together in a fairly simple, basic way. The power supply is merely adequate with only a small number of chip regulators and a small transformer; the design uses a 'standard' rather than 'lavish' level of construction.

The parts used are of ordinary commercial quality in both active and passive departments, and the 7100 shares its transport with cheaper machines. The 8x oversampling digital filter comes from Sony and drives a pair of Burr Brown PCM56P DACs. Save for the oversampling rate, all the technology is fairly prosaic.

The case has solid steel panels on Pioneer's honeycomb base. The extruded alloy front panel has a high quality finish, and looks admirably attractive despite plastic buttons. All phono sockets are gold-plated and there are both coaxial and optical digital outputs, switched on the rear panel.

LAB REPORT

The output was 1.76dB above the industry 2V standard, so A-B comparitants beware. The source impedance of 1kohms is higher than most, reducing the drive potential a little. Aside from this the 7100 produces a fairly average set of results in most departments – the absence of any artefacts on the intermodulation spectrogram being the praiseworthy exception.

The -90dB sinewave shows some triangulation, but is clean enough in general. Low level linearity is almost perfect down to -110dB on the right channel, but the left is weak below -70dB, with a steadily increasing error to 8dB by -90dB. The frequency response displays a slight rolloff at frequencies above 15kHz, but the error is only 1dB at 20kHz which isn't serious.

SOUND QUALITY

Despite the latest 8x oversampling Japanese technology, this Pioneer failed to convince the panel that this particular configuration is any better than the simpler 4x oversampling methods previously employed. Although fairly crisp and well defined, the sound needs more drive and drama. The bass is quite good with reasonable tune playing ability, but it's also too soft and heavy. The tonal character of the midrange remains generally sweet on most material, even with loud, complex extracts. Yet at times there's a hint of underlying hardness. The story is much the same in the treble, but there was panel criticism of

some grain and imprecision.

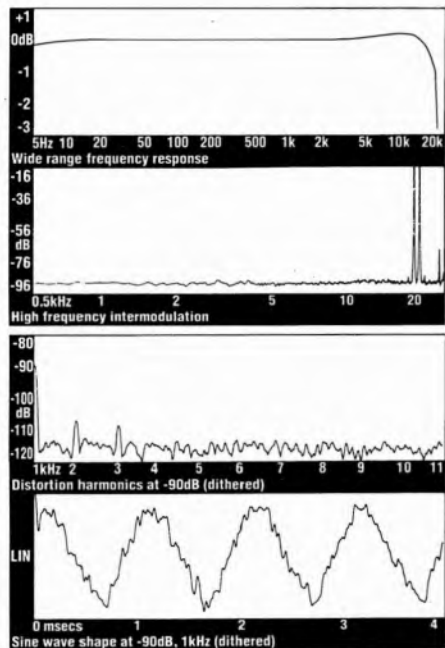
Images are quite well located, but treble focus is a mite smeared and width and depth only achieve average status. It can be summed up as having an even tempered and well mannered sound, but one which ultimately fails to excite.

CONCLUSIONS

The perceived external value quotient is high, as build is well up to standard and facilities are abundant. However, these attributes aren't quite matched by the only average sound quality. Depending upon your priorities, this player may well be worth considering.

TEST RESULTS

Test resolution (L/R av)	15.5 bits		
Output level, source impedance	2.45V, 1.76dB, 1kohms		
Effective dynamic range	103dB		
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-90dB	-89dB	-85dB
	(0.0032%)	(0.0036%)	(0.0056%)
Ref -70dB		-34dB	
Stereo separation	114dB	112dB	83dB
Stereo balance L/R	0.48dB	0.48dB	0.64dB
Frequency response (20Hz to 20kHz)	±0.92B		
High frequency intermodulation	-101dB (0.00089%)		
Electrical noise (CCIR ARM, 1kHz)	-100dB		
Mechanical noise	low		
Ultrasonic noise	-103dB		
Error correction	1mm gap		
Shock/vibration resistance	average		
De-emphasis	-0.2dB at 5kHz		
Track finding speed (15, YEDS 2)	3 secs		
White noise overload test	OK		
Size (w x d x h)	42 x 32.5 x 12.3cms		
Typical price inc VAT	£300		



REVOX B126

FWO BAUCH LTD., 49 THEOBALD STREET, BOREHAMWOOD, HERTS WD6 4RZ. TEL: (01) 953 0091.



Revox has a high reputation as a major European manufacturer of quality upmarket hi-fi products. Best known of course for open reel tape machines and latterly cassette recorders and tuners, the full range also includes amplifiers, loudspeakers and two models of CD player. More recently the components have been integrated in computer controlled systems that offer full round-the-house sound capability – a feature which distinguishes Revox from most other brands.

The B126 is the cheapest of their CD range, but at £650 it reflects the cost of high quality Swiss manufacture and the strength of the Swiss Franc. As usual with European firms, Revox has based its players on Philips technology.

The presentation is normal Revox house style, which is attractively different from the rest of the players on the market. The side panels are made from grey ribbed plastic attached to a basic steel chassis. The lid is an undamped, heavy gauge steel 'L' section with a dark grey finish, and the front panel is in natural brushed aluminium. The black styling panels set into the lower half are designed to match the LCD display surround. Immediately above the display, the loading drawer is flat, plain, and a flush fit with the panel. The front and side panels overlap the line of the base so that ground clearance looks minimal. One option is the remote control handset, which must be bought as an extra if required.

The controls are sited either side of the centre section. The ten instant track access keys are in silver and the programming keys in black. On the right hand side are the main disc function keys together with the display and auto stop facilities. There is no track skip in the ordinary sense, but pushing play/next when play is in progress moves the player on a track as usual.

The CD transport is basically the Philips swinging arm type, but it has been extensively modified to provide very smooth operation. A large alloy-casting runs down one side from the front to the back of the player, a steel box section is bolted to this and the transport is sited in the middle. The structure is therefore made immensely rigid.

The transformer sits behind the transport, effectively shielding it from all the electronic circuits.

Revox designed system control circuitry occupies a board on the left side; the right hand board accommodates the digital and analogue circuits. A selection of good quality capacitors from various European manufacturers are used – reservoir electrolytics from Elko, decoupling electrolytics from Roe and some film caps from ERO. A number of top quality chip regulators are also used and the layout is exceedingly neat and sensibly organised. The latest type Philips digital filter drives an A grade TDA1541 DAC, and simple output filtering is constructed around selected 5532 operational amplifiers.

LAB REPORT

The output at full level is 1.5dB up on normal, from a low 225ohms source impedance. Total harmonic distortion is exceedingly good at all levels and the full level IM distortion matched this. Stereo balance is excellent and channel separation very good. Mechanical and electrical noise are low and ultrasonic spurious are very well suppressed.

The frequency response is flat, save for the familiar slight high frequency digital filter ripple, and the de-emphasis circuits are perfectly engineered. Low level linearity is virtually perfect and the –90dB sinewave has little distortion or noise. Track finding speed is the standard Philips 3.5 seconds, and the resistance to shock and vibration is excellent.

SOUND QUALITY

This player delivers an immediately recognisable and good quality, if fairly standard and relaxed Revox sound. The bass is a touch lightweight but has good articulation. The mid is quite dynamic, lively, sweet and detailed, and remains fairly free and lucid on loud passages. There is no obvious distortion, but occasionally the sound becomes just a little brittle. The treble is a mite scrappy and tizzy, but detailed and interesting nonetheless.

Stereo width, depth and focus are all good, although at times the sound seems a bit

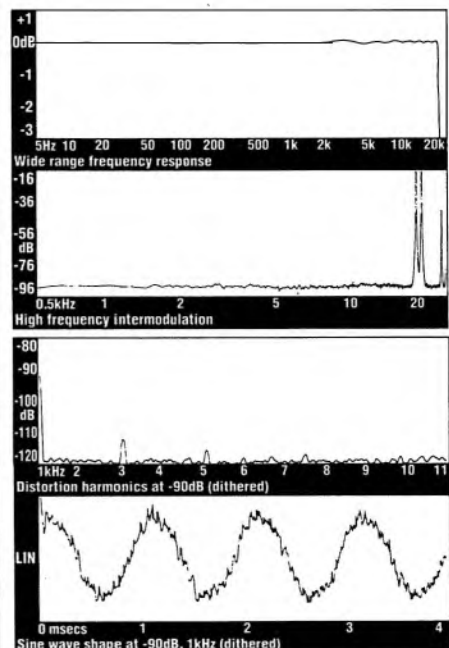
diluted and lacking that Philips immediacy. Somewhere along the line the performance seems to lose a little soul.

CONCLUSIONS

Revox always makes machinery of fine quality and exceedingly fine finish. With all the engineering that has been put into the transport, this player should last a very long time. The lab performance is exceptionally good and the sound quality firmly in the good class. If you have a Revox system, then this player will be ideal; if you don't, then perhaps the price may seem just a little high.

TEST RESULTS

Test resolution (L/R av)	15.9 bits		
Output level, source impedance	2.38V, 1.51dB, 225ohms		
Effective dynamic range	107dB		
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	–94dB (0.002%)	–91dB (0.0028%)	–91dB (0.0028%)
Ref –70dB	–36dB		
Stereo separation	130dB	120dB	94dB
Stereo balance L/R	0.01dB	0.01dB	0.03dB
Frequency response (20Hz to 20kHz)	±0.04B		
High frequency intermodulation	–102dB (0.00079%)		
Electrical noise (CCIR ARM, 1kHz)	–107dB		
Mechanical noise	low		
Ultrasonic noise	–110dB		
Error correction	2mm gap		
Shock/vibration resistance	excellent		
De-emphasis	–0.02dB at 5kHz		
Track finding speed (15, YEDS 2)	3.5 secs		
White noise overload test	OK		
Size (w x d x h)	45 x 33.5 x 10.9cms		
Typical price inc VAT	£650		





SEVENOAKS HI-FI & VIDEO

This advertisement is valid until at least 30th April 1989. Please note: Beckenham, Chatham and Woolwich close all day Wednesday.

SUGGESTED SYSTEMS

The suggested systems priced below all include the popular Dual CS503/1 turntable, but an alternative turntable or CD player is available at extra cost. Please see 'OPTIONS' list below for further details.

SPEAKERS

All systems offer a choice of Dual CS503/1 AMPS

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MISSION 764
INC FREE 75 STRAIGHT CABLE
£399.95

MISSION 765
INC FREE 75 STRAIGHT CABLE
£599.95

Rotel RA820A	M/Short MS20 II	W/Gale Diamond III	Celestion D1.4 II	M/Short MS20 II	Hebrook 183	M/Audio R300MD	
Rotel RA820BXC	Goodmans M800 II	Celestion 3	H/Trolox P 5	A/Research 122	Tannoy M20 Gold	B&W DM570	
Nad 3020E	W/Dale Delta 30	Royal Rad 10	Royal Pal 850	BMW DM350	Castle Dinham	A&R Alcam 24	
Nad 3130	Mission 70 II	JW Sonotta	Tanno Expise	Celestion D1.6 II	Celestion D1.8 II	Tanno DC 2000	
Rotel RA840BXC		Goodmans Sterling P 3	JW P 1		A/Research 132	M/Audio R350MD	
Rotel RA840BXC		Royal A1	A/Research 112				
Marrantz PM35							
QED A240SA II							
QED A240CD II							
Yamaha N4300							
Yamaha N4400							
Yamaha N4500							
Yamaha N4600							
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Yamaha N9500							
Yamaha N9600							
Yamaha N9700							
Yamaha N9800							
Yamaha N9900							
Yamaha N10000							

OPTIONS

The following Compact Disc Player or Turntable may be ordered instead of the Dual CS503/1 in the above systems.

CDs

- Denon DC0610 add £90
- Denon DC0610 add £130
- Denon DC0610 add £180
- Denon DC0610 add £210
- Denon DC0610 add £215
- Denon DC0610 add £110
- Denon DC0610 add £130
- Denon DC0610 add £180
- Denon DC0610 add £100

SAVE

Massive savings when you buy a suggested system — each component has been highly acclaimed by the UK Hi-Fi press and as a package offers unbeatable value for money.

TURNTABLES

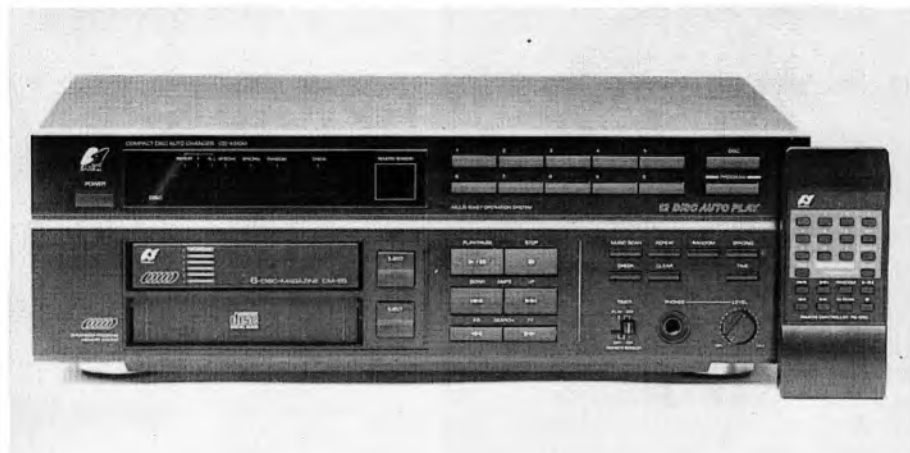
- Dual CS505-3 add £100
- Dual CS505-3 add £170
- Dual CS505-3 add £130
- Dual CS505-3 add £170
- Dual CS505-3 add £150
- Dual CS505-3 add £180
- Dual CS505-3 add £180
- Dual CS505-3 add £140
- Dual CS505-3 add £130
- Dual CS505-3 add £120
- Dual CS505-3 add £170

FREE

Cartridge supplied with these systems. Carriage for mail order customers on all systems in excess of £250 (UK mainland only).

SANSUI CD-X510M

SANSUI (UK) LTD., AXIS 4, RHODES WAY, WATFORD, HERTS WD2 4YW. TEL: (0923) 226499.



Sansui has created an imposing dreadnought of a player in the 510M. It's an autochanger model which has been further developed on the 'more is better' principle, taking two six pack cartridges of CDs at the same time, which means that 12 or so different hours of playing time are possible without attention. In order to accommodate the machinery to make this possible, the player is considerably taller than the average.

The front panel is divided into two sections by a sculptured styling indentation. The slots for the two magazines together with their individual eject buttons are placed within the lower section of the deck. Joining the display in the upper sector are 12 keys which are designated a 'multi operation system'. These are used to select disc and track numbers directly or make programmed play easier.

Besides the normal range of disc operation and programme controls, music scan normally plays the first 10 seconds of each track on all the discs loaded, but this intro time can be altered to anything between 1 and 59 seconds. There is also auto spacing (4 seconds gap between each track), full programming of up to 30 tracks over all the discs in the magazines, random play (all discs again), and track/disc playing time (limited to the disc playing).

The time function relies on an external timer to activate play, and the switch also disengages the remote control sensor. The remote control itself is small and handy with a bulbous end to house the batteries, yet it covers all the sensibly required front panel facilities. The orange display has all you could need and includes disc and track number, a disc calendar, playing times and function flag reminders. A variable headphone output is included.

The build quality and finish are impressive considering the price, and the front panel is a high quality alloy extrusion. The case is steel, and as usual the round feet subcontractors are kept busy. The case is made mainly from prefabricated steel panels, although the disc loading section is plastic. The laser transport is worm driven and it sits on a rubber decoupled subchassis. Several

separate printed circuit boards are used and a complex and somewhat messy wiring harness is the result.

The execution of the electronic side is basic good commercial quality stuff. Standard line output phono sockets and Sansui system remote control sockets are located on the back panel.

LAB REPORT

Output is a bit down on the average and the source impedance was fairly high too, so the volume will be lower than other players, making A-B comparisons difficult. The spectrogram of the full level intermodulation signals reveals some problems and the full level total harmonic distortion figures aren't good for a CD player either. However, at lower levels the Sansui sorts itself out. In most other respects the player is fairly average, but the exception is an error correction capability which is the worst recorded in this issue - although I had no trouble with my ordinary, undamaged disc collection. Low level linearity and the frequency response are both respectable enough.

SOUND QUALITY

This player makes no pretence at having audiophile tendencies. It is designed as a fairly basic model with the added facility of multiple disc access, and it performed much as expected.

The bass lacks drive and impetus. It's a mite slow and ponderous at times and dynamic eloquence was definitely limited, although it has good extension and reasonable weight. The midrange sounds thin with a loss of bite, yet is also a little hard, though not squeaky or overtly aggressive. The treble can be somewhat airless, with some grain and a loss of clarity and detail.

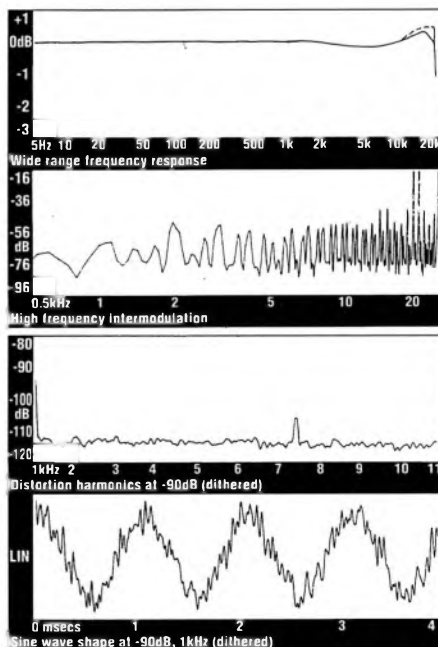
Detail and the creation of space and images which define soundstage dimensions are only present in strictly finite quantities. While some of the perspectives are preserved, the full extent of the performing environment is cut somewhat short. Images are not created with any great precision and performers of all types are not that well focused.

CONCLUSIONS

As an autochanger it works exceptionally well and track finding is fairly rapid. The operation and programming facilities are versatile, the lure of loading 12 CDs at a time may encourage some purchasers, and for background music it's almost perfect. However, I'm not sure of its ultimate suitability to the domestic environment, particularly where sound quality is pursued with zeal.

TEST RESULTS

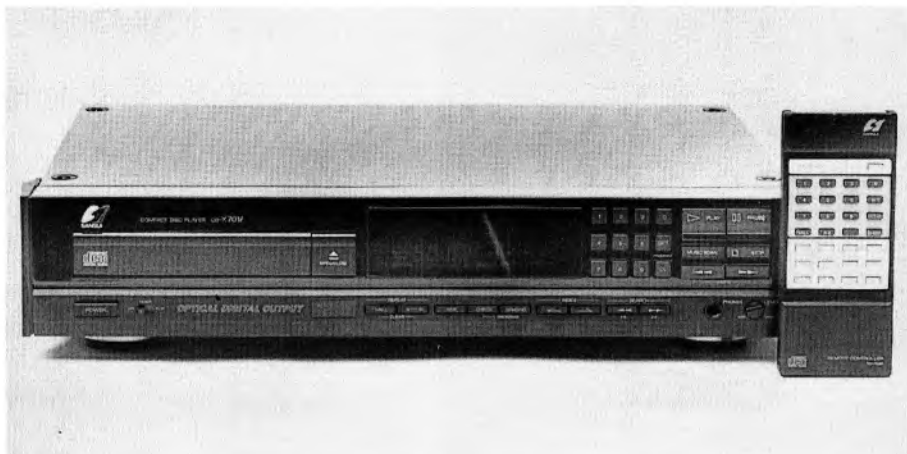
Output level, source impedance	1.73V, 2kohms		
Effective dynamic range	104dB		
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-75dB	-73dB	-34dB
Ref -70dB		-35dB	
Stereo separation	114dB	90dB	63dB
Stereo balance L/R	0.19dB	0.18dB	0.07dB
Frequency response (20Hz to 20kHz)	±0.45B		
High frequency intermodulation	-57dB		
Electrical noise (CCIR ARM, 1kHz)	-90dB		
Mechanical noise	average		
Ultrasonic noise	-93dB		
Error correction	0.5mm gap		
Shock/vibration resistance	average		
De-emphasis	-0.3dB at 5kHz		
Track finding speed (15, YEDS 2)	8 secs		
White noise overload test	OK		
Size (w x d x h)	43.0 x 33.0 x 14.5cms		
Typical price inc VAT	£300		



SANSUI CD-X701i

SANSUI (UK) LTD., AXIS 4, RHODES WAY, WATFORD, HERTS WD2 4YW. TEL: (0923) 226499.

RECOMMENDED



Sansui is one of the smaller Japanese audio manufacturers and has long maintained a reputation as a hi-fi separates specialist, despite the odd foray into cheaper systems. The reputation as a top CD player manufacturer has yet to be established, but if looks are anything to go by the *CD-X701i* may well enhance the situation. It's a high class player with plenty of facilities, admirable build quality and pleasing finish. Styling is different from most, the front panel having a brushed aluminium section on the lower half and a high gloss finish above.

The controls are arranged around a large display window which sits in the centre and attracts all the attention. This gives a 20-track calendar, track and index numbers, lap, remain and total playing time, along with reminder telltales for almost everything else. For £450 you expect a comprehensive set of facilities, so the longish list includes direct keypad track entry, index, track and music search, music scan, repeat one/all, A-B repeat, and programming for 20 tracks. A variable headphone socket is located in the bottom corner.

The remote control facilities mimic those of the front panel as far as possible, omitting only the external timer control switch.

The player is very solidly built from damped steel panels, with cross-bracing to increase rigidity. Provision is made for line output via gold-plated phono sockets or balanced 600ohm Canon connectors, while both optical and coaxial digital outputs are available. An optical fibre is even included to hook the machine up to your digital processor.

Inside, the player is divided into two sections separated by a steel partition. One board houses all the digital devices with their associated regulated power supplies, the other has all the analogue circuits from the DAC onwards, plus large power supply reserve capacitors and its own regulators. The two audio channels are separated by a copper earth bar and one or two 'for audio' components have been used where deemed appropriate. The provision of the balanced outputs has made this section larger and more complicated than normal. Relay

switching is used for mute although de-emphasis switching is left to transistors.

The power transformer is shared but there are separate windings for each section. A surprisingly complex supply is used for the digital section with plenty of smoothing capacitors and several three-terminal voltage regulators. Most of the control chips come from Sony and a Sony 2x oversampling digital filter mounted on the digital board feeds a pair of Burr Brown *PCM56P* 16-bit DACs on the analogue side. Connection between the two is made by quite a long run of screened cable. The disc transport works smoothly although the budget doesn't stretch to linear motor drive for the laser. There are no facilities for 8cm CD singles and an adaptor ring must be used, but at least one is supplied.

LAB REPORT

The low source impedance means that the *X701i* should drive virtually any input and long runs of cables with impunity. Channel separation is excellent and separation very good. The frequency responses are generally flat save for a slight rise at high frequencies and mild inter-channel differences. Harmonic distortion figures are satisfactory at 0dB but poor at low levels, and the IM distortion is reasonable.

The low level linearity tests reveal some errors of up to -5dB below -70dB on both channels. The -90dB sinewave highlights some of the problems and the spectrogram reveals strong 2nd and 4th harmonic distortion artefacts. Signal-to-noise ratios are fine and the de-emphasis works as it should.

SOUND QUALITY

The panel was complimentary about the general performance of this machine, the consensus of opinion placing it firmly in the good category, which is reasonable enough for the price.

The bass is firm and well extended with fine articulation of complex structures. The midrange is neither hard nor loud - each octave is delivered with proper weight and an even level of communicative ability. The treble has a hint of added 'edge', but on the

whole is detailed and interesting. The articulate, snappy sound reveals dynamics faithfully and there is plenty of detail even on loud complex extracts. Orchestral string sections are clear and chorus' have a very accurate tonal balance. The brass section is the only part to show up any problems - just a slight brittleness.

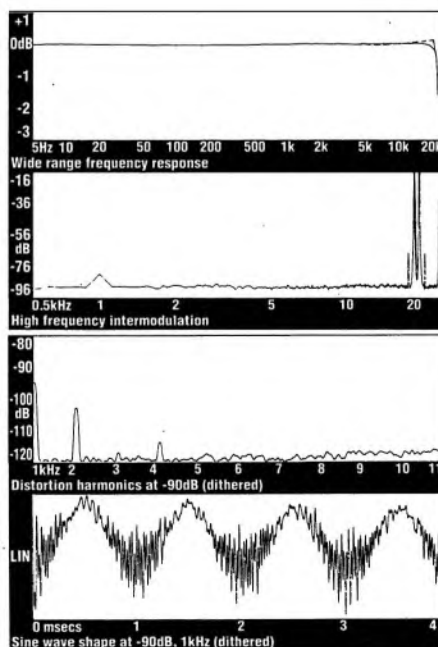
The sound stage is wide and depth is firm and good. Images are well formed and certain layering detail is made apparent with some transparency. Overall this player proved to be a well balanced, competent panel pleaser.

CONCLUSIONS

Sansui appears to have tried hard to extract decent performance from this uppermarket sector player. Every aspect has been well thought out and it's more than competent everywhere, lagging the current leaders in this division by only a small margin, so it must be worth Recommendation.

TEST RESULTS

Test resolution (L/R av)		15.7 bits
Output level, source impedance	2.21V, 0.87dB, 57ohms	
Effective dynamic range		99dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	-92dB -88dB -82dB	
	(0.0025%) (0.004%) (0.0079%)	
Ref -70dB		-25dB
Stereo separation	131dB	107dB
Stereo balance L/R	0.11dB	0.14dB
Frequency response (20Hz to 20kHz)		±0.2B
High frequency intermodulation		-77dB (0.014%)
Electrical noise (CCIR ARM, 1kHz)		-96dB
Mechanical noise		low
Ultrasonic noise		-106dB
Error correction		1.5mm gap
Shock/vibration resistance		average
De-emphasis		-0.13dB at 5kHz
Track finding speed (15, YEDS 2)		3 secs
White noise overload test		OK
Size (w x d x h)		45 x 38.0 x 9.8cm
Typical price inc VAT		£450



Uxbridge Audio

Dear Sir

Wembley Park,
Middlesex.

The EXCELLENT service, personal attention and professionalism I found with your staff, compels me to write this letter.

Having embarked on the daunting task of looking for the right music system I visited many Stores and purchased a lot of literature. I was attracted by your advertisement in What Hi-fi magazine. First class sound quality was my top priority and from another article in the same magazine I had made up my mind to purchase a system recommended therein.

A quick phone call to your Shop to find out whether you had them in stock and I was lectured on how a Music System should be purchased . . . "Have you listened to it? How do you know you will like it's sound? It isn't the same as buying a washing machine, when it has to be taken on faith that it will do the job as you want it. It is more like buying a musical instrument, where personal preference dictates. You do not need to be an expert, you only need to listen to it and decide for yourself . . ."

Not too keen on the lecture, I was, none the less, taken up by what he said, and decided to pay you a visit. This turned out to be QUITE AN EXPERIENCE! After listening to a few systems I had already decided I would be buying my own combination and not the one recommended in the magazine. A music system should, indeed, be listened to, before purchasing. In addition, the personal attention, friendly, untiring and "non pushy" attitude of your sales assistant, Jas, turned the daunting prospect of choosing the right hi-fi into a most pleasant experience.

When I first read the letter from a satisfied customer in your advert I didn't think it genuine. But after my experience I know just what he meant. I echo him in commanding you and your staff and I will not hesitate to recommend you. I, once again, thank you for the help in choosing my system and the excellent service and attention I have received at and since it's installation.

Wishing your Company every success

Mrs. F. Monteiro

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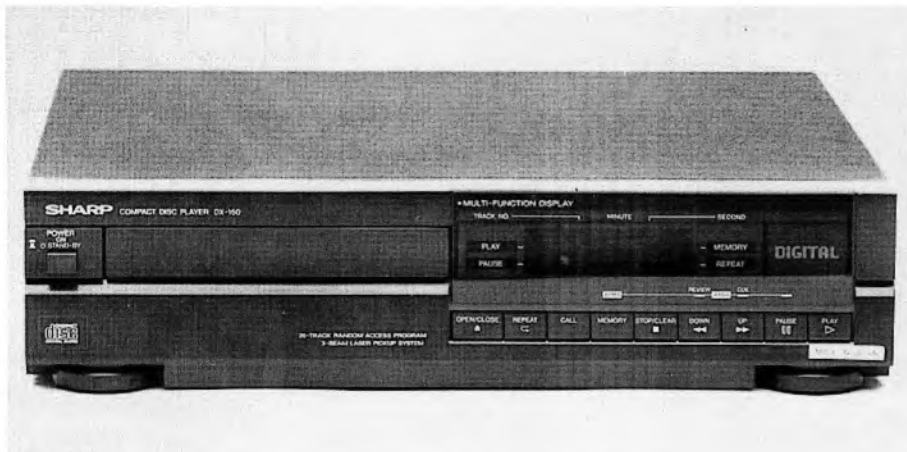
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SHARP DX-150

SHARP ELECTRONICS (UK) LTD., SHARP HOUSE, THORP ROAD, MANCHESTER M10 9BE. TEL: (061) 205 2333.



The Sharp brand is more normally associated with value for money domestic electronic apparatus than as a company specialist in serious hi-fi. Yet in fact Sharp manufactures many of the lasers used in today's CD players, and has always had a budget oriented, stand-alone player or two of its own. The *DX-150* ties with the Goodmans *GCD 300* as the cheapest player in the issue, and it is unashamedly aimed at entry level customers, lacking such luxuries as a remote control.

The front panel styling is a bit fussy. It is a good quality plastic but has an excessive amount of detail, even to the extent of integral moulding in fake front feet. If you include the orange display, there are no fewer than five different colours of lettering. The case is a standard light steel fabrication, the upper 'U' section of which is finished in a textured black.

Inside, half the player is totally empty. The enquiring mind searches frantically to find out where all the electronics is hidden, and apart from the mains transformer, supply caps, and regulator stages, all the major circuitry is located under the transport. This condensed block forms an assembly module which doubtless can be fitted into any system Sharp chooses. Circuitry is designed around a non-oversampled configuration, employing analogue brick wall filters in the output stage. The transport is mainly plastic, with the exception of a small metal subchassis which carries the laser. This is decoupled from the machine on rubber hangers which form a suspension.

Sharp has decided to designate some of the standard controls and facilities with its own established nomenclature, linking up with its established cassette deck practice. APSS (auto programme search system) is track skip. Manual scan search is implemented by first pressing the pause button, then the APSS button once for the direction of search required; the machine will then audibly search until play is pressed again. APMS (automatic programmable music selector) is a standard memory facility which allows up to 20 tracks to be programmed in any order using the memory and programme keys. The sequence programmed can be

reviewed by pressing the call button before play is commenced. If call is pressed during play, then the next track to be played is displayed. Repeat caters for a single track, the entire disc or the programmed selection.

The small display has telltales for play, pause, programme, memory and repeat. The track number is shown reasonably large and it is joined by a standard time indicator covering the current track.

LAB REPORT

Output level is somewhat up on the CD standalone and the output impedance is a rather high 3.6kohms. Although there's no clipping of the full level white noise signal, the total harmonic and intermodulation distortion at high levels shows that it isn't all that happy here. Low level distortion too is a little up on average.

Stereo separation and balance are adequate, but the response has some high frequency rolloff and de-emphasis also shows some error. Error correction capability is very good, but shock and vibration resistance is only average. The -90dB sine wave is apparently modulated with some low level periodic noise and some low level spurious were discovered at very low frequencies. Linearity is fine down to -100dB, which is good for the price.

SOUND QUALITY

The bass is softened, slow, boomy, and lacks definition, with compressed dynamics and a boxy sound in the upper bass. Low level detail is masked, the midrange sounds coloured, squeaky and slow, and the unit seems unwilling to play more than one instrument at a time. It gets confused when there's a lot going on, and the panel agreed that the sound was generally reminiscent of 'early' players. Treble is imprecise and grainy, revealing little detail and with no life and sparkle.

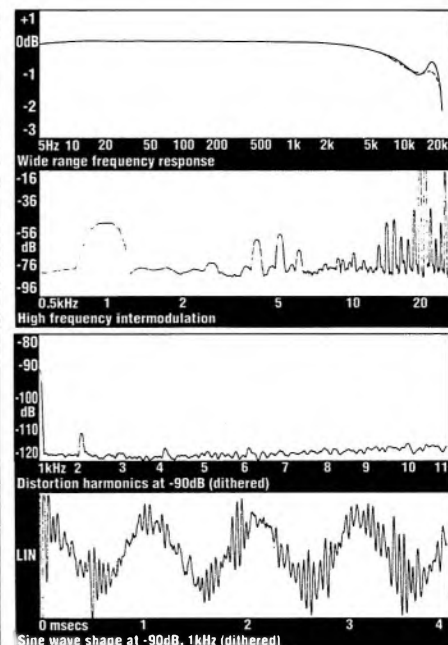
The stereo image has very little depth, images aren't convincingly formed and width is below average. Transparency and space are other words unlikely to spring into the mind of an owner of one of these players. It just does its job in a typical early CD fashion.

CONCLUSIONS

This basic player at a basic price puts in a basic performance. As a serious hi-fi product it's really a non starter, and should perhaps have been left in the midi system rack where it belongs.

TEST RESULTS

Test resolution (L/R av)		15.5 bits
Output level, source impedance	2.43V, 1.69dB, 3.6kohms	
Effective dynamic range		95dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	-68dB -67dB -48dB	
	(0.04%) (0.045%) (0.40%)	
Ref -70dB		-26dB
Stereo separation	98dB 96dB 56dB	
Stereo balance L/R	0.15dB 0.17dB 0.54dB	
Frequency response (20Hz to 20kHz)		±2.3B
High frequency intermodulation		-48dB (0.04%)
Electrical noise (CCIR ARM, 1 kHz)		-100dB
Mechanical noise		low
Ultrasonic noise		-95dB
Error correction		2.5mm gap
Shock/vibration resistance		average
De-emphasis		-0.5dB at 5kHz
Track finding speed (15, YEDS 2)		5 secs
White noise overload test		OK
Size (w x d x h)		33.0 x 29.0 x 8.0cms
Typical price inc VAT		£130





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YORKSHIRE

Bradford Rawson Square (near John St Market)
Tel: 0274 309266

MIDLANDS

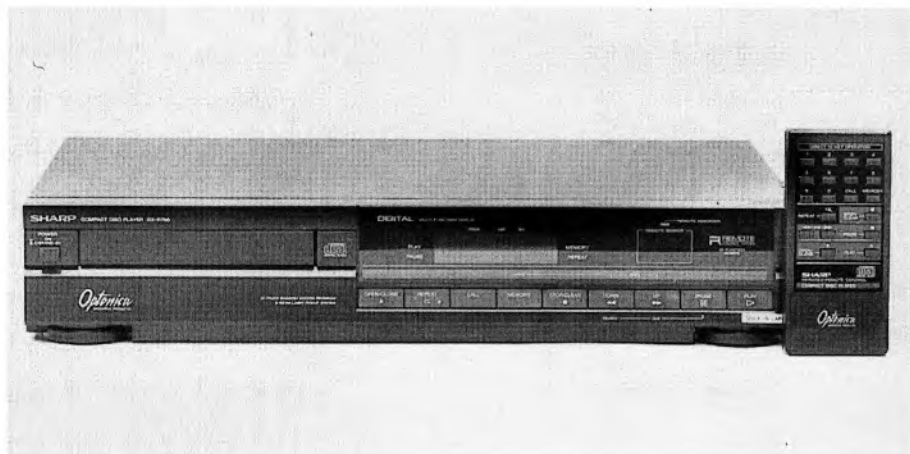
Birmingham Superfi, 67 Smallbrook Tel: 021 631 2675
Leamington Spa 49 Park Street Tel: 0926 881500

SCOTLAND

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SHARP DX-R750E

SHARP ELECTRONICS (UK) LTD., SHARP HOUSE, THORP ROAD, MANCHESTER M10 9BE. TEL: (061) 205 2333.



This is a relatively cheap remote control player bearing the Optonica 'innovative products' logo. Optonica used to be the brand name given to Sharp's hi-fi separates, though the company has more recently been operating almost exclusively in the value-for-money general consumer electronics area, sectors such as portables, video, microwaves etc. The company's position in the hi-fi separates sector has therefore never really been fully developed.

However, this player is something of a marketing exercise on Sharp's part; although it has remote control and is a full width example of the genre, it is really nothing more than a dressed up version of the midi sized player reviewed over the page. The only technical innovation appears to be in its modular construction, not its circuit technology.

The front panel sets it apart from its competitors, making no pretence at being an alloy extrusion it's presented in a high gloss plastic. A perspex panel covers a large proportion of this, protecting the display, some of the decals and the remote sensor window. The minimum repertoire front panel keys are arranged in a single row under the perspex panel. The sequence is logical, starting with open/close and passing through repeat, call, memory, stop, track search, pause and play. Like the 150, the fake front feet are moulded into the fascia.

The remote is relatively small and rather stylish. It covers all the front panel facilities and provides an instant track select keypad as well. Programming is available for up to 20 tracks, the display is a small, simple orange-lit LCD. It covers most things like track number and playing time, with telltale reminders of the various functions.

The box is constructed from undamped 'L' and 'U' shaped steel panels which are a little tinny, and about 70 per cent of the interior base surface is totally empty. All the main functions are placed on a board under the transport, with power transformers, supply capacitors and regulators on a separate board behind. The front panel display/control board has been expanded to accommodate the extended buttons and remote.

The transport is a standard plastic type with linear tracking worm drive laser transport, decoupled on a rubber suspension, and the disc clamp has some foam damping. The circuits employed do not use oversampling techniques and so require a brick wall analogue filter. The back panel has only the captive mains supply cable and a couple of standard line output phono sockets.

LAB REPORT

The full level output voltage is half a volt up on the standard, and was delivered from a higher than average 2.2kohms impedance, which could create some treble rolloff if driving capacitive loads such as long cable runs. Although the white noise test reveals no obvious clipping, the full level distortion measurements indicate some problems. Intermodulation products create an interesting spectrogram, and the downband distortion products of a single 20kHz full level tone were also high.

Stereo separation is reasonable at low frequencies, but diminishes as the frequency is increased, to an unexciting 56dB at 20kHz. The channel balance, however, is rather good on the whole. A surprisingly good signal-to-noise ratio was measured and ultrasonic noise is well suppressed. Dynamic range, assessed at 95dB, is fair, the low level (-70dB) distortion measurement likewise. Error correction is rather good, and resistance to shock and vibration is average, but the track finding is a little pedestrian by modern standards.

The frequency response shows some treble aberrations, with the high frequencies rolled off and a little uneven. The de-emphasised response was also a little wayward. Low level linearity is exceptional for the price - accurate down to -110dB - but this player also had a low level, very low frequency spurious tone which modulates low amplitude signals. This isn't clear on the -90dB sine wave, which in fact is well shaped.

SOUND QUALITY

This more expensive version of the 150 may have remote control but the panel's reactions

were little different, though ultimately it scored slightly higher due to a marginally better bass quality. It still sounds too soft and slow in the bass, but seems to lose some of the boxy quality of its cheaper stablemate. The mid and treble is still much the same - rather squeaky and hard with an accentuated upper mid register and a grainy treble devoid of life and sparkle.

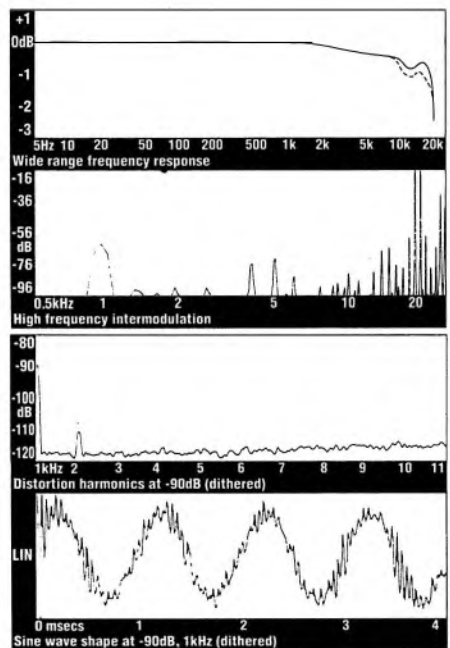
Imaging is imprecise and indistinct. The soundstage is rather narrow and lacks virtually any semblance of depth, while ambience recovery and transparency are also difficult to get excited about.

CONCLUSIONS

The indifferent sound quality could in some measure be accounted for by the problems discovered in the lab tests. Although some companies have managed to find some extra performance from old style non-oversampled designs, this one is clearly showing its age. As a CD player it functions as intended, but it needs more work to achieve a favourable level of sonic attainment.

TEST RESULTS

Test resolution (L/R av)		15.5 bits	
Output level, source impedance	2.47V, 1.83dB, 2.2kohms		
Effective dynamic range		95dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-68dB	-68dB	-47dB
	(0.04%)	(0.04%)	(0.45%)
Ref -70dB		-28dB	
Stereo separation	98dB	87dB	56dB
Stereo balance L/R	0.03dB	0.01dB	0.25dB
Frequency response (20Hz to 20kHz)			-2.0dB
High frequency intermodulation			-47dB (0.45%)
Electrical noise (CCIR ARM, 1kHz)			-102dB
Mechanical noise			low
Ultrasonic noise			-100dB
Error correction		2.4mm gap (after 1 glitch)	
Shock/vibration resistance			OK
De-emphasis			-0.36dB at 5kHz
Track finding speed (15, YEDS 2)			5 sec/s
White noise overload test			OK
Size (w x d x h)		42.9 x 29.0 x 8.1cm	
Typical price inc VAT			£180





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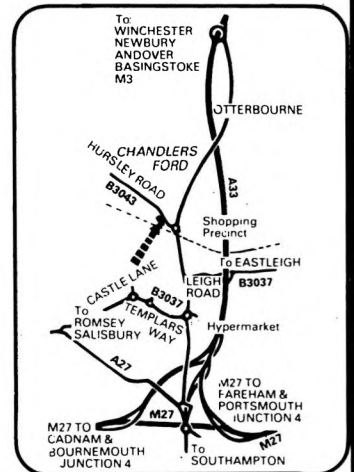
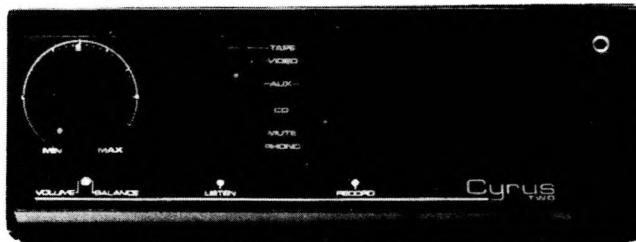
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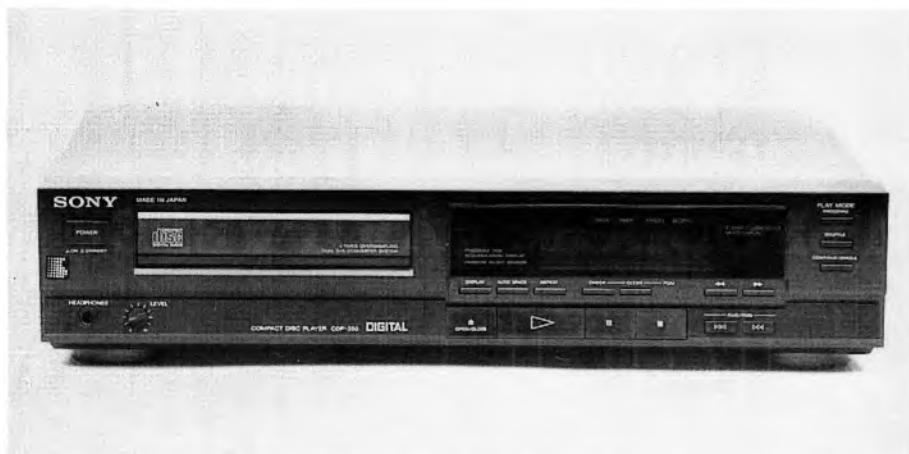


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SONY CDP 350

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RECOMMENDED



Sony hardly needs any introduction. It's one of Japan's major hi-fi producers, the co-developers of the CD format and has a high public profile. The huge range of CD players covers all but the very cheapest and has an enviable reputation for performance and quality.

The *CDP 350* is one of the cheaper units, but above average finish masks a fundamental plastic moulded construction which incorporates the large diameter feet. The front panel and keys are all made from plastic like the basic box, but an undamped, wraparound top panel and flat steel base plate give it some weight. It is finished in satin black to the normal high standards, but lacks finishing touches like gold plating to the phono plugs, and the wonderful diamond-milled 'Sony' lettering.

The facilities are fairly standard. There's no remote control (the *CDP-550* is the remote equivalent - see *Hi-Fi Choice No. 64*), index search, or keypad direct track entry select, so the front panel is fairly simple. This in turn of course means that it is very easy to use, and all the keys are logically placed in a hierarchical order of size to operational importance.

In keeping with recent Sony practice, there are three play modes, covering programme (20 tracks), shuffle and continuous single play. Apart from the obvious which every player has, there are keys for repeat, auto space, programme check and programme clear.

The display is more comprehensive than might be expected for the price, and includes a 16-track calendar display with rather small numbers, track, index and three time modes, covering track time played, track time remaining, and total time remaining.

The simple box is made fairly rigid by internal moulded bracing, and the large main board has a small 'on board' power transformer. Almost all the chips have Sony's name on them including the digital filter and dual digital-to-analogue convertor. Electrolytics come from Nichicon with the odd audiophile type in the analogue circuits. The layout is neat, needing only essential off board wiring.

The predominantly plastic transport is

8cm disc compatible and smooth in operation. Unusually, the laser carriage moves up to meet the disc, which means the top clamp is fixed. The steel sub-chassis is well decoupled on a fairly compliant suspension.

LAB REPORT

Like the more expensive *CDP 550* this player wasn't too happy at high signal levels, producing fairly high levels of harmonic distortion by CD player standards. The graph clearly shows the problems encountered on the intermodulation test: several orders of harmonics are present and the white noise signal is symmetrically clipped. However, it performs well at lower levels.

The channels have very good stereo balance and fine separation. The signal-to-noise ratio is better than 100dB (CCIR/ARM, 1kHz weighted), ultrasonic spurious are well suppressed, and the machine achieves a very creditable 107dB effective dynamic range. Error correction is around average, whereas shock and vibration resistance is good.

The frequency response shows a very mild treble rolloff above 2kHz (but only 0.27dB down at 20kHz); the de-emphasised response is also accurate. The -90dB sinewave has good shape and only a little spurious mush, while low level linearity is exceptionally accurate down to -110dB on both channels.

SOUND QUALITY

The panel wasn't as enthusiastic over the *CDP350* as they had been about the *CDP550* last year, even though it appears to be virtually the same player, albeit remoteless. It received only a fair rating, which is nonetheless reasonable for a £180 player.

The bass sounds a little soft and down on slam and power, failing to give rock and jazz material the required substance. It has enough weight and extension, but like the *CDP550* has a slightly 'bumpy', 'boomy', characteristic. The midrange can become hard and edgy on loud material, and has a mild tendency to shriek on classical strings, which is a result of the perceived upper-mid-forward balance. The treble is a mite grainy

and tizzy, drawing rather too much attention to itself for comfort.

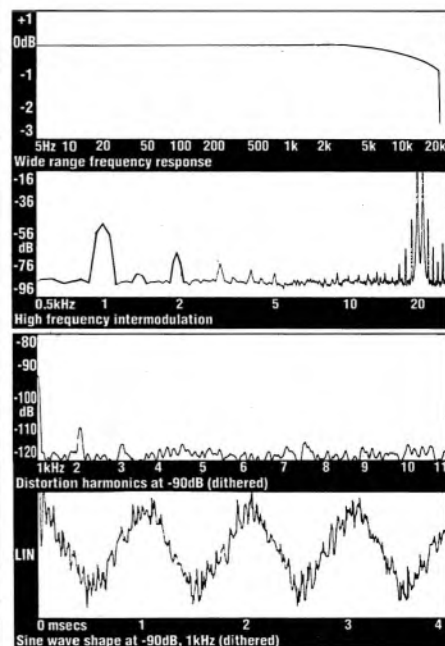
Depth is close to average, width reasonable and there is some projection of images into clear space, though ambience recovery and clarity are not too strong.

CONCLUSIONS

The *350* is cheap and well made, the facilities are adequate, but the lab tests show up some weakness. As there are several players in this price bracket which sound rather better and have better facilities including remote controls, this Sony doesn't produce enough plus points to achieve formal Recommendation.

TEST RESULTS

Test resolution (L/R av)	15.4 bits		
Output level, source impedance	2.1V, 0.42dB, 2kohms		
Effective dynamic range	107dB		
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-67dB	-67dB	-77dB
	(0.045%)	(0.045%)	(0.014%)
Ref -70dB			
Stereo separation	123dB	104dB	78dB
Stereo balance L/R	0.03dB	0.02dB	0.03dB
Frequency response (20Hz to 20kHz)	±0.27dB		
High frequency intermodulation	-50dB (0.32%)		
Electrical noise (CCIR ARM, 1kHz)	-101dB		
Mechanical noise	average		
Ultrasonic noise	-107dB		
Error correction	1mm gap		
Shock/vibration resistance	good		
De-emphasis	-0.08dB at 5kHz		
Track finding speed (15, YEDS 2)	3 secs		
White noise overload test	symmetric clip		
Size (w x d x h)	43.0 x 34.0 x 9.7cms		
Typical price inc VAT	£180		



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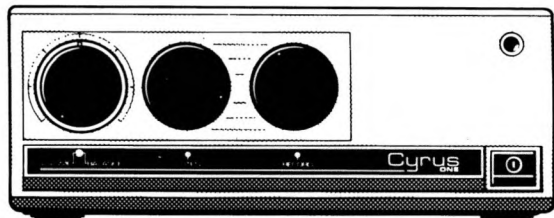
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SONY CDP 50M

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This is Sony's unusual – indeed unique – challenger in the multi-disc autochanger market. Unlike normal run-of-the-mill auto-changers it doesn't have a removable cartridge or caddy into which discs are loaded. Instead a large carousel loading drawer stretching the full width of the player has space for five discs, all on the flat with labels exposed to view. The disc transport therefore consists of a circular plastic tray with 5 indents into which the 12 or 8cm discs neatly fit. Each section is numbered and the carousel revolves to the next disc position by pressing disc skip; it doesn't mind if each position is full or not.

Autochangers arguably don't make much sense if remote control isn't provided, so this Sony includes only a minimum of front panel controls, sensibly leaving most of the control tasks to the remote. The front panel facilities are therefore limited to play/pause, stop, track skip, disc skip (used when loading), five buttons for disc select, external timer on/off, variable headphone socket and the display with its associated time display switch.

The remote control is fairly small and falls easily to hand. It duplicates most of the front panel controls and also incorporates an 11-button track selector, shuffle play, repeat and programming facilities. It's possible to programme up to 32 selections using the remote handset, in any order and from any disc. The main display is similar to that on the CDP350, with track number and time (three modes), plus a calendar display of 16 tracks and operational flags, but it has been expanded to include disc number as well.

The construction formula is normal Sony practice at this price level – predominantly plastic, with a U-shaped steel lid and pressed steel baseplate. The large loading tray means that this player is rather deeper than usual, stretching a full 38cm back, while the carousel arrangement makes the inside rather complicated and more cramped than an ordinary player.

The 50M uses the Sony 4x oversampling digital filter to drive a dual DAC of the same make. The power supply is fairly small and all the capacitors and passive components are of

standard commercial quality. There is no evidence here of any attempt at improving sound quality by inserting the odd audio-grade cap in important places. However, the unit is well engineered and the board layout is neat and tidy.

LAB REPORT

This is another Sony player with problems at full level – it clips a white noise signal (symmetrically), and harmonic and intermodulation distortions are fairly high – see graph. The low level results are fine, the unit has a decent effective dynamic range, and the signal-to-noise ratio is respectable too. Error correction is adequate and resistance to shock and vibration is around average.

Stereo separation is good, as is stereo balance. Whereas the output level is exactly to the CD standard the source impedance is higher than most. The dithered -90dB sine-wave has a good shape without much noise, and note the absence of distortion harmonics on the -90dB spectrogram, which results from the very good low level linearity that extends with hardly any error down past -110dB into noise. There is a slight treble rolloff past 4kHz on the frequency response, but this is very mild and the de-emphasis circuits are reasonably accurate. Track selection from any disc was very fast for an autochanger.

SOUND QUALITY

The listening tests showed that this player has obviously limited sonic ability. Clarity and subtlety are somewhat lacking, which results in some incoherence throughout the frequency range. The low end has too much weight but also sounds soft and dynamically compressed, to the extent that the music seemed slow at times. Treble too has its problems with grain, and can sound tizzy and excessively 'up front' at times. When loud it becomes hard and edgy, putting a gloss on strings and increasing nasality in the human voice.

Focus is vague and could become phasey with difficult material. Depth and width were both judged below average and the M50 doesn't project images well or create subtle

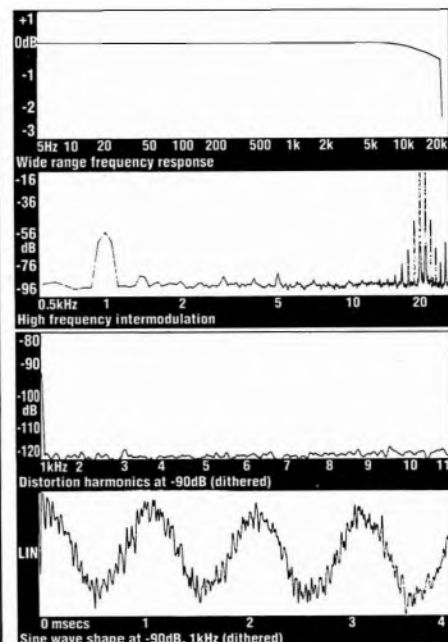
layering effects.

CONCLUSIONS

I like the concept of this player very much indeed. It's very easy to use and you can enter a whole evening's listening without moving from your chair, handy for those who have trouble moving around, or just feel very sedentary. It's a pity that the technical and sonic performance are rather average, but at least the package is relatively cheap.

TEST RESULTS

Test resolution (L/R av)		15.5 bits	
Output level, source impedance		1.99V, 0.04dB, 2kohms	
Effective dynamic range		106dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-77dB	-72dB	-76dB
	(0.014%)	(0.025%)	(0.016%)
Ref -70dB		-35.5dB	
Stereo separation	106dB	106dB	81dB
Stereo balance L/R	0.06dB	0.07dB	0.07dB
Frequency response (20Hz to 20kHz)			±0.28dB
High frequency intermodulation			-53dB (0.22%)
Electrical noise (CCIR ARM, 1kHz)			-100dB
Mechanical noise			average
Ultrasonic noise			-100dB
Error correction			1mm gap
Shock/vibration resistance			average
De-emphasis			+0.3dB at 5kHz
Track finding speed (15, YEDS 2)			3 secs
White noise overload test			symmetric clip
Size (w x d x h)			35.6 x 38 x 10.7cms
Typical price inc VAT			£250



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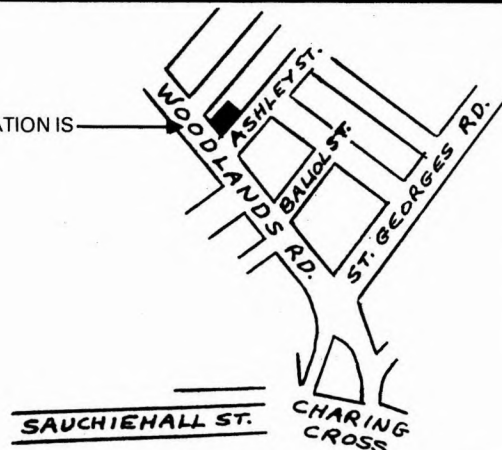
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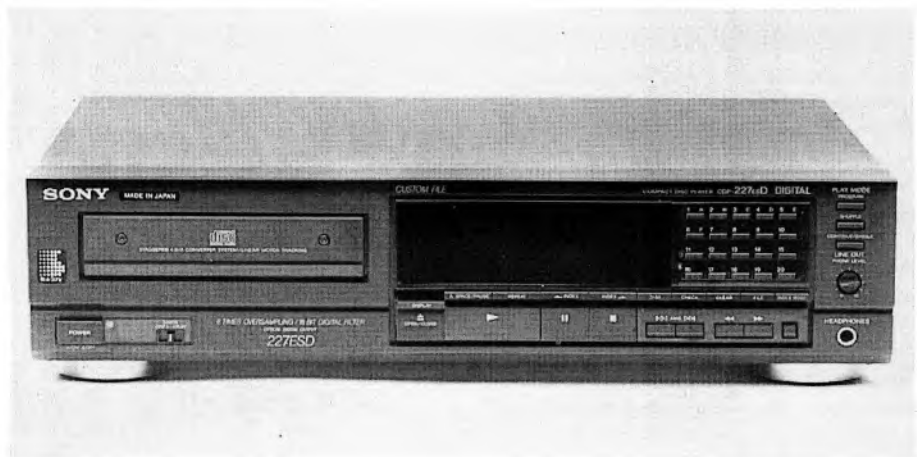
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SONY CDP-227ESD

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RECOMMENDED



The CDP-227 is one of Sony's ESD range of equipment which is endowed with a first class level of both build quality and facilities. In previous *Hi-Fi Choice: CD Players* the ESD CD players have scored highly, and although the CDP-227 is the cheapest in this range, it still looks and feels a substantial unit.

The extensive front panel facilities are all backed by a remote commander which it shares with the rest of the range. This includes a remote volume control which is effective over the headphone output and a pair of rear mounted phono sockets. A nominally superior sounding set carries the normal fixed output, but the variable set can be connected directly to power amplifiers, and the pre-amplifier rendered redundant.

Amongst the programming features is 'custom file', a more elaborate version of the Philips FTS system, in that it allows a playing order to be pre-programmed for up to 226 discs, the unit automatically recognising the disc on loading. The elaboration is the addition of a 'disc memo' function which allows a comment about a disc of up to ten letters to be stored in the same memory, and this appears on the display each time the disc is inserted.

The display is as comprehensive as the controls, with track number, playing time, index, helpful programming assistance, flags for everything, and includes the custom index facility and memo function. It is more visible at a distance than most, and greatly helps in extracting full use of all the player has to offer.

The case is basically an open box made from plastic, but this is internally braced for strength and has a heavy laminated steel bottom panel. The lid is of light steel construction; although it has damping material applied, it still rings somewhat when tapped. The transport is mainly plastic though it's mounted on a fully decoupled, ceramic reinforced base. A cheaper worm drive replaces the linear motor of the more expensive models, though it works efficiently enough. The tray accepts both 8cm and 12cm CDs.

All the major function electronics save the display are mounted on a single, neatly executed board. Top quality parts have been

used in important sections, such as Cerafine capacitors in power supply, decoupling and audio coupling applications. An 8x oversampling digital filter feeds two dual Philips *TLA1541* digital-to-analogue converters which share the digital data from the filter on and odd/even number basis. This stage is followed by a conventional operational amplifier output stage, based on *NE5532* dual op-amps and a simple 3-pole output filter. The remote/front panel volume control is a motor driven Alps pot. On the back panel are two sets of line output, gold-plated phono sockets, one variable the other fixed, and switchable optical and coaxial digital outputs.

LAB REPORT

On the whole the measured performance is first class. Aspects such as channel separation, channel balance, signal-to-noise ratio and total harmonic distortion are all hard to fault. The intermodulation distortion results are among the best ever measured and spurious of all types are well suppressed. The -90dB sine wave is very clean, although linearity tests showed some accentuation of very low level (-90dB) signals. Error correction benefits from Sony's latest 'error prediction logic servo II'.

SOUND QUALITY

While not quite up with the best players covered in this issue, the 227 put up a fair account of itself in the listening tests. Unlike machines using Sony's earlier 4x oversampling digital filter, this model seems largely devoid of the high level clogging effects from which the cheaper models suffer.

The bass in particular is strong and fluent. Though kept well in bounds, it creates the excitement of percussive sounds with an admirable air of authority. The midrange is generally pleasant and revealing with a balance which only just edged towards hardness on a couple of occasions, and both times on particularly difficult classical pieces recorded to a high level.

Focus is very good, beaten only by a few generally more expensive models, and images are well separated within an amply

extensive soundstage.

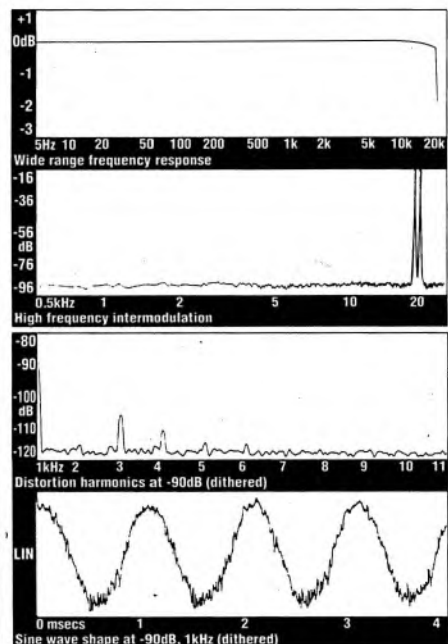
The sound out of the variable output isn't so convincing. The soundstage shrinks noticeably, particularly in the depth plane and there's a general loss of transparency. Dynamic impact is more restrained and there is more of the hint of hardness in the upper midrange. However, direct connection to a power amplifier and deletion of a pre-amplifier from the signal path should create compensating improvement depending on the nature of the preamplifier used.

CONCLUSIONS

Taking build quality, technical performance and sound quality into account this is one of the more interesting players on the market. While other units at a similar price do one or two things better, it will be difficult to find one which combines all these attributes in such a complete package.

TEST RESULTS

Test resolution (L/R av)		15.8 bits
Output level, source impedance	2.20V, 0.83dB, 200ohms	
Effective dynamic range		108dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	-95dB -94dB -92dB	
	(0.0018%) (0.002%) (0.0025%)	
Ref -70dB		-34dB
Stereo separation	132dB	120dB 94dB
Stereo balance L/R	0.11dB	0.11dB 0.08dB
Frequency response (20Hz to 20kHz)		±0.3dB
High frequency intermodulation		-103dB (0.00071%)
Electrical noise (CCIR ARM, 1kHz)		-100dB
Mechanical noise		low
Ultrasonic noise		-110dB
Error correction		2.5mm gap
Shock/vibration resistance		average
De-emphasis		+0.14dB at 5kHz
Track finding speed (15, YEDS 2)		2 secs
White noise overload test		OK
Size (w x d x h)	43.0 x 34.0 x 10.9cms	
Typical price inc VAT		£400



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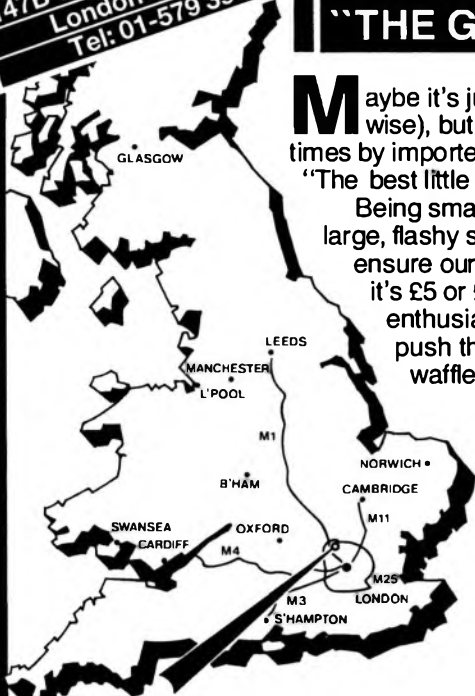
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TEAC PD-470

TEAC (UK) LTD., 5 MARLIN HOUSE, THE CROXLEY CENTRE, WATFORD, HERTS WD1 8YA. TEL: (0923) 225235.



The Japanese Teac brand is active in both domestic and professional markets. Although most famous for analogue open reel tape recorders and cassette decks the company continues to produce a comprehensive range of hi-fi separates and has long been active in the area of digital sound. The range of CD players is comprehensive, covering the market from the inexpensive right up to a two-box 'super heavyweight'.

The PD-470 is an entry in the hotly contested £250 price region, and is comprehensively equipped and well specified. The front panel layout provides a familiar variation on a theme - there is only so much you can do with the styling unless you break totally from the established format, which few are willing to do.

All the normal basic track and play manipulation controls are present. The 11-key direct track selectors have plenty of room between the buttons and consequently good access. All the other controls nestle beneath the display window and include single track or whole disc repeat, a programming section for up to 20 tracks, an auto space facility to create four second spaces between each track, and a time button which changes the display mode. The display itself is satisfactorily large and comprehensive with index as well as track numbers, playing and remain times as desired, plus a track calendar array.

The remote control keypad has even more buttons than the front panel, though it's small enough for one hand operation. The additional features cater for A-B repeat (any section), programme check and cue lock, which locks the player into the audible search mode if desired.

Like many of the current crop of players, the case is plastic with integral back-to-front and longitudinal moulded in bracing. This moulding also contains the basis for the transport, though the laser and direct drive disc motor are mounted on a four-point suspended subchassis and decoupled by undamped springs. The top and bottom panels are of undamped steel, and the whole forms a stiff and resilient construction, sitting on four, gold-banded plastic feet. The front panel is a plastic imitation of an alloy

extrusion.

The main circuit board contains many Sony chips, up to and including the digital filter which drives two Burr Brown *PCM56P* DACs run at a 4x oversampled rate. The analogue filtering and output circuits are constructed round 'in line' operational amplifiers, and internal passive devices are standard commercial types. The power supply transformer is one of the smallest in any CD player and the whole caboodle only consumes 10W. A switchable coaxial digital output is provided alongside the nickel-plated analogue phono sockets.

LAB REPORT

No real problems were revealed during the lab testing of this product. Stereo balance is a little worse than normal and track selection time a second or two slower. There is little error in the frequency response and linearity errors are held to a maximum of 3dB right down to -110dB. The error correction circuits are only capable of thwarting missing code up to a maximum of 0.8mm, where some modern designs manage up to 4mm.

SOUND QUALITY

This player is pleasant. It doesn't make any of the nasty squeaky sounds of earlier generation machinery, but in so avoiding is also rather soft and just a little bland. The bass is too spongy and 'rounded', lacking in dynamic impact and consequently the ability to excite the listener. Rock tracks lose some of their explosive quality while the tactile qualities present in many classical and jazz pieces are subdued. The treble sounds too dull and loses too much detail - the decay of cymbals and bells seems just too fast. The midrange is pleasant, devoid of hardness or emphasis, but like the treble misses out on the nuances which make for good hi-fi. Emotional impact is missing from voices, along with some of the timbral quality of instruments rich in harmonics.

Soundstage perspectives need to be better constructed. Although some depth is available from better recordings, images are not projected into space in the way that better designs manage. Intricate material sounds

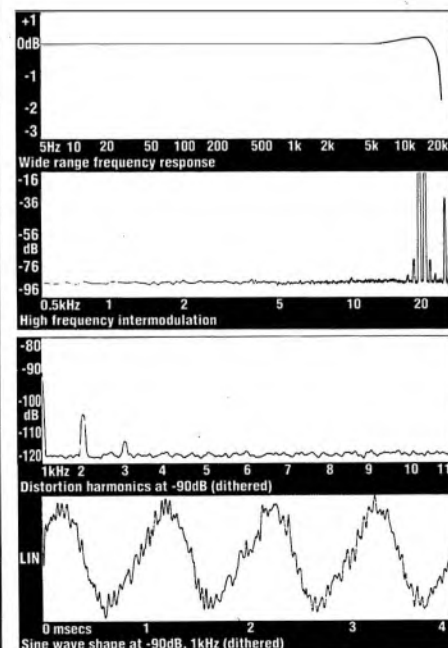
over-simplified, compounding the view that there's a general lack of ambience. Width is only average and the sound is all too one-dimensional.

CONCLUSIONS

Pleasant just about sums this player up for sound quality, but in its pleasantness it loses musical excitement. On the plus side it does appear well made, I liked the ergonomics, and the lab performance is good. But at this price the competition is a little too fierce to allow for any great enthusiasm.

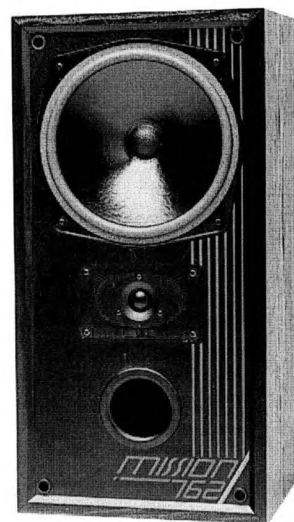
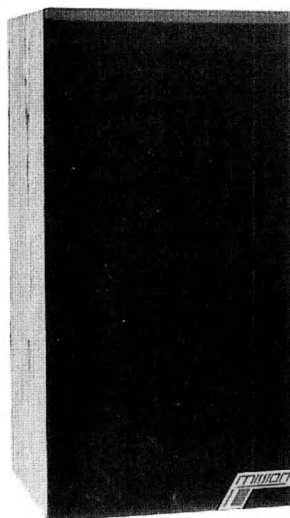
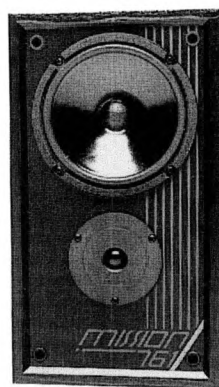
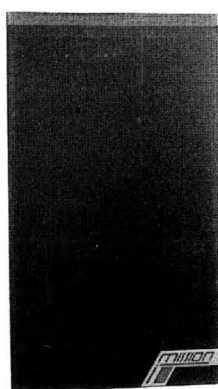
TEST RESULTS

Test resolution (L/R av)	15.9 bits
Output level, source impedance	1.95V, -0.22dB, 1kohms
Effective dynamic range	107dB
Harmonic distortion	20Hz 1kHz 20kHz
Ref 0dB	-91dB -90dB -82dB
	(0.0028%) (0.0032%) (0.0079%)
Ref -70dB	-37dB
Stereo separation	113dB 103dB 78dB
Stereo balance L/R	0.40dB 0.41dB 0.16dB
Frequency response (20Hz to 20kHz)	-0.6dB
High frequency intermodulation	-90dB (0.0032%)
Electrical noise (CCIR ARM, 1kHz)	-99dB
Mechanical noise	low
Ultrasonic noise	-110dB
Error correction	0.8mm gap
Shock/vibration resistance	average
De-emphasis	+0.15dB at 5kHz
Track finding speed (15, YEDS 2)	4.0 secs
White noise overload test	OK
Size (w x d x h)	43.4 x 29.5 x 8.9cms
Typical price inc VAT	£250



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TEAC ZD-880

TEAC (UK) LTD., 5 MARLIN HOUSE, THE CROXLEY CENTRE, WATFORD, HERTS WD1 8YA. TEL: (0923) 225235.



Teac has been in the audio business for a little over 30 years, and produces a wide range of electronic goods aimed at the hi-fi market — there are no fewer than 15 cassette decks listed in this year's catalogue, for example. The compact disc player range covers a mere nine machines if you include the extravagant two-box flagship, the £450 ZD-880 sitting only two down from the top.

There's no doubt that the external finish and build quality comes close to expectations. The unit has a solid feel, and the steel top panel produces a satisfyingly dead sound when excited by external stimulus. The front panel is a high quality anodised alloy extrusion and the plastic buttons are well finished. Much of the lettering is in bright gold and the front panel is turned into a not unattractive advertisement for what is contained within.

The player apparently has Teac's own ZD digital circuit to minimise digital distortion, and direct coupled linear phase analogue circuitry. Facilities include keypad direct track select, A-B and one/all repeat, auto space, index search, facilities to accommodate an external timer, random memory programming for up to 20 tracks and a cue lock facility. The latter is a locking version of finger-on forward search (unlocked by pressing one of the other transport function keys), and is designed to operate with Teac cassette decks which have a CD level check function, allowing recording levels to be matched accurately to CD output.

The display is discreet yet comprehensive, with track index and playing time (remain time, total remain time and track playing time) and 20-track calendar display which is designed to help when programming the memory. The headphone output is variable.

The case is a steel box with heavily damped top cover. The base is a two layer construction, apparently devoid of damping material. As well as gold plated analogue phono sockets there is also a switchable digital coaxial socket. Internally the player is appropriately built with the printed circuit board laid out in a logical fashion. The wiring harness is slightly messy but in general build quality is well up to standard. Separate supplies for analogue and digital stages are fed

from a shared transformer, with each set of reservoir capacitors and regulators close to their respective parts of the boards. A Sony digital filter feeds two Burr Brown PCM54HP DACs, followed by a complex analogue filter and a high current copper earth bar inserted between the channel circuitry. Most of the parts are of standard commercial quality, but there are some top quality components in important places. The output stage, for instance, uses selected NE5532 AN operational amplifiers. The transport uses a linear motor to track the laser, and rests on a well decoupled sub-chassis — even the clamp ring has some foam damping attached.

LAB REPORT

The response reveals some mild high frequency filter ripple, coupled with a slight rise in output above 8kHz, but the de-emphasis test shows little error. The (CCIR/ARM, 1kHz weighted) signal-to-noise ratio is below average, but it remains good nonetheless, given the CD medium's strong showing in this department. The error correction capability is also a little below the best, but no problem is envisaged with any undamaged discs.

Harmonic and intermodulation distortion figures measure much as expected and must be considered good at low levels in the light of the -90dB spectrogram. The -90dB sine-wave has a good shape, but is somewhat noisy. The low level linearity is good with only a minor -2dB weakness at -90dB and -3dB at -100dB.

SOUND QUALITY

The bass is extended with reasonable emphasis, but is not really articulate enough to allow detailed bass lines to be followed with any sense of ease. The sound is a little sharp in the midrange, with some loss of dynamics and clarity and an attendant deficit of life and ambience. The midrange sounds slightly loud and muddled, and violins, for instance, come over as smeared in perspectives. There's some treble grain, but more importantly information is not cleanly portrayed and there's some loss of clarity here.

The soundstage is narrowed, treble focus is also weak and a mild haze obscures depth.

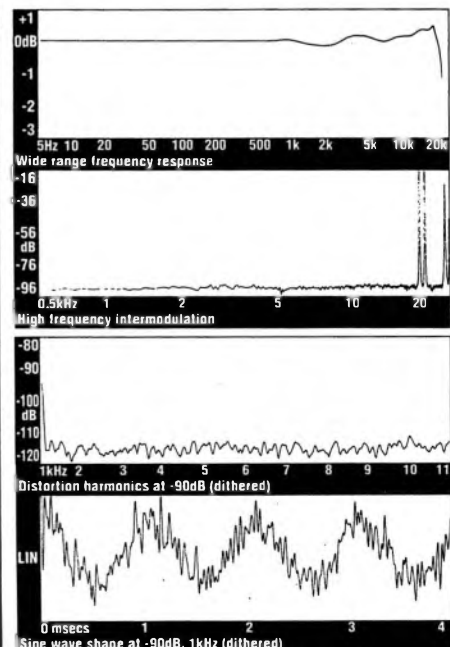
It was generally agreed that this player is none too strong on staging.

CONCLUSIONS

For £450 you are entitled to expect a first class level of build coupled to good facilities and well above average sound quality. This player is well made and the finish is first class. Although the lab performance measures up, it is ultimately let down by an indifferent sound quality.

TEST RESULTS

Test resolution (L/R av)	15.8 bits		
Output level, source impedance'	2.00V, 0dB, 1kohms		
Effective dynamic range	102dB		
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-88dB (0.004%)	-88dB (0.004%)	-89dB (0.0035%)
Ref -70dB	-34dB		
Stereo separation	113dB	109dB	89dB
Stereo balance L/R	0.08dB	0.07dB	0.05dB
Frequency response (20Hz to 20kHz)	±0.5dB		
High frequency intermodulation	-97dB (0.0014%)		
Electrical noise (CCIR ARM, 1kHz)	-88dB		
Mechanical noise	average		
Ultrasonic noise	-102dB		
Error correction	0.8mm gap		
Shock/vibration resistance	very good		
De-emphasis	+0.13dB at 5kHz		
Track finding speed (15, YEDS 2)	2.5 secs		
White noise overload test	OK		
Size (w x d x h)	43.5 x 30.0 x 9.6cms		
Typical price inc VAT	£450		



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THE SOUND ORGANISATION

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TECH TALK

Our test programme included complete laboratory analysis as well as thorough auditioning of each player. Here we explain the review approach and test methods.

The sound quality of top of the range black disc players remains beyond question, but CD players are winning more and more sales from analogue.

The general consensus seems to be that CD provides a reliably good baseline of audio quality, which is more than satisfactory for the majority of non-enthusiast applications. Given this baseline the more critical listener can discern significant and important differences in CD player sound quality. In context, a CD player can be auditioned much as one investigates an audio preamplifier; indeed many of the subjective effects may be described in amplifier sound parlance.

The advantages which are indisputably offered by Compact Disc players over vinyl disc playing equipment can be summed up as follows:

- 1) Up to 1 hour 15 minutes uninterrupted playing time.
- 2) Freedom from surface noise, clicks and pops.
- 3) Discs are comparatively damage and wear proof (provided some care is taken).
- 4) No complications of stylus wear, contamination or alignment.
- 5) Full automatic facilities, track programming etc, many players having comprehensive remote control.
- 6) All the usual 'cheap turntable' problems such as pitch stability, wow and flutter etc, are absent.
- 7) CD players can be small.
- 8) High level 'flat response' output can obviate the pre-amplifier, and many players also have competent headphone outputs.
- 9) High lab specifications for distortion, balance, separation and signal-to-noise ratio.
- 10) Some immunity to acoustic feedback and reasonable levels of shock and vibration resistance.
- 11) The sound is relatively neutral, with a wide open frequency characteristic as well as notably good bass, since arm/cartridge

subsonic resonances are avoided. Stereo is usually very stable and well focused, with much separate detail.

That said, there remain enthusiasts who continue to prefer their music from vinyl LP sources, complaining of a slightly 'amusical' quality about the sound of CD. The enormous new and secondhand repertoire and much lower disc prices remain further major vinyl incentives.

As regards the more subtle aspects of sound reproduction, CD players can vary in their stereo presentation – some have a more relaxed 'distanced' perspective while others seem more direct and 'up-front'. Differences can be found in the far space or depth region behind the frontal image plane, while some players may also show a softening of definition in the bass or treble extremes. The treble may also appear a touch 'grainy' and fatiguing. The mid can vary in tonal quality, with a thinner, 'harder' effect on some players, and a sweeter, more natural balance on others.

LABORATORY TESTS

The format for the presentation of the CD test programme was first introduced in issue 64 last November, replacing the existing version which had been used for some years.

A new technical test was used on all the players in this month's crop. The *CBS 1* test disc contains a fade to noise track for exploring the low level linearity of CD players. This is a dithered 500Hz signal starting at -60dB and over a 30 second period it fades linearly to -120dB . Using the computer controlled Audio Precision System One test set with a very wide dynamic range, it is possible to track this tone down to the noise floor of the CD player. Any linearity error is easily assessed and, although the graphs produced by this method have not been published, comments as to the strength of the players in this department have been commented on in the reviews where appropriate.

The frequency response test runs over a test range of 5Hz to 22.5kHz and the intermodulation

graph is presented on a logarithmic frequency scale from 500Hz to 25.5kHz, to reveal the audible band distortion products and also the presence of nearby higher frequency components.

The graphs include a readout of the -90dB recovered sinewave, achieved by triggered time averaging. The encode signal is dithered (from CBS disc CD1) which means that any deviations from a pure sinewave are very much the responsibility of the players. Accompanying the replay sinewave is a spectrum analysis of that signal clearly showing both the distortion harmonics present and the audible noise floor. The graph runs from 1 to 11kHz and hence the fundamental is set at the starting vertical line while the peaks shown are the harmonics themselves. Shown on a high

specifications, and player resolution is expressed directly in bits, this estimated from a combination of low level distortion and linearity and the accuracy of level recovery from -70 to -100dB recorded modulation at 1kHz.

The standard surface gap error test has been expanded from the previous maximum of 0.8mm up to 4mm, and while most players do pretty well these days, with error protection for 0.8 to 1.2mm of data gap loss, a few examples are still quite amazing, with enough processing power to stay audibly clean on up to 3mm of missing data – a huge chunk in context of the very high density of data storage on the disc.

For frequency response, a high resolution graph has been used. Left and right channels are both assessed to ensure that no balance errors occur. Other tests include checking for correct de-emphasis; testing response alignment; output impedance (important when using passive control units); output level; track location speed (assessed as the time taken to access track 15 on the Sony test disc YEDS2). Weighted and unweighted signal-to-noise ratios were measured with and without pre-emphasis and each player's mechanical noise was also assessed.

LISTENING TESTS

After a reasonable conditioning/warm-up period, each player was auditioned by a small group of experienced listeners using a wide range of source material, paying particular attention to establish consistency of rating against previous reviews.

The basic reference system included bi-wired Celestion *SL700* loudspeakers on Celestion stands, driven by a variety of exotic cables from Musical Fidelity *MA100* power amplifiers, fed from a high quality passive volume control. Reference was made to vinyl reproduction from a Linn *Sondek* with Rega *RB300* arm and a van den Hul *MC10* cartridge. The software used ranged from early choral music with solo voice, through chamber music, full orchestral pieces to a selection of jazz, rock, and pop.



The Celestion SL700 used in the listening tests.

resolution scale, it runs from -90dB relative to peak modulation to a low -130dB probing deep into the lower levels of CD replay resolution.

The test results tables include a figure for effective dynamic range, the amplitude window available from MSB peak or a nominal 2 volts down to the practical noise and distortion floor. Distortion results are given in dB and percentage to aid comparison with other tests and

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CD PLAYERS: CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS

Chris Bryant sums up this month's major review project on CD players. If you're on a tight budget there are bargains to be had, for sure.

We seem to say this every time we test a large group of CD players, but in general the performance of every aspect of CD players continues to improve as manufacturers try harder to secure a market share. The best of the cheap players has now advanced to the extent that they are as good as some of the highly rated audiophile models of a year or so ago, both in technical and sonic performance.

In this issue of *Choice* the divide between the worst and the best similarly priced CD players has grown. This makes choosing Best Buys and Recommendations more clear cut. With even some quite cheap players attaining excellent results in both the lab and the listening tests, standards have had to be raised before any *Choice* accolade is appropriate.

The difference in price between the cheapest and most expensive players continues to grow. At the cheap end they are getting even cheaper, with some CD players available for under £100, while more than £5,000 is needed to purchase some flagship models. Generally, as the price rises the number of facilities becomes greater, the technical implementation more lavish, the weight heavier and the build quality superior. However, paying more does not necessarily ensure the best sound quality for your money, with some players costing less than £200 being ridiculously able in terms of sound and technical merit.

Where technical aspects are concerned, the surprise of this issue was the performance of the players using Philips digital filters and digital-to-analogue converters (DACs). The major fault with the original *TDA1541* DAC coupled with the *SA7220* digital filter was the very poor low level linearity. However, in their latest guise this problem is substantially reduced, and the players using them have benefited. Most of the current production appears to be 'A' grade for the DAC and 'B' grade for the digital filter. Last year these were the designations of the specially selected chips used

only in the top models. Now, even the £150 players had these fitted, so Philips has obviously improved the quality of its production.

Philips based players have always sounded dynamic, lively and in general rather better than similarly priced players using other manufacturers' components. Gleaning information from manufacturers around the world, it appears that the consensus of opinion is that much of the Philips advantage lies in the design of its 'good sounding' DACs. Sony and Nakamichi have adopted Philips DACs in some of their best players and consequential improvements have resulted.

At present the good players with extra bits and greater oversampling rates don't seem to be any better than the standard 16-bit variety using a 4-times oversampling rate. The theoretical advantage in using a higher oversampling rate and more bits is very small anyway, and it is thought by some that many currently available DACs don't work well at the higher rate.

I wasn't the author of the last *Hi-Fi Choice* edition of CD players. However, for that issue I was a member of Martin Colloms' listening panel, and for this issue he returned the favour. Also, Colloms Electroacoustics Labs were used for all the technical measurements. As the same techniques were used throughout all the tests, the consistency of the review opinion here is maintained with respect to previous issues.

BEST BUYS

Marantz CD583 (£150)

For £150 this player is a steal. Although it's short of a remote control it has plenty of on-board facilities. An incredibly good lab performance coupled to virtually audiophile status in the listening tests. Amazing value at this price.

Pioneer PD4100 (£170)

Available in silver as well as black, this simple player proved to be an exciting performer. It may be short on the facilities site, but the *PD4100* was well liked for

its good sound quality.

JVC XL333 (£170)

This little JVC player is packed with features with the exception of a remote control. If you can get past the orange display, the sound quality is very respectable and one of the best JVCs yet, irrespective of price.

Philips CD582 (£200)

This is a player which has remote control and vies with the Marantz *CD583* for the title of 'best cheap player going' for both sound quality and technical performance. Added to this, even the display and the ergonomics are good.

Philips CD782 (£230)

The *CD782* arguably didn't sound quite as good as its cheaper stablemate, but it put in a more than competitive performance, both technically and sonically. It has the added attractions of a fully featured remote control, FTS and a simple six step remote volume facility. Styling is just a little bland.

Akai CD 62 (£330)

Where the build quality is well up to standard and the features are plentiful, the lab performance was only adequate. However, this player shone in the listening tests, especially in the bass and midrange.

Marantz CD75/IISE (£350)

It may still be housed in a plastic box, but it's what's on the inside that counts. In *SE* guise this player has plenty of facilities, a very good lab performance and the sound quality of a *CD65/IISE* (see *Choice* No. 64). Audiophile CD quality for those who thought they couldn't afford it.

RECOMMENDED

Sony CDP227esd (£399)

The build quality and especially the ergonomics of this player are a delight. It has a vast number of useful facilities and generally measured up very well in the lab. Sound quality performance is starting to be overtaken slightly by the best of the competition, but at the present time it's still

good enough to see off most pretenders

Sansui CD-X701i (£450)

One of the prettiest players in this issue to some eyes. It achieved credibility in both the lab and the listening tests and has plenty of facilities. Although in some ways it's technically a bit old fashioned (only 2 x oversampling methods are used) it deserves a Recommendation.

Onkyo DX-7500 (£450)

This player is lavish in many respects. It has a vast number of facilities, different rather 'attractive' styling, plus a good level of technical innovation and performance. If Onkyo had trimmed the DAC correctly it would have been better still. The midrange sound quality is the best in its price range and so it must be highly Recommended.

Denon DCD-1520 (£500)

Although it has its technical hype – 8 x oversampling and full 20-bit conversion – for once it's mostly justified, as some aspects of the *1520's* lab performance were truly amazing. The player has plenty of facilities, is well built and the good listening test results ensured its Recommendation.

Marantz CD85 (£550)

This is a heavily built, extravagantly manufactured player with an ample number of facilities. Lab performance was impressive and the sound quality very competitive in its class.

Marantz CD12LE (£2,500)

Design and build quality is completely O.T.T. – and the price is approaching the absurd. But there's no denying that this is Marantz's best sounding CD player yet. If you want the best you have to pay the price, and the law of diminishing returns seems more prevalent in CD players than in any other area of audio. This is a fabulous machine, but is the improvement in sound quality over the *CD75/IISE* really worth £2,150? It's your cheque book...

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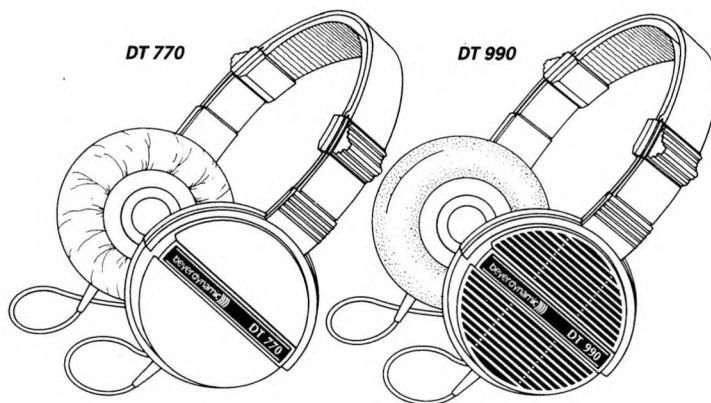
Perhaps we could persuade you that it will go nicely with other status symbols, like your Porsche.

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Expensive? Yes. Worth it? Yes. Every penny.

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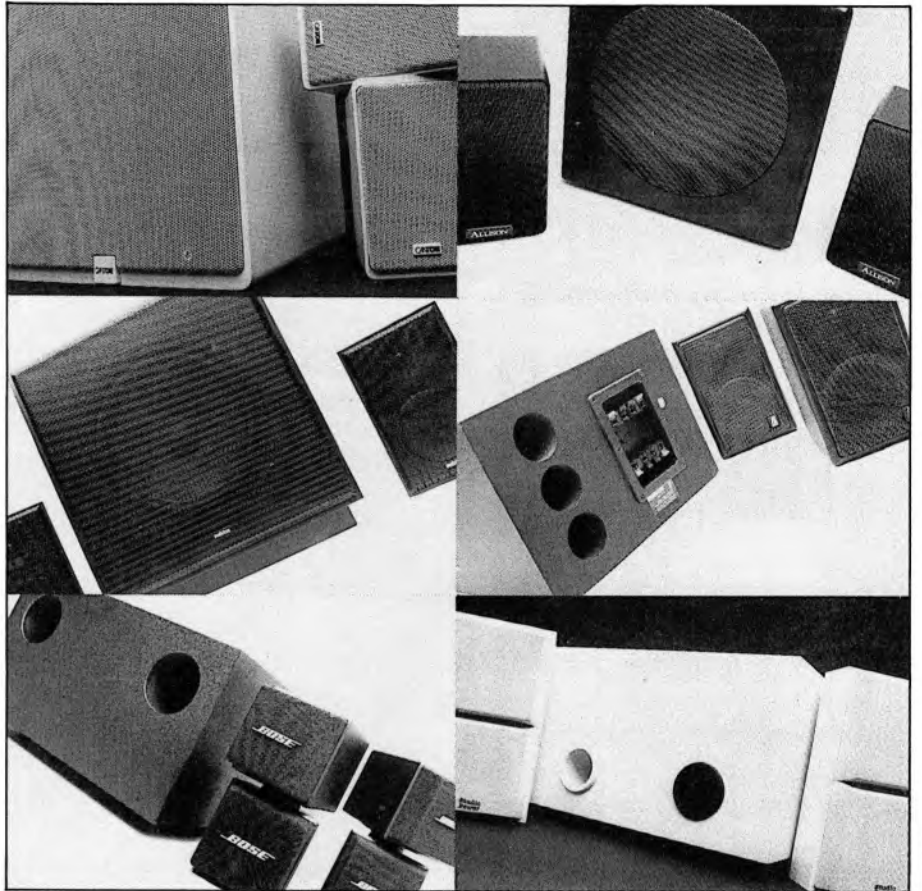
SATELLITES AND SUBWOOFERS

Jason Kennedy investigates an increasingly popular loudspeaker sub species.

For lack of a better name we have chosen 'Satellites and Subwoofers' to describe loudspeaker systems comprising a single stereo subwoofer unit and a pair of miniature enclosures designed to transmit the midrange and treble frequencies. Most of the satellite and subwoofer combinations gathered for this test have been designed to partner one another and are packaged together, but some can be purchased as separate units, and a few of the subwoofer units would make good partners for existing compact loudspeakers.

The principal purpose of this type of loudspeaker system is to achieve a reasonable degree of fidelity with the minimum of visibility. They are not really aimed at the dedicated hi-fi enthusiast but rather at those who prefer their loudspeakers to be the opposite of their children: heard but not seen.

Due to the relative omni-directionality of low frequencies a subwoofer can be placed almost anywhere within a room and be used without drawing too much attention to itself. The satellites which provide only the midrange and treble are more directional and thus give some idea of imaging. There are basically two types of subwoofer. One is the direct radiating subwoofer which has a traditionally mounted driver (which unusually has twin voice coils, one per channel) of reasonable size firing into the room in the same way as regular loudspeakers, for



Heard but not seen

instance those from Revox and Canton. And the other type is exemplified by the AR and Bose units, having two drive units attached to an internal baffle, usually on opposite sides in a push-pull configuration – both this baffle and the cabinet itself are ported for an acoustic output.

The satellite units can be discreetly wall mounted or hidden in a bookshelf and the subwoofer depending on type can be placed under or behind appropriate bits of furniture. This of course depends on the subwoofer involved, you'd have to have a pretty large coffee table to hide the likes of the Canton or Revox models in this test. In fact they would make reasonable coffee tables themselves in a modern environment. Models of this size are probably better suited to placement next to a wall, but preferably not in a corner as this tends to excite all

possible room modes and create unseemly levels of boomy bass. The level of bass output for a subwoofer is directly related to its proximity to room boundaries. Given the target audience for the product, tone controls will most likely be used to achieve an acceptable frequency balance. However, if these are not available the relative level of bass output can be altered by experimenting with positioning. To assess whether or not you've arrived at natural balance use material with acoustic instruments on, such as double bass and cymbals, or alternatively mix to taste.

The cable arrangement used with these systems consists of the usual speaker cables between amplifier and subwoofer plus two more runs hooking the subwoofer up to the satellites. Therefore some thought may have to be put into placement of the units if yards

of wire are to be avoided, and believe me they are. Many of the manuals supplied with these systems recommend the use of heavier gauge wire if extra long runs need to be used, by which they mean heavier than bellwire. We aren't talking hosepipe style, yet. Because spring clip terminals are all that you'll find on these systems fat cables and 4mm plugs are out. The majority of the systems in this test came with some form of cabling to allow instant hook-up, but it's pretty basic stuff and can be bettered by the likes of 39 strand.

For the tests we used single strand cable of fairly 'anorexic' proportions, chosen for its transparency and availability. However, one system shied at its high resistance and nothing came out of the satellite units, so this sort of thing cannot be generally recommended. For the listening tests the satellites were fixed with Blu-tack to heavy Founda-

tion stands close to the wall and about six feet apart. The subwoofer was initially placed between the satellites but was often subsequently moved into the room to tune the frequency balance.

The reports give some idea of what the six systems did with the signal that they were presented with. However, it's important to remember the purpose these systems were designed for, ie domestic acceptability with reasonable bandwidth. On a fidelity basis they don't compete with similarly priced, and cheaper, conventional loudspeakers, but you try hiding your Monitor Audios in the average British living room. That said equipment of

the highest fidelity was used in our assessment including the Roksan *Xerxes* turntable, Audio Technica *AT-OC7* cartridge and Audio Innovations amplification. The digital domain was catered for with the exceedingly pretty ADC *CD-2000E* compact disc player. The test material included *Dequello* by ZZ Top, *Way Out West* by Sony Rollins, excerpts from Handel's *Messiah* (on Decca SXL 2316 – they don't come much more dynamic) and a test of low frequency extension from Phillip Glass entitled *Koyaanisqatsi*. On the silver disc side we had offerings from Michael Hedges – *Strings Cf Steel*, Flim and the BBs – *Further Adventures Cf* and Yello – *Flag*.

CANTON PLUS C/PLUS S

Canton is a West German company whose range includes some extremely glossy and attractive loudspeakers. The *Plus C* and *S* combination is finished in what looks like white emulsion, all the better for blending in with your average interior perhaps. For the same price of £225 for the *Plus C* and £140 for the *Plus S* you can have a choice of matt black finish, or if you want to pay more Canton offers very shiny real wood veneers. Both units have stove enamelled perforated metal grilles, giving them a degree of high tech style and some protection from feet, children and animals.

In common with many of these combos this system has a rated impedance of 4ohms,

The *Plus S* satellite units are fairly small (20 x 11.5 x 11.5cm) plastic cabinets with a plastic dome tweeter and 3/4inch midrange unit. The back of the cabinet houses your regular spring clips and various means for attaching the unit to the wall or a stand.

Listening, for the most part, was carried out with the reference cable, but the supplied wire was tried out and found to be a bit thicker and smoother but less extended at high frequencies, ie veiled. The first material auditioned was Yello on CD, which sounded warm and slightly soft, although vocal intelligibility was quite good, indicative of a mid-forward balance. Imaging was slightly flat and lacking in depth, and the heavy bass on this disc wasn't as solid as it can be with hi-fi transducers. In places the bass got a bit phasey and when the volume was pushed, a degree of audible distortion crept in.

On the vinyl front the deep bass test disc revealed reasonable but not exorbitant extension with fair reproduction of the darkness and power of the recording, about par by the standards noted in these tests. The Sony Rollins *Way Out West* album is an early stereo recording and has the drums and bass on one channel and the saxophone on the other, but, because of the central subwoofer the double bass tended to image centrally. This happened with most of the systems but shows that when only low frequency notes are played the positioning of the subwoofer is given away – luckily this sort of recording isn't too prolific. The sound of the saxophone was a little lacking in lower mid, making it a bit thin but still essentially believable, with enough nuance getting through to convey the mood of the piece.

Another recording from the golden age of vinyl production, (late '50s and early '60s) Handel's *Messiah* was played to reasonable effect. However, although the standard of recording was noticeable it still sounded limited in depth, scale and dynamics. The effect was essentially one of 'sat-uponness'.

The Canton system is not the most natural or dynamic of loudspeakers, but it's essentially polite and not too veiled. By the standards set over this complete test it's about average, not distorting too obviously and with a reasonable bandwidth. It would be best suited to slightly bright systems and CD in particular, as it has a tendency to roll-off the treble and soften the bass – the term polite seems appropriate.



It would be best suited to slightly bright systems and CD in particular

so if you have this output option on your amplifier, use it, as it will give a more even response from the speakers. Accessories in the package include various stick on foam and plastic feet as well as four 5metre lengths of thin stranded cable, which will get you up and running but could be improved upon.

The *Plus C* subwoofer is a large (36 x 34 x 34cm) square medite cabinet with a direct radiating 12inch twin coil driver. In the accompanying booklet Canton suggests that it be placed close to a wall facing into the room. However, we found it necessary to cut down bass output by moving the unit about 16inches from the wall, although tone controls could be used to the same effect without this inconvenience.

Price:	£365
Subwoofer size:	36 x 34 x 34cm
Satellite size:	20 x 11.5 x 11.5cm
Finishes:	Black, white, wood veneer

AR STC660/1MS

Both the singer and orchestra were portrayed with depth and colour

The *STC660* and *1MS* are not obviously related to AR's current UK range, being manufactured in the States and styled in a more conventional fashion than the almost Hammerite finish of the recently tested *Spirit* range.

The styling is pretty rudimentary and the black finish nothing to write home about, however the alloy cased satellites have a crackle finish which is attractive in an industrial sort of way. The subwoofer is more down to earth, being wrapped in easy wipe vinyl and given that the idea is to hide this component the utilitarian finish is perhaps excusable.

The *STC660* subwoofer is what AR calls a coupled cavity and KEF calls a bandpass system. Inside the box is a diagonal ported baffle to which two 6inch drivers are attached in push-pull fashion (ie one on each side of the baffle). These two cavities are then coupled to the room via three ports at one end of the cabinet, and this design apparently creates natural roll-off points at both ends of the unit's bandwidth. Its external dimensions are fairly discreet (22 x 30.5 x 38cm) and it could easily be hidden in a normally furnished room - minimalists can use it as a foot stool.

Suggested placement was with the ports facing the wall, but experimentation led to it being turned through 90 degrees leaving the ports pointing sideways, and again tone control tweaking should bring about the desired balance if positioning is fixed.

The *1MS* satellite units are made up of a cast alloy shell and a rigid plastic baffle, to which is attached a plastic dome tweeter and paper coned midrange driver. The drivers are protected by a seemingly fixed perforated metal grille, and the whole unit is reasonably compact measuring 19 x 12 x 12cm (h x w x d) with regular spring clip connections. The only extras included in the £300 package are some clips which bolt onto the satellites for wall mounting, no cables or rubber feet here.

And so to the listening . . . First impres-

sions with David Lee Roth on the turntable were of a fast and tight loudspeaker system with a slightly dull balance. Switching to CD reveals a good level of information, with plenty of clues to imaging and a reasonable degree of naturalness.

Some of the dynamic range of the Decca SXL became apparent and both the singer and orchestra were portrayed with depth and colour, in fact it was this piece which also showed that the ARs could play tunes. A dangerously subjective observation, but if you're familiar with Rotel amplifiers or Sondeks you'll know what I mean.

Only when we got to Lou Reed's *Walk On The Wild Side* with its double bass and background electric bass, did the level of bass output become obviously too great, but twisting the subwoofer round evened up the balance and allowed more of the nuance in the vocal to be heard. The violin on this track sounded rather unnatural, in a thin synthetic fashion, but admittedly this was how nearly all these systems treated it. Pushing some low low frequencies into the system produced a taut and well controlled response but not a particularly extended one. The subwoofer substitutes nimbleness for deep bass which pays dividends under most circumstances, particularly with rock material, ZZ Top coming across fast and dynamically with a good punch to kick drum although a slight loss of impact was noticed at lower frequencies.

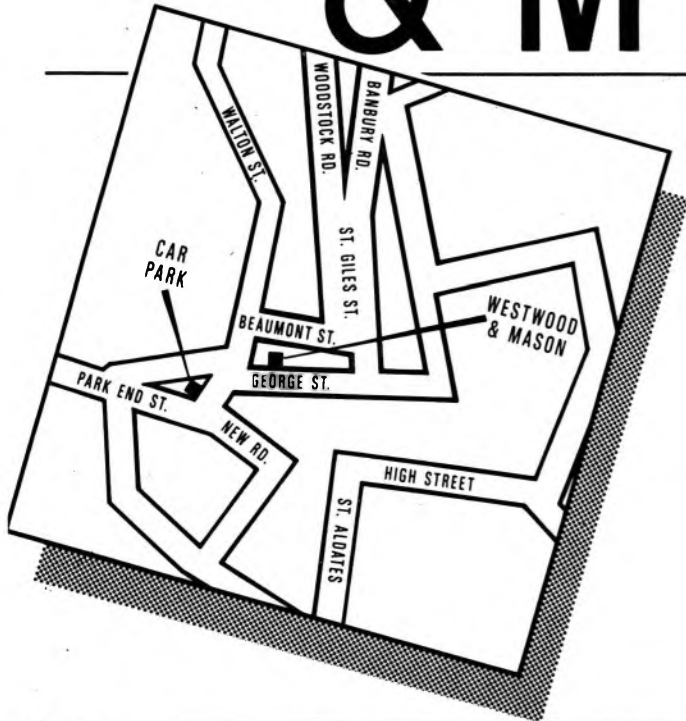
Overall the AR system turned out to be one of the quickest and most musically enjoyable in the bunch, its limitations appearing to be in bandwidth and naturalness. However, with non-acoustic music these sort of constraints are less obvious and it can be a very entertaining system.

Price:	£300
Subwoofer size:	22 x 30.5 x 38cm
Satellite size:	19 x 12 x 12cm
Finishes:	Black



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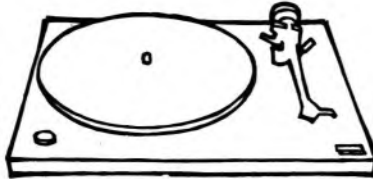
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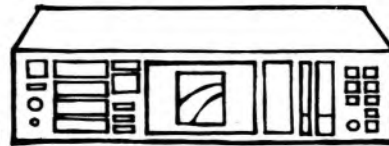
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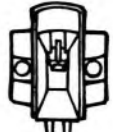
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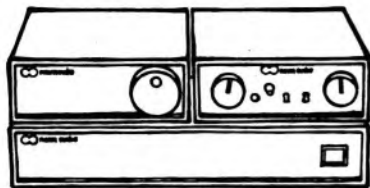
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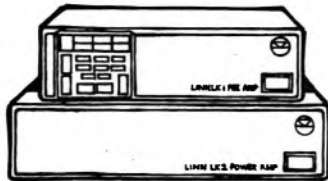
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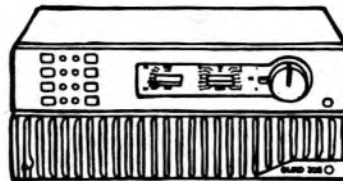
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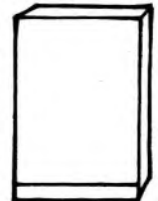
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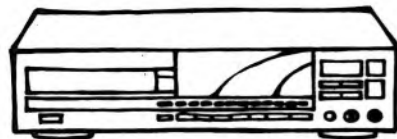
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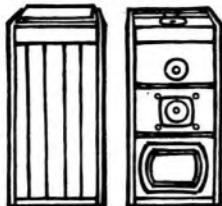
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MORDAUNT-SHORT



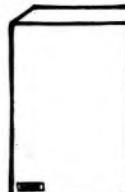
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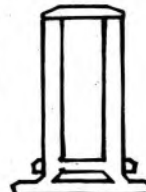
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BOSE ACOUSTIMASS

The audience just couldn't believe that you could get so much bass out of such tiny speakers

The first time I came across the satellite and subwoofer genre was in a shop in Surrey where they were demonstrating the Bose Acoustimass system to great effect. The audience just couldn't believe that you could get so much bass out of such tiny speakers, and of course they were right, but in that somewhat cluttered store the bland subwoofer was barely noticeable. Whether or not Bose invented this type of speaker system is unclear but it's fairly obvious that its done more than most to popularise it, and judging from the amount of new systems that have been appearing lately it would seem to have created a healthy market. Given the design's flexibility and size, it can only be a matter of time before every midi system owner wants one. Fundamentally, these are speakers for people who don't like speakers.

The first thing one notices about the £499 Acoustimass system is that the mid and treble capsules can be swivelled so that the top treble unit faces one way and the lower midrange unit faces another, pretty whacky, huh. But apparently this is no mere gimmick – it in fact fits in with the Bose philosophy of reflected sound.

The satellites have a switch in the back marked 'direct' and 'reflected', and the manual suggests that for reflected sound the tweeters be aimed at the wall to the side of the speakers, either inwards or outwards. In construction they are fairly straightforward plastic capsules fitted with 2½inch cone drivers and very simple crossovers, hardly the recipe for a high fidelity loudspeaker but let us not be too hasty in our assumptions. Their overall dimensions are 18.5 x 9 x 12cm (h x w x d) and the finish is a combination of black plastic and cloth grille, the latter being liberally splattered with the manufacturer's name.

The subwoofer is of the sparse ported box type and wears a coat of black vinyl, hardly glamorous but it's not supposed to be seen. Inside the 19.5 x 32 x 51cm mediate cabinet are two 6inch paper drivers with wide dust caps to improve rigidity. These couple to the outside world via twin 2½inch ports. Speaker cable in the form of four six metre lengths of stranded 18 gauge (which is about 1.5mm diameter) wire is also included for instant hook-up.

The first attempt at audition with the reference cables proved fruitless as the resistance of our 0.6mm cable was too much for the satellite to subwoofer connection, the only audible sound being bass. Switching

over to the Bose cable cured this and listening in direct mode went ahead. The first things that strike you about this system are the better than average integration of the subwoofer with the satellites and a distinctive treble peak at about the frequency of cymbals. Some material such as Michael Hedges (amplified acoustic guitar) on vinyl sounded remarkably natural, and the good tonal integration gave rock tracks a solid trucking feel yet bass extension didn't appear to be that good.

However, the inky black bass on *Koyaanisqatsi* proved that the subwoofer could get down low if presented with the right material but unfortunately the tweeters also revealed their tendency to exaggerate surface noise. This emphasis proved quite a nuisance with quiet passages on less than perfect vinyl, and particularly bad on a Coltrane track which features brush sticks on cymbals – this hit the response anomaly perfectly and sounded ridiculously loud.

Switching to reflected mode diffuses treble and mucks up imaging but tames the HF lift, and from the tonal balance point of view it's a preferable option. The effect with both records and CDs is to warm things up a bit and round off the edges of notes; either way the sound is hardly natural being either hard and taut (direct mode) or big and soft (reflected mode). If used as a background source the reflected mode is probably more appropriate as it gives a wider soundstage and smoother sound, but for concentrated listening experimentation is advised as both medium and material will have a bearing on the best arrangement – good tone controls are a must.

Price:	£499
Subwoofer size:	19.5 x 32 x 51cm
Satellite size:	18.5 x 9 x 12cm
Finishes:	Black



The Studio Power range has made a not inconsiderable impact on the, how shall we call it, midi system market with its macho *Metal Cone* range and has now set its sights on the Bang & Olufsen market with its *Designer* range. This includes some unusual wall mounted pyramid shaped units and the *Sub 2000* system under scrutiny here. This line comes in both black, white and silver/grey, the latter being quite attractive and reminiscent of the aforementioned Danish equipment.

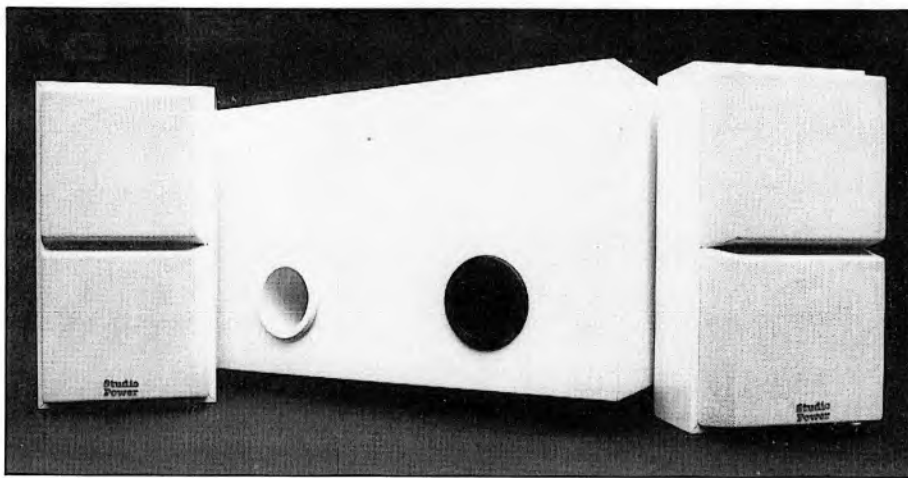
As you can see the *Sub 2000* owes quite a lot stylistically to the Bose Acoustimass system which undoubtedly pre-empted it by several years. It doesn't have the swivelling action for reflected sound that the Bose has but

otherwise could easily be mistaken. Needless to say, its pricing is somewhat more competitive, the *Sub 2000* system retailing for £349.

The satellite units have non-removable cloth grilles and are made up of a plastic shell with a wide aluminium frame which forms the rather small base of the speakers, but also gives the unit a reasonably attractive appearance. However, they are the flimsiest satellite units on this test. The driver units employed are a cone/dome tweeter and paper cone midrange unit, both 2½inch units by our reckoning. These were the only ones in the test group to come with wall brackets, these having a swivel joint to allow appropriate angling although they don't offer much in the way of rigidity. Overall the satel-

STUDIO POWER SUB 2000

Records sounded more involving when the volume was pushed higher than usual



lites are a little larger than usual measuring 21 x 11 x 10cm (h x w x d).

The ported cabinet style subwoofer is made of medite or chipboard and finished in vinyl wrap, the effect isn't all that stunning but reasonably discreet. Four plastic feet raise the box up so that cables can be connected to the spring clip terminals underneath the unit, which from an aesthetic point of view makes a lot of sense. Inside the 19.5 x 32 x 50cm cabinet are two drivers operated in push-pull (ie one on either side of an internal baffle) which are coupled to the room via twin ports. The output of the subwoofer can be tuned by experimenting with a variety of different length plastic reflex tubes which fit into the ports, (these directly affect both SPLs and extension) and you get two 2inch tubes and one each of four and six inch lengths. These can be used in any combina-

tion to achieve the preferred balance – in the small, triangular shaped room used for the tests, the combination of a two inch and a four inch tube gave the most accurate balance, with the ports facing the listener.

The first impressions of the *Sub 2000* system were of good tonal integration but a rather veiled and flat sound, flat in this case meaning that the system didn't appear to be able to resolve dynamics very well. Consequently records sounded more involving when the volume was pushed higher than usual. This was particularly so with the organ and vocals on *Koyaanisqatsi* which sounded thin and bland until more power was pushed in. The slight tonal thinness and lack of dynamics pervaded most of the material played through the system. The balance suited some material better than others but the essential flatness had a tendency to rob notes of life – warmer amplification would be more sympathetic but would be unlikely to inject *joie de vivre* into the sound.

The speakers didn't appear to be any better suited to CD, Yello failing to really merit attention unless the volume was pushed to the point where the speakers distorted. Simpler music seemed to fair better and the quality of a recording was subtly evident. However, the lack of transparency inherent in these speakers is enough to make much music seem unduly bland.

Price:	£349
Subwoofer size:	19.5 x 32 x 51cm
Satellite size:	21 x 11 x 10cm
Finishes:	Black, white, silver/grey

REVOX PICCOLO SYSTEM

It soon became clear that this was the best set of boxes in the bunch

Revox is primarily known for its very attractive and expensive reel to reel tape recorders and a range of similarly tasty separates, however, of late it has been making forays into the real world with relatively affordable amplifiers and tuners. The *Piccolo* system is part of this drive and retails for a modest (by Revox standards) £370, for which you get the biggest (39 x 36 x 37cm) subwoofer in this test and the choice of either black or white finish.

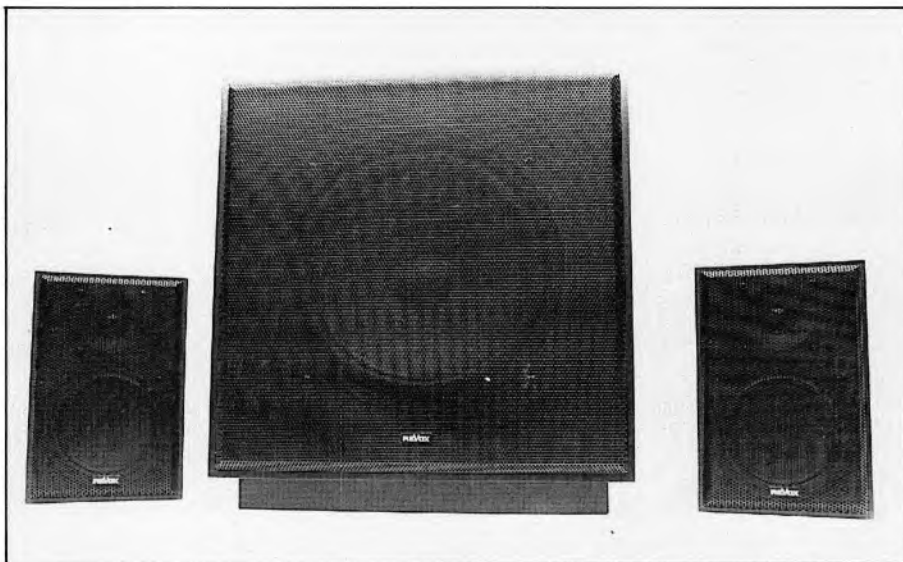
The medite or chipboard cabinet, (I couldn't tell which without trashing the thing), contains a nine inch twin coiled bass

driver which fires directly into the room through a perforated metal grille. It's finished in the loudspeaker manufacturer's friend – vinyl wrap. It's ironic that when vinyl furniture was popular (ie in the '70s) manufacturers produced speakers covered in real wood veneers, and now that three-piece suites have moved on to marginally less grim coverings economics lead cheap speakers to be covered in plastic.

The same goes for the satellite units, which are the only ones in the group made of wood (in so far as MDF or chipboard can be called wood). At 22 x 14 x 14.5cm they are also quite large and this element of scale undoubtedly influenced the positive findings on audition. The drivers in each unit are a 1inch plastic dome tweeter and 4inch mid-range cone with a large flat dustcap, and are protected from stray fingers by perforated metal grilles. Speaker cable in the form of four times four metres of thin stranded wire is supplied with the package.

Initial impressions of this system were very encouraging, and it soon became clear that this was the best set of boxes in the bunch. The first few tracks revealed a good control and a very nice sense of timing, this latter element being indicative of good speed and low levels of bass overhang. Lou Reed sounded more natural than previously and the strings actually sounded like strings. You could almost hear the fact that what sounds like slightly odd double bass is in fact acoustic and electric bass playing the same line.

When fed organ and vocal, bass doesn't go down incredibly deep but managed to get the



floor vibrating. Once again the speaker's timing gave this piece a better sense of atmosphere than usual, the deep vocal sounding some distance behind the satellites. The operatic track still didn't achieve its full scale but was more dynamic than usual.

What really hit the spot was ZZ Top's late '70s style of blues rock, the *Piccolo* system reproducing kick drum with a nice solidity and punch putting across the perfect timing

of the band (ie their tightness as well as the inherent correctness of the tempo – which is why people use the *Xerxes*). Fundamentally this system proved itself to be more transparent and neutral than the others in the group and thus better able to reveal the information being thrown at it by the amplifier. By the standards of the medium this is a good'un.

Price:	£370
Subwoofer size:	39 x 36 x 37cm
Satellite size:	22 x 14 x 14.5cm
Finishes:	Black or white

Allison Acoustics loudspeakers have recently been re-introduced into the UK and the slightly unusual CD range looks set to make itself felt on the market. The company's founder Roy Allison was chief engineer at AR and worked with Edgar Villchur on the *3a* and *LST* loudspeakers in the early '70s, since when he has been joined by other ex AR staff, and the standards achieved by that company look likely to be repeated at Allison.

The *Mini 2 Subwoofer System* (£330) features the smallest and neatest subwoofer discovered in this test. As the 'guff' says it's less than a cubic foot in size (28 x 28 x 28.5cm) and features a direct radiating 8inch doped paper cone, which has two interleaved voice coils in an attempt to reproduce the bass content of both channels. The perforated grille is in fact plastic despite its metallic appearance which should benefit the unit sonically as it will resonate at a lower frequency. Its finish is an attractive semi gloss black which should sit comfortably in the average living room, unless you're into period furnishings.

The *Mini 2* satellites are similar to the AR ones in that they use alloy enclosures which offer excellent rigidity as well as good immunity to knocks. The drivers used are a 1inch soft dome tweeter and a 4inch long throw midrange unit; the crossover point is apparently at 2kHz. The case is finished in matt black with a removable mesh grille and the brochure claims that these units are protected by a power guard device which, I guess, thwarts any attempts at damaging them with high levels.

The *Mini 2* has an active brother called the *2P* which has an internal amplifier capable of running off both mains and 12 volts. However, they're a bit more expensive at £269 and wouldn't offer significant bass extension on their own.

Listening to the *Mini 2* system revealed very good integration between the satellites and subwoofer, such that one could easily be forgiven for thinking that they were regular loudspeakers. The system reproduced the driving force in ZZ Top with its tight controlled bass and good resolution of midband detail. The more laid back *Walk On The Wild Side* also benefited from the better than average dynamics and naturalness of this system, the violins for once sounding like wooden instruments and the voice regaining some of

its inflection.

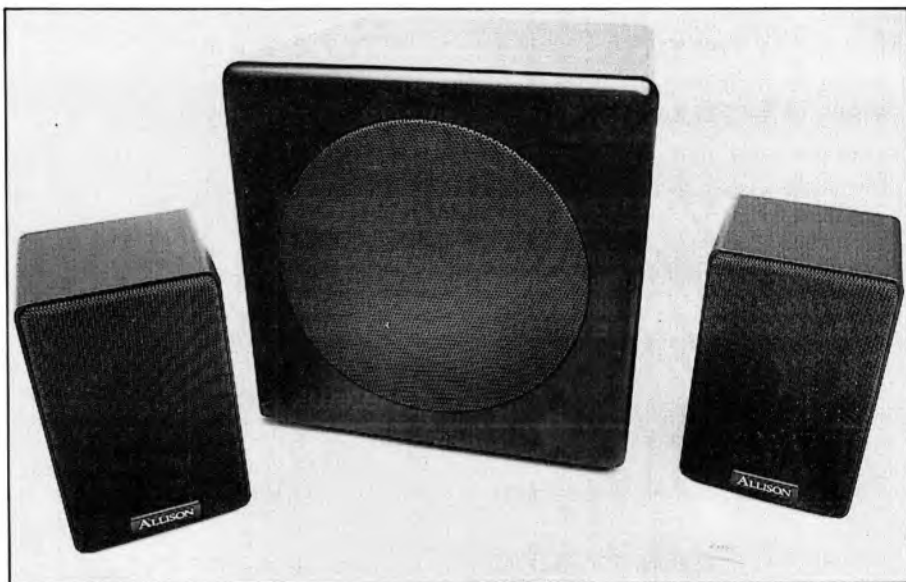
Throwing some low bass at it produced a mixed reaction – the subwoofer didn't really go down that far but made up for it to an extent with good depth to the vocal. The feel of the track seemed more relaxed than usual which indicates a cleaner or softer top end.

This slightly casual approach gradually grew to become the hallmark of this system, such that bright and lively material sounded pleasantly warm and material that was already pretty calm tended to wallow in mediocrity. The Allison system was a complete contrast to the Bose one auditioned and initial observations were coloured by the relief to find a nicely balanced well integrated loudspeaker system.

Further listening reinforced the impression that the Allisons although very nice and more natural than usual are a bit lacking in what it takes to be a thoroughly musically entertaining system. In the context of the purpose of such systems the Allison is as good as most and its neatness makes it a user friendly system, although a bit more zest

ALLISON MINI 2

It features the smallest and neatest subwoofer discovered in this test



wouldn't go amiss. However, one might expect unimpressive amplifiers to be used with these systems which would provide a little bit of distortion and give music that extra edge and make up for the laid back nature of the speakers.

Price:	£330
Subwoofer size:	28 x 28 x 28.5cm
Satellite size:	18.5 x 11.7 x 11cm
Finishes:	Black

The last sentence of the Revox review sums up our findings on this new breed – if you are after the best possible sound quality for the money steer clear, but if the user-friendliness of the system appeals then check them out. In some ways they are like midi systems, the compactness and flexibility lending itself to the house proud, whilst pro-

viding greater bandwidth and thrill power than the average midi system speaker. This is not an indictment of subwoofers which can improve the fidelity of a system if used carefully, but rather a lack of enthusiasm for the satellite and subwoofer combinations currently on offer. Still, if you like your speakers to be heard but not seen . . .

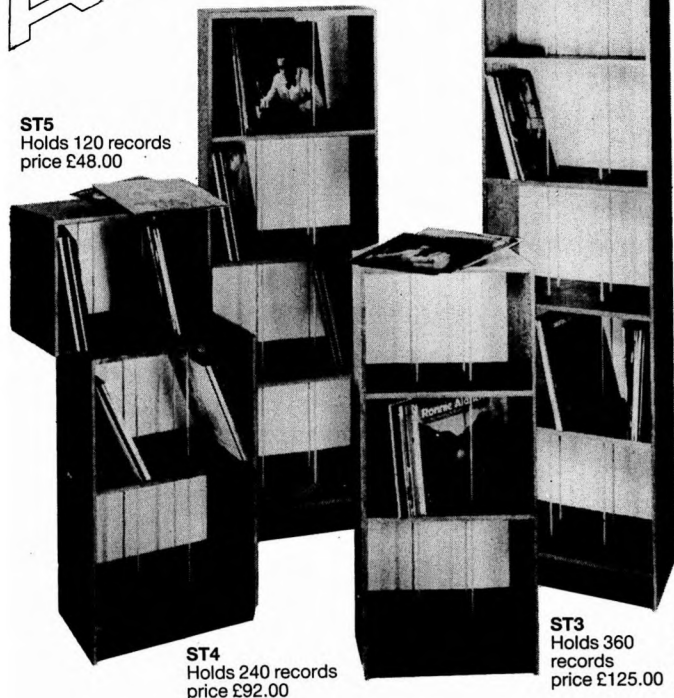
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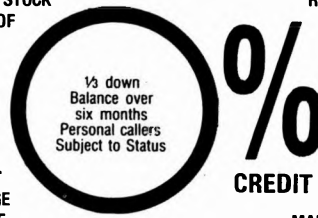
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CHOOSING AND USING . . . RECEIVERS

Alvin Gold unravels the mystery of that soon-to-become-fashionable-again beast, the tuner/amplifier.

Receivers are a niche product which enjoy tremendous popularity in the US, Japan and most European countries – but not here. For reasons that are probably as much rooted in history as in the due process of logic or of reason, receivers don't sell well in this country. They're simply not taken very seriously. Is there something wrong, or maybe peculiar about receivers

there are savings, ie of size. Generally you end up with one box in place of two similarly sized boxes, which has got to be a good idea. Receivers are also simpler to operate, in principle anyway. At the very least you save on one power switch, and typically you are presented with an integrated control system that is bound to oil the wheels of ergonomics. However, in design terms the

or £60 extra to spend on, say, the turntable, could make a very big difference.

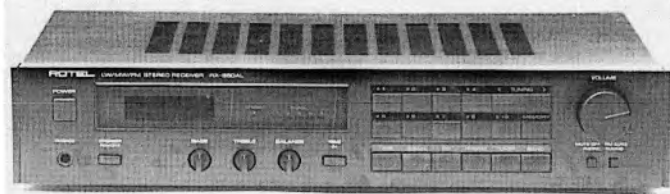
But there is one important point to watch. Because receivers don't sell in vast quantities in this country, and because this is one of the very few countries to use Long Wave for public service broadcasting, many – no, most – receivers on sale in this country cover FM and MW only. Remember that LW is the home of Radio 4, where it can be heard on the all too frequent occasions it is not on FM.

Power measurements are shown for a single channel driven into 8ohms, which gives a best case figure and both channels driven together into 4ohms, which gives the worst case figure. One of the seven – the Revox – failed this test altogether. None behaved ideally, the theoretical ideal being a doubling of power (in watts/channel) as impedance is halved. Distortion and noise figures are also given, along with the important loading parameters at the various inputs. In most cases the numbers were unexceptional or better, but the Revox suffered very low input sensitivity (see review), and several models had a very high input capacitance, sometimes combined with a low impedance on one input or more. Where this occurs it's important to use source components with a low output impedance (this can be a problem, especially with some CD players) and/or to use short, low capacitance interconnects. If in doubt, your dealer will advise. The all important phono RIAA curves are also plotted.

FM tuner sensitivity (for a 50dB signal/noise ratio) is measured for mono and stereo signals, and ditto the figures for signal/noise, distortion plus 19kHz pilot tone and 38kHz subcarrier rejection. High levels of these signals can interfere with Dolby processing as the Dolby encoding circuit will read them as a music signal. There may be other more subtle effects too. Any comments arising are included in the reviews.

OUR TESTS

The test programme employed the usual mix of bench testing (my thanks to Chris Bryant on this occasion) and hands on listening using a variety of ancillary equipment. The list includes Dual CS-505/Linn K1 and Roksan/Rega/Audio Technica AT-F5 record players, Kenwood and Technics CD players, assorted Sennheiser headphones and loudspeakers ranging from budget models like



A Best Buy for Rotel with the £230 RX-850L.

via-a-vis component amplifiers and tuners, or is the national pattern of differences simply a matter of taste? Or even prejudice?

Unfortunately, there's no obvious one line reply to this. There are trade-offs when building tuner and amplifier circuits in close proximity, and they arise largely because tuners operate at almost infinitesimally small voltage levels which are vulnerable to induced voltages from the hefty power supply components. There are other more subtle interactions too. But these effects can be made arbitrarily small by the process of good design, so this isn't the whole answer.

I'm here right now with this proposition, which is that there's no good reason to overlook receivers. Purists will look down their noses at the very idea of combining two functions into one box, and indeed they always have done. But unless we're talking about the exotic elite, the *creme de la creme* of amplifier and tunerdom, intrinsic technical shortcomings simply aren't an issue.

One obvious reason why you should buy a receiver if you were otherwise considering an amplifier and a tuner is that

most pertinent advantage of the receiver over separates is the opportunity receivers allow for cost savings, primarily because there is only one transformer instead of two and only one box to

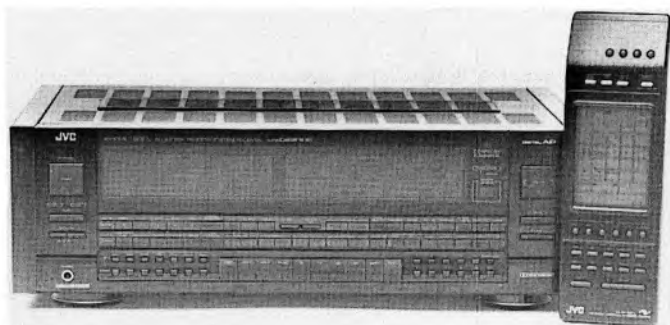


The £330 Harman/Kardon 440Vxi is warmly recommended.

put all the electronics inside. These two items can represent a considerable saving to the consumer. In one example, that of the Harman/Kardon HK330, the receiver sells for around £100 less than the cost of the equivalent separates – a 25 per cent reduction. The equivalent calculation for the Rotel RX850AL (also covered in the reviews that follow) gives a saving of £66, which is better than 22 per cent. The amounts of money involved can be substantial, and will significantly reduce the cost of a complete system. Another way to look at it is to say that your budget will allow you to put together a system. In a budget system, £50

the Celestion 3 and Mission 710 through to Apogee *Calipers* – the latter because they are an adverse load and extremely insensitive.

Then there are the lab tests.



No recommendation for the JVC RX1001V, but the author would kill for its remote control!

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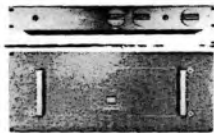
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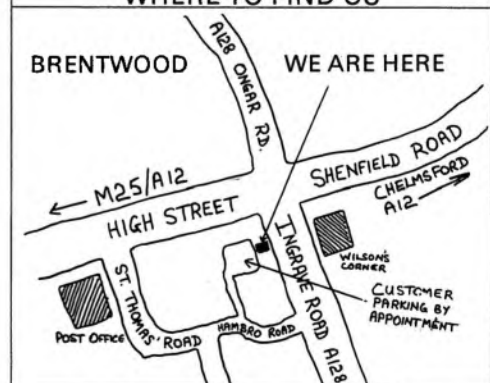
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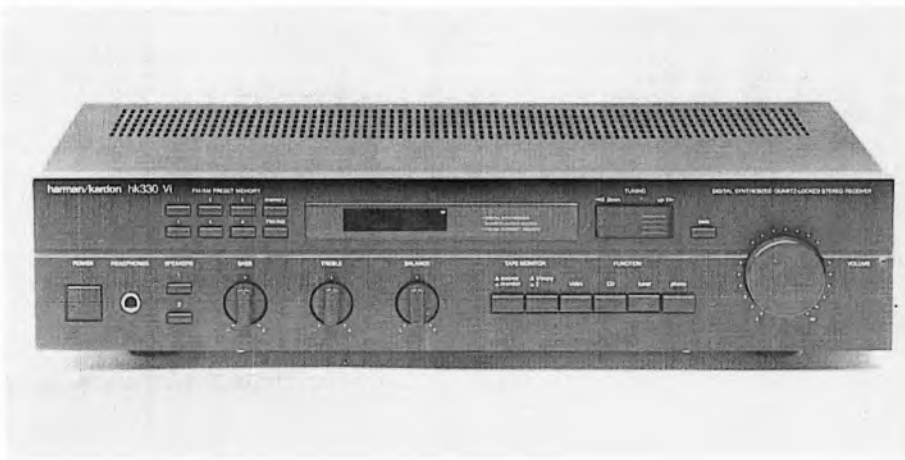
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Harman Kardon has more right than most to call the receiver territory its own, but at the budget end of the market at least there's precious little scope for individuality, and HK doesn't even try. What it has done instead is to use good quality separates as the basis for the combination, specifically the *TU909* tuner and the *PM635i* amplifier. Perhaps the most impressive feature of all however is the price. HK has pitched the *330* at a round ton less than the combined cost of the amplifier and tuner when purchased as separates.

The amplifier has a 25watt per channel rating, but these are man-size watts, backed up in traditional HK house fashion with plenty of current (± 18 amps peak) and a wide power bandwidth (DC to light – well, 0.5kHz to 150kHz, which is close enough). It is simply equipped with inputs for phono (moving magnet, *not* moving coil), three line level inputs (CD etc) and two tape circuits with full monitoring and copying permitted in one direction, but not t'other. The restriction is a trivial one for most people. Bass and treble controls provide the usual services, and two pairs of loudspeakers can be connected, and used individually or together.

On the radio side, the HK suffers from the omission of LW. There are six AM presets and 12 FM ones using six preset buttons and three waveband switch positions – FM1 (six presets), FM2 (the other six) and MW. It's true that LW doesn't bear much relation to hi-fi, but I submit that it's illogical to leave it out given that MW is included.

LAB REPORT

Build quality is very ordinary, being mostly based on standard quality components and a method of construction that takes no obvious account of esoteric factors like microphony. Metalwork is thin and flimsy, and socketry is pretty modest. Spring terminals are used for the loudspeaker wiring. The circuit is split across separate tuner and amplifier printed circuit boards, with various sub-boards.

Per channel power output is very high at well in excess of double the rated both channels power, but the equivalent both channel 4ohm figure shows a real drop in output. The numbers remain high in absolute terms, but

they do suggest that the amplifier is happiest into straightforward loads. In practice the HK will drive – or attempt to drive – almost anything, but sounds more even and in command with reasonably sensitive 8ohm loudspeakers.

Residual noise with the volume control at minimum is higher than some, but the noise contribution at normal listening levels is on a par with the competition on all inputs except the FM tuner where pilot tone breakthrough spoiled the figures. Staying with the tuner, the sensitivity figures look very poor. Whilst the muting circuit prevented a true mono figure being given, the *330* tuner is neither very sensitive or very selective, and is best used for local transmissions where a good quality aerial installation is available.

SOUND QUALITY

The performance of this receiver is satisfactory in relation to price, but no more than that I don't know the tuner on which the *330* is based very well, but I have recent and highly positive experience of the *PM635* amplifier. As a result, I can be perfectly clear that the translation from amplifier to receiver has not been handled seamlessly, and that the receiver sounds more than just perceptibly less solid, neutral and detailed than the excellent component amplifier.

The overriding impression after using the HK quite extensively and in three quite distinctive systems is that the receiver is rather lightweight. It has a sometimes pushy, aggressive quality via the line inputs especially (tested with compact disc) and the bass and sounds tuneful but lean, even shallow. This can lead to an impression of brittleness with some material, though where the frequency extremes are not being stressed the HK sounded pleasingly positive, even tactile and lively.

The HK was most open to criticism with records. The phono input is clearly not a sophisticated one, and the potentially lumpy bass was all too often more actual than potential. Stereo imagery tended to be flattened into the lateral plane with relatively little coherent depth information present, even when the rest of the system was good in

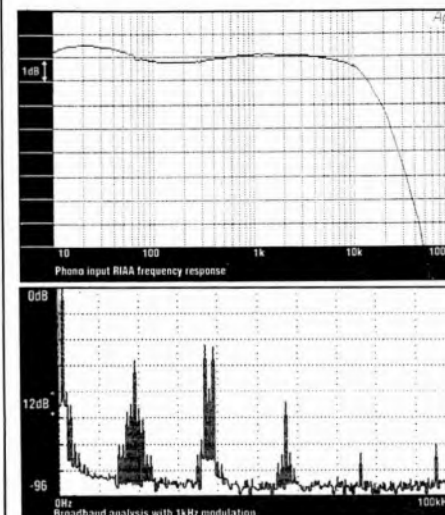
this area. The radio section suffered similarly on FM, whilst the MW band, although clear and intelligible, tended to caricature the findings already discussed. Of course, exaggerated intelligibility is not to be sniffed at with AM tuners, and interference was held well in check.

CONCLUSIONS

This receiver is well priced in relation to the separates from which it is derived, yet it cannot stay in the ring long with the Rotel *RX850AL* (reviewed later) which costs £30 less, and it doesn't really do the *PM635* amplifier (from which the audio circuits are supposed to have been cloned) much justice either. The tuner is satisfactory though the lack of mono switching, sensitivity and LW define its limits. It's the amplifier that dominates proceedings though, the lasting impressions being of clarity combined with agility, but at the cost of a rather lightweight, uneven quality.

TEST RESULTS

Amplifier Section			
Rated power into 8ohms – maker's spec			14dBW/25watts
Power output at 1kHz:			
one channel driven 8ohms			17.9dBW/62watts
both channels driven 4ohms			14.8dBW/60watts
Distortion at rated power			
1kHz, aux/CD input			–70dB/0.032%
1kHz, at 0dBW, aux/CD input			–75dB/0.018%
Noise disc input (MM) (IHf, CCIR wtd)			–72dB
aux/CD input (IHf, CCIR wtd)			–77dB
Residual unwt'd noise, vol control at minimum			–70dB
Stereo separation aux/CD input at 1kHz			70dB
Input data	sensitivity	loading	capacitance
disc mm	0.41mV	47kohm	85pF
disc mc	—	—	—
aux/CD	30mV	32kohm	500pF
Tuner Section			
FM sensitivity mono/stereo for 50dB s/n			20 μ V [*] /100 μ V
Ultimate signal/noise (CCIR/ARM/1kHz ref)			
mono/stereo			67dB/38dB†
Total harmonic distortion at 100% mod, 1kHz			–48dB
Pilot tone rejection, 19kHz/39kHz			–33dB/–46dB†
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<i>†some pilot tone breakthrough</i>			
<i>‡sidebands at –27dB</i>			



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HARMAN KARDON HK440Vxi

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RECOMMENDED



This is a grown up brother to the *HK330Vi* which is covered separately in this issue. It looks very similar to the *330*, the main changes being the elimination of a bank of push buttons in favour of rotary selectors and a tuner display which shows minor additional bits of information.

Power output is given by the maker as 30 watts/channel into both 8 and 4ohms. HK tends to be stringent in the way it specifies power output, and this reflects in the way the design behaves. Amplifier facilities almost exactly parallel those of the *330*, so we're talking about a moving magnet input, three line level inputs, two tape circuits with true off-tape monitoring and dubbing (tape one to tape two only), tone and loudness controls and either/or switching for two pairs of loudspeakers.

One important difference between the two HK products is apparent at the rear. The *440* is equipped with an impedance matching switch which maximises voltage delivery with 'easy' 8ohm loads, or trades volts for amps with lower impedance and/or reactive loads. NAD amplifiers have had a similar feature for many years, and in both cases it should be seen primarily as specmanship, enabling a slightly better specification to be quoted for those impressed by numbers. In most practical situations – and this was put to extensive test for this review – the amplifier is going to sound better on the high current setting, even at high volume levels.

The tuner is an almost exact replica of the *HK330* one. There are 12 FM and six MW presets, but no LW, which is inconsistent and annoying for the reasons given in the *HK330* review. Worse, there is no mono switch and so no real possibility of using this tuner for exploring distant transmissions. The large number of FM presets however, may suit some oddball installations well, for example in areas served by several transmitters.

LAB REPORT

The *HK440Vxi* is built very much like the *330*, its main distinguishing features being a rather larger frame transformer and beefed up power supply and other components. Metalwork is on the thin, resonant side and

the circuitry is of no better than average standard and rather messily wired to boot. Loudspeaker sockets are cheap spring terminals, which is mildly disappointing.

The *HK440* doesn't offer any more power than the *HK330* in its high current mode (used for measurements and for most of the listening), though the subjective impression was of much more weight and control at high volume levels. The other figures are, unexceptional at worst, though input capacitance on the line inputs was surprisingly high at 550pF. Input impedance was none too high, and this means that interconnects should be kept short and the output impedance of source components should be low. Some CD players and other components are none too good in this area and the result will be loss of extreme HF and 'air'.

The phono equalisation curve shows an LF shelf lift below about 100Hz, extending to below 10Hz where the response will be mechanically buoyed by the main LF arm/cartridge. If the RIAA is to err on a budget machine it should be in the other direction since budget turntables are often poorly controlled in the region and easily given to (sonic) excess.

FM sensitivity is poor, and although the noise floor is low, the level of spurious clustered around the subcarrier frequency and multiples is high.

SOUND QUALITY

Whilst superficially this model sounds quite like the *HK330*, in reality it is a much more ambitious design which comes a lot closer to plumbing the depth of musical expression than the cheaper model, which treads rather uncomfortably around the edges.

The rather insistent quality of the cheap model is equally evident here too. The *440* doesn't completely escape the charge of sounding 'electronic' and processed. But the amplifier nevertheless manages to exude a strong sense of stature and authority, and perhaps above all, stability. Dynamics are truly excellent – the amplifier has an almost unstoppable quality and remains consistent over a wide range of volumes, whilst displaying real instrumental separation at all levels.

The amplifier can be overloaded, but it takes some doing, even using the difficult Apogee *Calliper* as a test load and with which it sounded wholly comfortable.

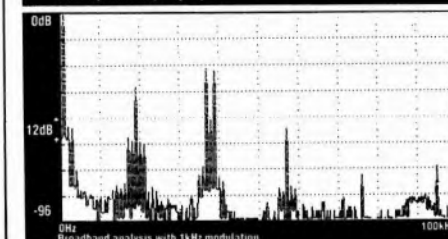
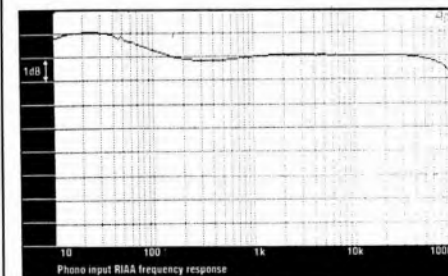
The phono section is perhaps not quite the strongest point of the design, and the bottom end shelf lift can often be detected as a degree of extra LF excitability where it isn't adding noticeably to tonal warmth, which does tend to err in the direction of richness. Even so, the HK worked well here too, sounding closer, more tangible and livelier than the less expensive *HK330*. The FM tuner was also a great improvement on that model, largely because it sounded fuller and warmer without loss of clarity. However it could sound cluttered when the music was particularly energetic and/or complex.

CONCLUSIONS

The relatively modest additional outlay compared to the *HK330* is more than justified. This is a confident sounding, outgoing design, balanced to veer slightly in the direction of highlighting detail rather than strict neutrality. Warmly Recommended.

TEST RESULTS

Amplifier Section			
Rated power into 8ohms –maker's spec			14.75dBW/30watts
Power output at 1kHz:			
one channel driven 8ohms			17.6dBW/58watts
both channels driven 4ohms			15.0dBW/63watts
Distortion at rated power			
1kHz, aux/CD input			–67dB/0.045%
1kHz, at 0dBW, aux/CD input			–73dB/0.022%
Noise disc input (MM) (HF, CCIR wtd)			–72dB
aux/CD input (HF, CCIR wtd)			–77dB
Residual unwt'd noise, vol control at minimum			–77dB
Stereo separation aux/CD input at 1kHz			72dB
Input data	sensitivity	loading	capacitance
disc mm	0.37mV	46kohm	80pF
disc mc			
aux/CD	23mV	29kohm	550pF
Tuner Section			
FM sensitivity mono/stereo for 50dB s/n			9µV/90µV
Ultimate signal/noise (CCIR/ARM/1kHz ref)			
mono/stereo			77dB/74dB
Total harmonic distortion at 100% mod, 1kHz			–49dB
Pilot tone rejection, 19kHz/39kHz			–31dB/–49dB
Typical price inc VAT			£329



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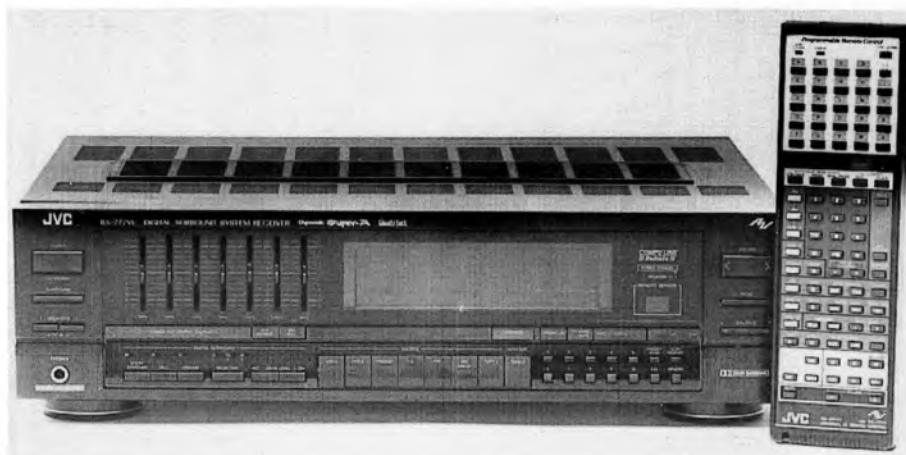
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JVC RX-777VL

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Very much a chip off the old block (the block of course being the *RX-1001V* reviewed separately), the *RX-777VL* still bristles with gadgets. Like most of JVC's current receiver range of which this is the penultimate model, the *RX-777* comes with a full programmable remote control.

The amplifier section can drive main and extension speakers at a useful 80 watts/channel, but there's a small secondary amplifier rated at 7 watts/channel to drive rear speakers when the JVC is doing its alter ego surround sound act. The rear panel is liberally populated with inputs, including phono (MC/MM), CD and four sets of tape connections, two of the latter being full video circuits which allow video signals to be routed through to a monitor. All audio and video socketry is phono based. In contrast to the *1001*, the *777*'s phono input is designed for high output cartridges only. Low output moving coils are not well suited.

A simplified version of the surround sound system used in the dearer model is fitted here too. It is still based on digital soundfield recreation, but whilst the algorithms stored in memory appear to be similar, there are fewer adjustable parameters, and the preset effects available are restricted to 'hall' and 'stadium' acoustics only. Given that recordings already have some kind of acoustic when they are recorded, and that it cannot be stripped out in subsequent processing, a drier acoustic with lower reverberation times such as you might find in a small club might well have been a more appropriate choice than, say, the 'stadium' algorithm, which is strictly there for show. Dolby Surround is included in this receiver, but again it's a simple non-Pro Logic implementation and only four speakers can be used.

Other equipment provided for the probably by now quite befuddled user, includes a graphic equaliser – again a seven band implementation but with manual control and therefore no memory facilities. There are no alpha-numerics for radio station name ID purposes either, but the tuner is still a well-loaded design with 40 random presets (FM, MW and LW – eat your hearts out, *RX-1001VBK* owners!) preset scan, auto and

manual presetting. All kinds of stuff asamad-derafact . . .

LAB REPORT

This product is stuffed to the gills with circuitry in the manner of a computer with several large edge mounted boards attached to a mother board for the tuner and low level analogue circuits. The power amp and logic boards are nearer the front of the receiver and interposed by various ancillary boards which apparently have been fitted expressly to fill every available space. The rear amplifier is a completely self-contained design with its own miniature power supply section. Quality issues are determined by mostly standard grade components and good electrical build. The metalwork however, is no great shakes, and neither are the spring speaker terminals which disintegrate if mistreated.

Perversely, the amplifier gave a higher 80hm output than the *1001* flagship, but slightly less 40hm output, indicating a possibly reduced tolerance of low impedance loads. Distortion is low, and so is noise except via the phono input which is 2-3dB worse than average. This is yet another receiver with a very high input capacitance on the line inputs. The tuner behaves well, but with a noisier 100kHz spectrum than the *1001*, RIAA equalisation is accurate.

SOUND QUALITY

One of the most quintessentially perfect moments in all recorded music is the 4th movement of Mahler's second symphony ('Urlicht'), a brief respite of quiet and calm in the eye of a maelstrom. It's a favourite test piece of mine which, when properly reproduced unfailingly causes all the hairs down the back of the neck to stand on end. First impressions of the *777* are that it is rather sharp and brittle sounding, with an emphasis on transient leading edges with some cost to body and richness. But this is something of a superficial assessment. The JVC works. The bass may sound lean, but complex bass lines are acutely observed, whilst the midband has depth, separation and colour. Only the treble retains the dry, almost grainy quality noted above, but this isn't enough in itself to spoil

matters, and the Mahler piece was suitably electric. It worked.

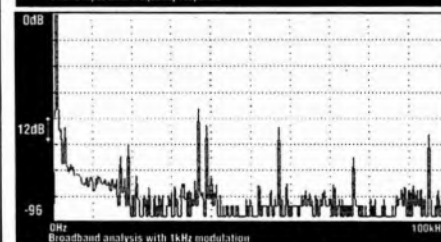
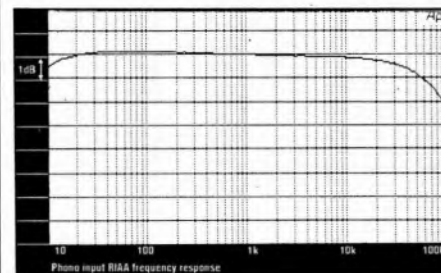
That was via the CD input, but the keen, lively quality was also sustained via the phono input which whilst slightly cold is also quite transparent and perfectly in keeping with the line inputs. The tuner also worked quite well. The FM section provides good stereo and a clean, positive sound with low levels of background noise and even a suggestion of depth. The AM side was equally pervasive and for similar reasons – leaving the stereo attributes to one side of course.

CONCLUSIONS

Whilst cheaper and simpler than its senior brother, on sound quality grounds this is easily the better of the two JVC receivers tested in this issue. But it could have been better still with some of the more gimmicky facilities omitted. It's true that some of them give the JVC real flexibility and power, but the most interesting part – the digital effects circuit – is fatally flawed by being engineered down to a price.

TEST RESULTS

Amplifier Section			
Rated power into 8ohms – maker's spec			18.75dBW/75watts
Power output at 1kHz:			
one channel driven 8ohms			20.22dBW/105watts
both channels driven 4ohms			16.9dBW/98watts
Distortion at rated power			
1kHz, aux/CD input			– 85dB/0.056%
1kHz, at 0dBW, aux/CD input			– 80dBW/0.01%
Noise disc input (MM) (HF, CCIR wtd)			– 70dB
aux/CD input (HF, CCIR wtd)			– 77dB
Residual unwt'd noise, vol control at minimum			– 79dB
Stereoseparation aux/CD input at 1kHz			65dB
Input data	sensitivity	loading	capacitance
disc mm	0.3mV	48kohm	185pF
disc mc			
aux/CD	26mV	47kohm	500pF
Tuner Section			
FM sensitivity mono/stereo for 50dB s/n			5µV/60µV
Ultimate signal/noise (CCIR/ARM/1kHz ref)			
mono/stereo			76dB/67dB
Total harmonic distortion at 100% mod, 1kHz			– 58dB
Pilot tone rejection, 19kHz/39kHz			– 67dB/– 89dB*
Typical price inc VAT			£500
*sidebands at – 510B			



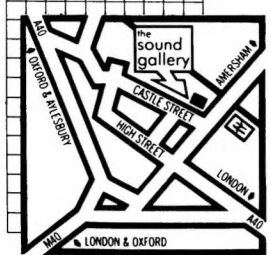
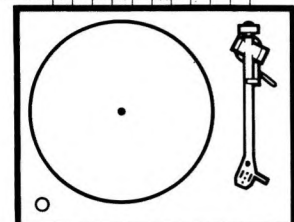
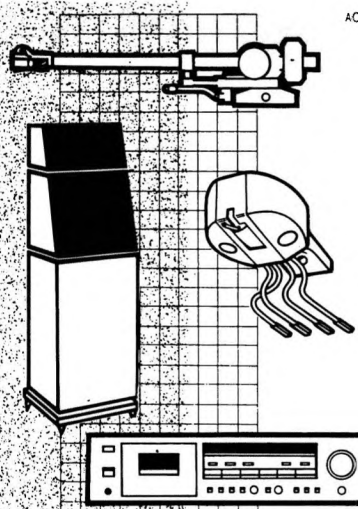
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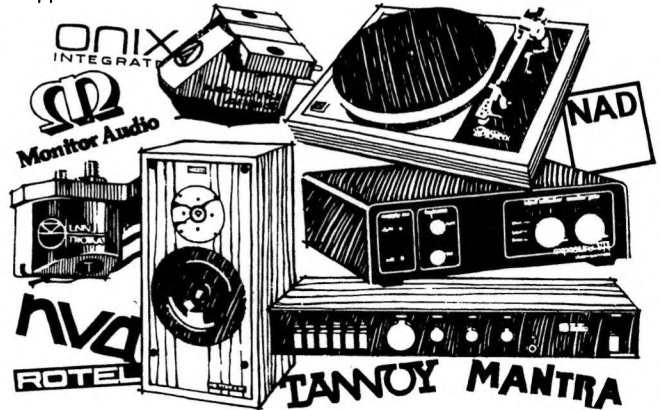
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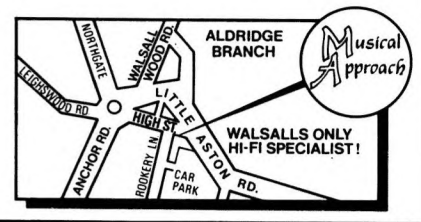
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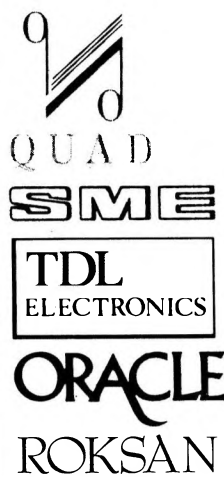
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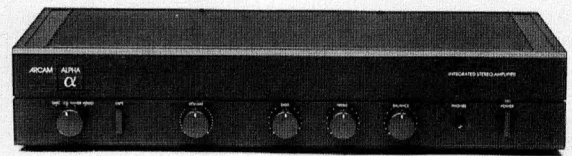
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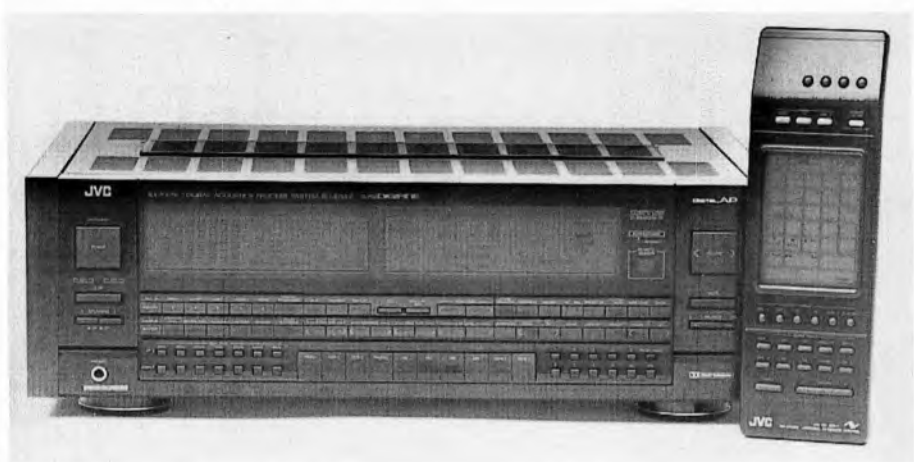
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JVC RX-1001V

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Never has your reporter set eyes on as fearfully complex an item, or one so thoroughly plastered with controls and displays, as the *RX-1001V*. I counted no less than 88 buttons for 'unsurpassed convenience', but the near full-width display is itself a miracle of something – exactly what, is difficult to say.

This receiver also comes with the most 'ginormous' remote control handset ever, but I have nothing but praise for this astonishing item, which is fully programmable and will control a complete A/V system, whether or not the components come from JVC. The gimmick is that it has a back-lit LCD 'menu' of control assignments, which can be instantly switched between the various possible components. Select the component you want to operate and touch the display where the wanted function is labelled.

The *1001* drives two loudspeakers at 120 watts per channel, plus 15 watts per channel for a pair of rear channel speakers in surround mode. Extension speakers can also be connected. Inputs include phono (MM/MC), CD, three tape circuits and three for video equipment with monitor connections. A major selling feature is an on-board digital soundfield processor (DSP) which generates artificial ambience and rear channel delay. Preset acoustics are available for a range of venues from an intimate club setting to a sports stadium, with additional control available over the nature and timing of the ambient characteristics for different room types and personal tastes. A non *Pro-Logic* Dolby Stereo circuit is included. There's also a seven band SEA (Sound Effects Amplifier) graphic equaliser with five preset response shapes and five user definable shapes which can be stored in memory.

JVC has also pulled all the stops out with the tuner. There are no less than 40 random access stations presets, which can be automatically preset if required. Signal strength metering, a variable muting threshold (used in conjunction with the auto-presetting feature) and preset scan are representative of what it can do. Five digit alphanumeric labels can be assigned to each preset, and incidentally to the SAE response curves

stored in memory. All this and no LW...

LAB REPORT

This receiver is built on the same lines as the *770*. Many printed circuit boards have been shoehorned into the inside, leaving little spare room and some head-scratching for the service engineer, I should think. The product is sensibly built however, with a generously rated power supply and a discrete surround amplifier. Physically however, the JVC seems rather resonant. The amplifier has a Dynamic Super-A 'sliding bias' output stage. The external fittings are okay apart from the spring clip loudspeaker terminals.

The power specification is nothing like met. With just one channel driven, only 81 watts are available, and there's only a modest increment into 4ohms, albeit with both channels driven. Noise and distortion figures are okay, but phono input capacitance is grossly excessive (700pF!) which is sure to detract from the good intrinsic response shape – the exact amount depending mainly on the source impedance and inductance of the cartridge and cable capacitance. The tuner figures are all good enough and the 100kHz spectrum analysis is remarkably free of spurs.

SOUND QUALITY

Whilst the *RX-1001V* is sharp and detailed, it conspires to be so in the manner of high feedback commercial designs over the decades. It is dry and tight yet also precise and detailed. There's little sense of space to the sound, ambient clues are repressed and the sound picture, whilst lean and purposeful, is also sterile. Sound quality deteriorated sharply when driven hard with densely complex music. Under these conditions a subtle muddling of low level detail deteriorated into a frazzled quality affecting mainly the high frequencies. Driven beyond its natural limits it acquired a ringing, metallic edge.

These comments apply almost equally to the line and phono inputs. The tuner, which at one stage presented a logic fault preventing it being used at all, cleared up to work well, providing a standard of FM performance in line with the other inputs – a little

hard-edged but clear and dynamic. Weak FM signals tend to be accompanied by noise and whistles. AM sound quality was dull but satisfactory.

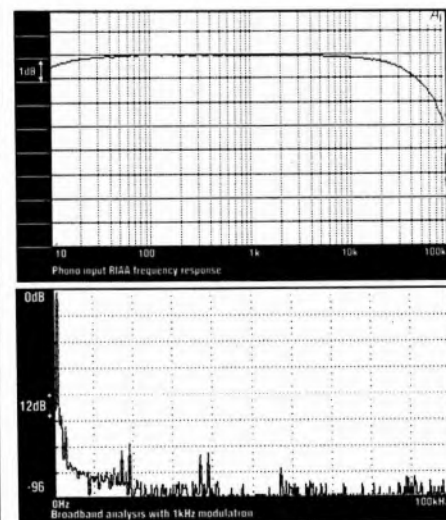
The sound enhancement circuits perform fairly basic and, to some extent rather gimmicky, processing. Note particularly the maximum four channels of sound, and the heavy concentration on stadium and church type effects which are primarily for show. And that's just how it worked out.

CONCLUSIONS

One problem is in knowing just who the system is aimed at. Undeniably sophisticated, powerful and flexible beyond most people's dreams, the *1001* nevertheless conspires to fall between stools. It is not the audiophile amplifier that its price suggests it should be. In fact it's not as good as its cheaper brother, the *777*. Nor is it all that sophisticated given recent developments in ambient sound processing from elsewhere. But I'd *kill* for that remote control...

TEST RESULTS

Amplifier Section			
Rated power into 8ohms – maker's spec	21dBW/125watts		
Power output at 1kHz:			
one channel driven 8ohms	19.1dBW/81watts		
both channels driven 4ohms	17.2dBW/105watts		
Distortion at rated power			
1kHz, aux/CD input	–77dB* /0.014%		
1kHz, at 0dBW, aux/CD input	–80dBW/0.01%		
Noise disc input (MM) (IHF, CCIR wtd)	–74dB		
aux/CD input (IHF, CCIR wtd)	–77dB		
Residual unwt'd noise, vol control at minimum	–80dB		
Stereo separation aux/CD input at 1kHz	81dB		
Input data	sensitivity	loading	capacitance
disc mm	0.22mV	46kohm	700pF
disc mc	0.059mV	100kohm	—
aux/CD	21mV	47kohm	200pF
Tuner Section			
FM sensitivity mono/stereo for 50dB s/n	4.5µV/50µV		
Ultimate signal/noise (CCIR/ARM/1 kHz ref)			
mono/stereo	76dB/70dB		
Total harmonic distortion at 100% mod, 1kHz	–58dB		
Pilot tone rejection, 19kHz/39kHz	–71dB/–90dB		
Typical price inc VAT	£770		
*this is just under clip at 75 watts			



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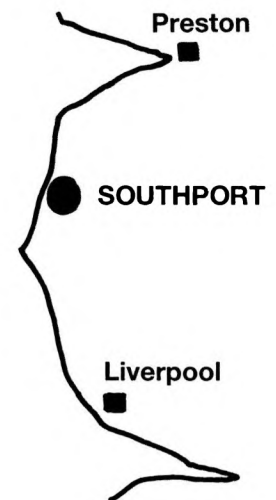
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REVOX B285

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Rated at a modestly powerful 70 watts/channel, the *B285* provides a surfeit of flexibility in some areas, and some surprising restrictions in others. Examples: uniquely the tuner can be had either with or without the AM tuner section, or you can buy it without AM and add it on later. You can even buy it as a preceiver, without the power amps. For this test the Revox came with an FM/MW/LW tuner.

You get two tape circuits with full cross dubbing and inputs for phono and one line level item, typically compact disc. The phono input is for high output (MM) cartridges only, though an MC head amp can be added as an optional extra. The tape circuits can be used for other source components. Even so, for such an expensive and otherwise flexible component, the *B285* seems somewhat deficient in inputs.

The shortage of inputs is all the more strange in view of the amp's other capabilities. Revox allows all the inputs to be 'equalised' for volume so that the different sources have a similar apparent loudness and there are no jarring volume steps when switching inputs. The facility even extends to each of the 29 available radio presets so that you can switch seamlessly from Radio 3 to (say) Capital Radio which habitually tries to steal a march by over-modulating its FM carrier. Each preset frequency is stored alongside muting, stereo/mono and blend switching status, and can be programmed to display a four digit alphanumeric label - *RAD4* for example. A great deal of other status information is displayed in the large central LCD screen. Default and maximum volume levels at the loudspeaker terminals and the headphone can be separately restricted for safety and aesthetic reasons.

A full range of support facilities are offered - tone controls, LF only loudness compensation, selectable capacitance on the phono input, a subsonic (high pass) filter for the phono input only (logically it should be available on the tape input too).

LAB REPORT

Leaving the spring loudspeaker terminals to one side (which is what Revox should have

done), the *B285* is impressively built inside and out. Most of the circuitry is contained on seven vertical PC boards which run from front to back of the receiver, with the heat-sink and encapsulated power supply disposed in the same way. The boards are superbly built with almost no flexible wiring anywhere to be seen.

The tuner can tune in unusually fine steps (25kHz steps FM, or 1kHz steps (best case) on MW and LW), and is clearly an exacting design offering excellent sensitivity and noise figures. The spurious noise spectrum is first class. The amplifier's RIAA stage indicates mild bandlimiting with the -1dB points at 30Hz and 28kHz, but the real story is the power amplifier, where power output testing into 4ohms produced a burst of oscillation, following which the amplifier shut itself down. The per channel 8ohm output is comfortably above spec, but the various sensitivities are well below average or what is needed to produce full output from the amp in many cases.

SOUND QUALITY

I can see why people might want to buy this product for its tuner, but not for the amplifier which is seriously deficient in a number of areas. There was little of the usual extra degradation via phono (cf. the line inputs) and there was a kind of underlying naturalness about the product that made it almost endearing. But whatever abilities lurked under the surface, they were smothered in a layer of muddle, compression and a kind of low level fuzzy, grainy quality (my listening notes describe the amp as sounding 'mugged'). All this had serious consequences. Examples: low level sounds tended to disappear in the presence of louder ones, an aural precedence effect that favoured the most obvious component in the mix. Stereo imagery lacked differentiation and tonal colours, though accurate from where I sat, seemed somehow pale and undernourished.

The tuner is a quite different kettle of fish. Best auditioned via a tape output using an outboard amplifier, it is a clean sounding and highly capable design, able to reproduce clean stereo with just a trace of smooth back-

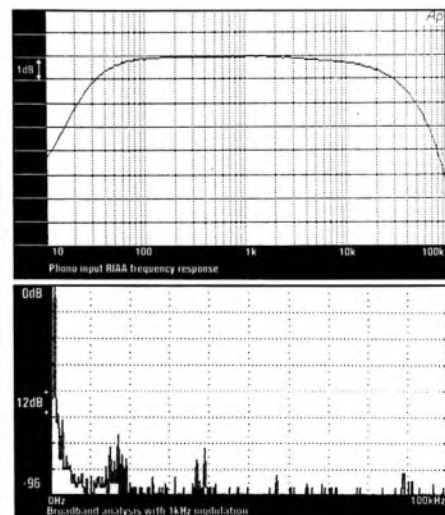
ground hiss where other good tuners were under serious stress. For most people even more important than its pulling power are musical attributes which measured by its ability to portray dynamics, tonal variety and explicit three-dimensional stereo imagery make the tuner everything the amplifier isn't. The AM section is clean and lively - excellent.

CONCLUSIONS

Summing this one up is all too easy. Revox needs to completely rethink its amplifier designs, to eliminate needless gadgetry - this applies particularly to the various sensitivity and 'volume top' facilities - to increase base level sensitivity, which is too low anyway, and to make the amplifier cope properly with difficult loads. The Revox's performance in this respect implies that even easy loads under dynamic conditions (pace Matti Ojala's work on dynamic impedance) will cause misbehaviour. In short, it's a lovely radio, shame about the amplifier.

TEST RESULTS

Amplifier Section			
Rated power into 8ohms - maker's spec			18.5dBW/70watts
Power output at 1kHz:			
one channel driven 8ohms			20.8dBW/120watts
both channels driven 4ohms			n/a*
Distortion at rated power			
1kHz, aux/CD input			-70dB/0.032%
1kHz, at 0dBW, aux/CD input			-74dBW/0.02%
Noise disc input (MM) (HF, CCIR wtd)			-60dBf
aux/CD input (HF, CCIR wtd)			-64dBf
Residual unwt'd noise, vol control at minimum			-75dBf
Stereo separation aux/CD input at 1kHz			40dB
Input data	sensitivity	loading	capacitance
disc mm (min - max)	5.0 - 16.7mV	47kohm	variable
disc mc	---	---	---
aux/CD	240mV	45kohm	400pF
Tuner Section			
FM sensitivity mono/stereo for 50dB s/n			2.5µV/25µV
Ultimate signal/noise (CCIR/ARM/1kHz ref)			
mono/stereo			80dB/76dB
Total harmonic distortion at 100% mod, 1kHz			-57dB
Pilot tone rejection, 19kHz/39kHz			-78dB/-91dB
Typical price inc VAT			£1782
*see lab report			
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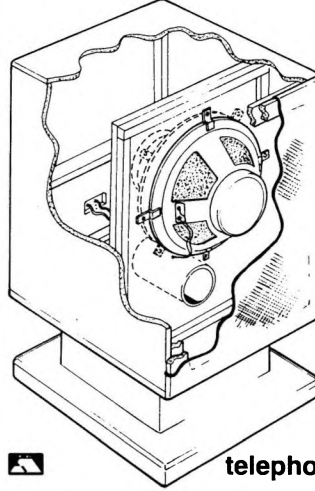
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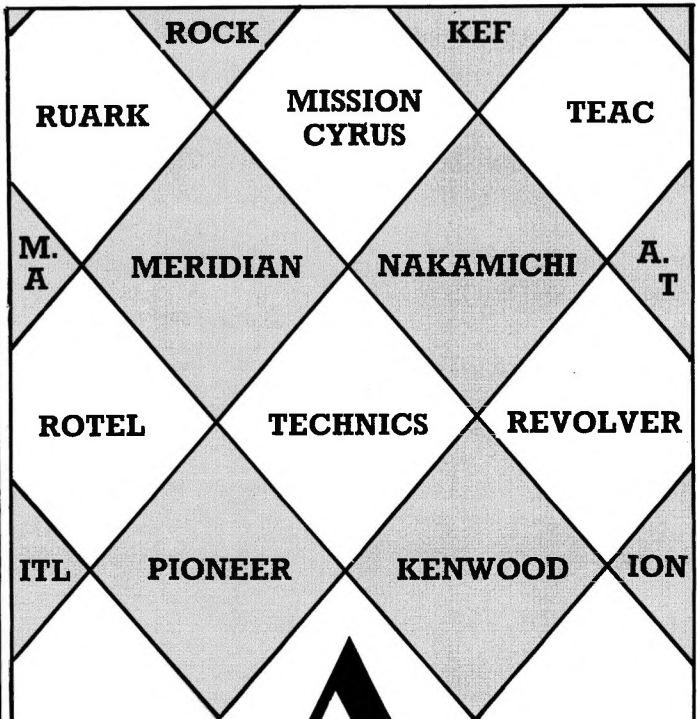


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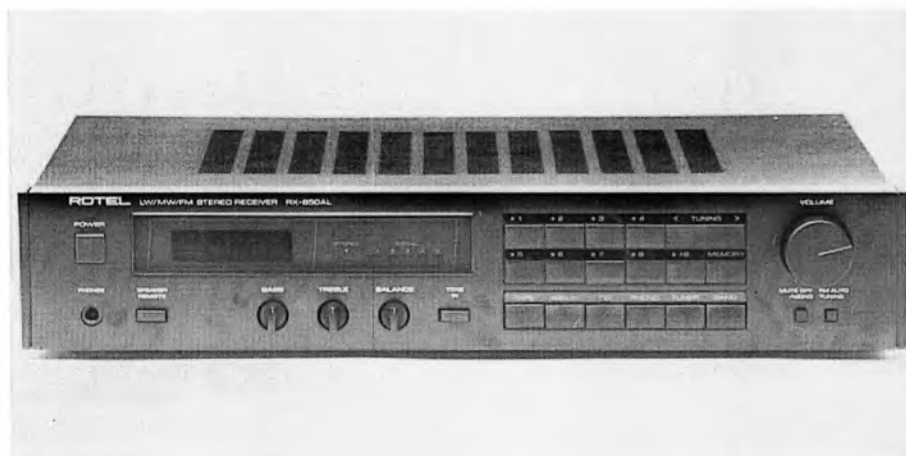
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ROTEL RX-850AL

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BEST BUY



The *RX-850AL* is billed as the marriage of convenience of two well known products, the *RA-820A* and the *RT-850AL* amplifier and tuner respectively. It's interesting that Rotel has chosen to use the cheaper, lower grade version of its budget amplifier with the more expensive of its two tuners. The logic is obvious enough, however. This is a budget design, but the digital presets featured on the *RT-850L* have reportedly been much more attractive to the buying public than the manual tuning of its cheaper *RT-830L*, which is similar in other respects.

The nuts and bolts go like this. The amplifier section has inputs for phono (moving magnet only), CD, auxiliary and tape, and is rated at 30 watts/channel. It can drive two pairs of loudspeakers, one permanently connected, bypassing even the headphone socket to maintain maximum signal purity. The well designed bass and treble control network, whose effects are mainly limited to the frequency extremes, can be bypassed. One limitation of the Rotel is that real time off-tape monitoring is not allowed. Other source selectors are released when tape is selected, which also rules out using an external processor (Dolby Surround etc).

The tuner section covers all three UK standard wavebands - FM, MW and LW - and has a 16 random preset capacity, auto and manual tuning, a five step signal strength meter and switchable muting.

LAB REPORT

The Rotel has been designed and built with care commensurate with price. Good quality 4mm binding posts are used to plumb in the loudspeakers, and the phono and CD sockets are gold plated - there's a touch of inconsistency here, but the intention is clear. The metalwork is of better than normal standards. The circuit is split over three main and several sub-boards, and appears to be well made with some fine quality components (capacitors etc) in critical areas. The power supply is well endowed for the 30watt power rating. At the very least then this is not a design that has sought the easiest way of meeting the price point and specification.

Power output is well above what was

expected from the price, and the healthy trend is continued into the low-Z test load - 68 watts/channel into a 4ohms load with both channels driven isn't bad. Distortion products are also very low and the noise figures are satisfactory or better. The various input parameters are okay except that input capacitance on the phono input is rather high, and with some combinations of phono cartridge and arm wiring this could result in a minor loss of HF.

However, the intrinsic response shape of the phono input is extremely accurate. There's some falloff at very low frequencies (-3dB at 13Hz), but this will be a positive advantage with many turntables. Tuner performance is good too. Stereo sensitivity is particularly fine for a budget design whilst noise and distortion are low. In common with the other low cost models however, there is quite a lot of spurious noise with this design, much of it concentrated into discrete bands of energy centred on the 19kHz and 38kHz pilot tone and subcarrier frequencies.

SOUND QUALITY

Sound quality proved excellent, not just with notionally compatible loudspeakers (the new Celestion 3 for example), but even with a pair of Apogee *Caliper* ribbon loudspeakers (low impedance, even lower sensitivity) where the Rotel seemed remarkably unfazed and in command at quite respectable volume levels.

With all inputs I felt that the Rotel sounded subtle and engaging. There's an openness about this design which leads to a very clear sense of light and dark, of piano and of forte. Music is intelligible when it is quiet almost to the point of inaudibility, and it remains uncluttered and poised even at high volumes, just prior to the point at which the amplifier starts to distort or (more often) the volume control runs out of track.

The phono input gave palpably the most realistic, or at least believable results, albeit by a fairly narrow margin and perhaps only because the test record player (a budget Dual fitted with a Linn *K18*) sounded better than the CD player I had available (no names...). The tuner too sounded fine, giving a

light, bright sound on FM with good stereo and excellent dynamics. AM sound quality was easily the best of the budget designs on intelligibility grounds, however, background interference is only modestly good.

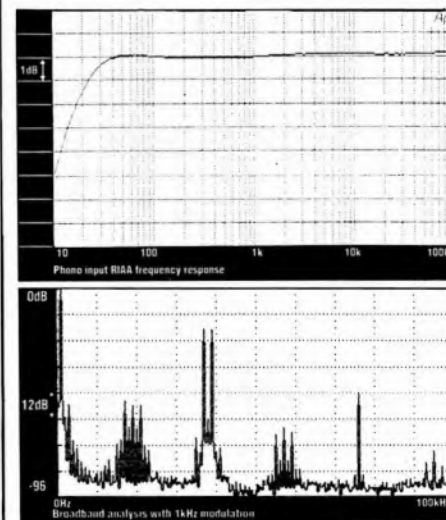
If the Rotel has a real fault, it is that it's occasionally a little *too* self effacing. It's wise not to expect too much from most modern commercial rock music since the amount of compression in particular tends to be horrendous. Nevertheless I found that recordings like Steve Winwood's *Roll With It* album sounded a little too detached for comfort, as though someone had drawn a curtain between the listener and performer. It was all a bit too tentative and, well, flavourless. Even here though there was no lack of detail.

CONCLUSIONS

An outstanding buy at the price, the Rotel is a supremely unglamorous design with more efficiency than soul. It can sound less than ideally tactile but it is well engineered and performs with integrity - not just in the lab, but also with music and can sustain prolonged exposure. Best Buy.

TEST RESULTS

Amplifier Section			
Rated power into 8ohms - maker's spec			14.75dBW/30watts
Power output at 1kHz:			
one channel driven 8ohms			17.5dBW/56watts
both channels driven 4ohms			15.3dBW/68watts
Distortion at rated power			
1kHz, aux/CD input			-76dB/0.016%
1kHz, at 0dBW, aux/CD input			-80dBW/0.01%
Noise disc input (MM) (IHF, CCIR wtd)			-73dB
aux/CD input (IHF, CCIR wtd)			-74dB
Residual unwt'd noise, vol control at minimum			-77dB
Stereo separation aux/CD input at 1kHz			76dB
Input data	sensitivity	loading	capacitance
disc mm	0.45mV	47kohm	185pf
disc mc			
aux/CD	29.4mV	43kohm	115pf
Tuner Section			
FM sensitivity mono/stereo for 50dB s/n			5µV/50µV
Ultimate signal/noise (CCIR/ARM/1kHz ref)			
mono/stereo			77dB/67dB
Total harmonic distortion at 100% mod, 1kHz			-53dB
Pilot tone rejection, 19kHz/39kHz			-53dB/-60dB*
Typical price inc VAT			£230
*sidebands at -19dB			



SAE R102

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The user interface of this unusual looking receiver is entirely logic interfaced, with no obvious advantage that I can tell. Indeed one disadvantage is that the volume, tone and balance controls are only coarsely adjustable in wide 2dB increments throughout their operating ranges.

The amplifier has a 50 watt/channel output spec and a moving magnet input, a solitary line level input, and two tape circuits with off tape monitoring and cross dubbing. A bass and treble control network is supplemented by two user definable memories. The tuner section is synthesiser driven and has eight presets on FM and a further eight on MW. There is no LW, but there's a mono switch and a preset scan control in lieu of random present selectors.

Whilst the front panel has a quality, engineered feel and the controls themselves do nothing to dispel the good impression, the casework elsewhere is rather rattly, and indeed rattled violently when power was applied, like an involuntary electronic shudder. There were also rather too many screw heads in evidence, and I was unhappy about the use of a single insulated captive mains cable and the two unshuttered mains outlets on the rear. Detachable wood side cheeks are a bonus.

LAB REPORT

The metalwork seems irrationally built, but after removing about a cupful of screws the lid came off to reveal a surprisingly well laid out and wholly rational interior. The output stage uses large thick film devices which simplify matters considerably. I was impressed by the high standard of screening around the high frequency display circuits. I've already commented on the resonant metalwork, but stripping down demonstrated that the root cause was not thin, flimsy metalwork. Au contraire - it's rattly *despite* the metalwork. The twist-to-lock loudspeaker terminals are the pits.

Most of the measurements gave respectable enough numbers. Power output, noise and distortion results are more than satisfactory though power output certainly doesn't significantly increase into low impedance

loads with the implication that this may not be the optimum tool for problem speakers. The inputs are all blessed with acceptable sensitivity, but the line level inputs suffer a combination of slightly low impedance and very high capacitance, which could lead to a loss of extreme HF in adverse circumstances. The tuner is a little low on sensitivity and hiss bound by the best standards, but the level of spurious is noticeably low and noise-like in character. Pilot tone rejection is excellent.

The SAE's RIAA curve is a mess. The response peaks at 120Hz, and falls away gently on either side. The -1.5dB points lay at about 28Hz and 20kHz, and it would be a major surprise if this wasn't audible in some way...

SOUND QUALITY

The R102 is a highly distinctive receiver and in musical terms quite a successful one, even though some of the raw material doesn't look all that promising. The biggest drawback is that it is kind of self-limiting. The SAE seems to erect safety barriers around itself so that if it's stressed by a particularly blazing passage, it limits or compresses just enough to keep itself out of trouble. At least subjectively, the unit seems able to sustain a degree of overload without gross distortion, but the limits are nevertheless not very high, and in many systems I can foresee this amplifier being driven beyond its comfortable limits with dynamic material played at realistic levels.

On paper the phono input looks like the weakest point, but the reality isn't quite like that. The receiver is limited to moving magnet (high output) cartridges of course and this itself represents a limitation on the performance extractable from records. Yet I found that the SAE played records in an enjoyably engaging manner. It offered a close, positive account of the music, with some diminution of presence at the frequency extremes, but a great combination of openness, clarity and three-dimensional imagery in the midband. The other key feature of the SAE is that it's colourful, by which I mean that tonal colours are rich and variegated.

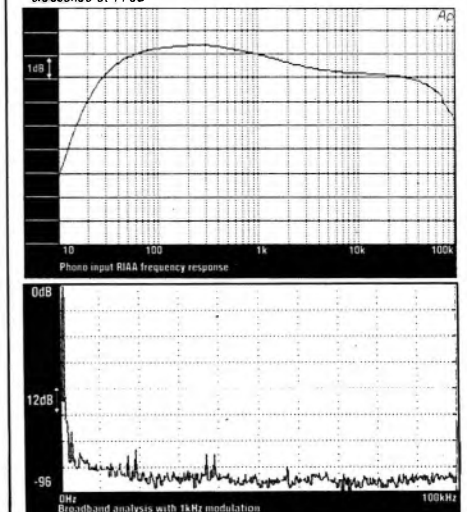
Sound quality using the line inputs (CD etc) was consistent with the phono input except that it didn't suffer the lack of presence at the frequency extremes noted with the phono input. More correctly, it didn't do so to anything like the same extent. The result was unfailingly musical and outgoing, with good presence and a lack of electronic 'glare', but it was still a touch soft-centred, lacking real grip in extremis. Constrictions similar to those noted with the record deck were also noted with the FM tuner, but on balance I felt the latter came off worse. FM sound quality was dull and constrained, without the subtle inner virtues of the phono and the other inputs. Background hiss also tended to be intrusive, whilst AM lacked sensitivity or frequency range, sounding wooden in consequence.

CONCLUSIONS

The SAE was clearly designed by someone who cared enough to make sure the final product sounded musical, which it does on the whole. However, it must also be recognised that the phono section is hardly neutral, and that the tuner is a little primitive.

TEST RESULTS

Amplifier Section			
Rated power into 8ohms - maker's spec			17dBW/50watts
Power output at 1kHz:			
one channel driven 8ohms			19.6dBW/91watts
both channels driven 4ohms			16.9dBW/98watts
Distortion at rated power			
1kHz, aux/CD input			-83dB/0.0071%
1kHz, at 0dBW, aux/CD input			-82dBW/0.0079%
Noise disc input (MM) (HF, CCIR wtd)			-72dB
aux/CD input (HF, CCIR wtd)			-80dB
Residual unwt'd noise, vol control at minimum			-74dB
Stereo separation aux/CD input at 1kHz			81dB
Input data	sensitivity	loading	capacitance
disc mm	0.39mV	49kohm	150pF
disc mc	—	—	—
aux/CD	25mV	34kohm	550pF
Tuner Section			
FM sensitivity mono/stereo for 50dB s/n			5.5µV/55µV
Ultimate signal/noise (CCIR/ARM/1kHz ref)			
mono/stereo			76dB/64dB
Total harmonic distortion at 100% mod, 1kHz			-62dB
Pilot tone rejection, 19kHz/39kHz			-74dB/-94dB*
Typical price inc VAT			£599
*sidebands at 77dB			



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21. Which area do you live in?
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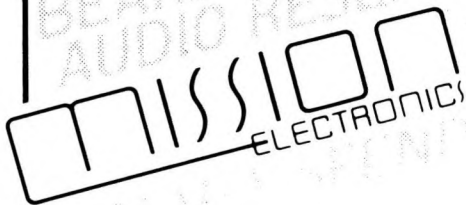
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GLOSSARY

The Hi-Fi Choice dictionary of audio terminology, explaining all the weird and wonderful adjectives used by our reviewers, as well as technical abbreviations.

AM: Amplitude modulated; see 'Medium Wave'.

ACOUSTIC BREAKTHROUGH: Sound that gets into the turntable and hence the cartridge from the air and thereby creates a risk of acoustic feedback.

ACOUSTIC FEEDBACK: If any sound in the room can find its way through the body of the record deck to the cartridge stylus, then that sound will be reproduced from the loudspeakers, along with the wanted programme material. If too much of this sound from the loudspeakers is picked up by the cartridge in this way then a vicious circle of acoustic feedback will be created.

ACTIVE: Speaker systems which contain electronic crossovers and where the drive units are connected directly to power amplifiers.

ALIGNMENT PROTRACTOR: A device used to minimise the lateral tracking error of a cartridge/arm combination.

AMPLITUDE: Size or magnitude; hence the amplitude/frequency response, known normally simply as the frequency response, which describes the relative loudness of the system at different frequencies with a constant input voltage.

ANECHOIC: Without echo; a special room or 'chamber' with thick sound absorbing materials on all surfaces to prevent reflections.

ARM MASS: More accurately called *effective* arm mass, because it is *not* the weight of the arm on a pair of scales. It is the mass of the arm and cartridge combination that appears to be concentrated at, and thus felt by, the stylus tip which is tracking a record groove. There is nothing inherently good or bad about arms with light or heavy effective mass; what matters is the manner and choice of their combination with cartridges of different compliance and the low frequency resonance produced by such combination.

AZIMUTH: With reference to tape and cassette recorders, the alignment of head gap to tape path.

BALANCE: 1) The overall relative loudness perceived at different frequencies (eg bass, treble); 2) the accuracy of the match between the two channels of a stereo transducer (eg cartridge or pair of loudspeakers).

BANDWIDTH: A range of frequencies with presumed defined upper and lower limits.

BASS: Lower part of the frequency spectrum.

BELT DRIVE: The motor has its rotational speed geared down to the required platter speed (33 $\frac{1}{3}$ rpm for LP discs) by a rubber or similar resilient belt which runs round a small pulley on the motor shaft and a large pulley attached to or part of the platter.

BEXTRENE: A plastics material frequently used for bass and mid-range cones.

BIAS: (*turntable/arms*) Because the cartridge on a pivotal arm is being drawn across the record surface by the stylus tracking at an angle offset from the pivots, groove friction produces an imbalance of lateral force. Bias is the application of a compensatory lateral force acting in the opposite direction.

BIAS: (*tape*) This refers to a high frequency current passing through the record head which allows the audio current also passing through the head to produce reasonably linear magnetisation of the tape at all levels permitted by the combina-

tion of each machine with the tape. The lowest level of bias is required for ferric cassettes, a slightly higher one for ferrichrome, an even higher one for chrome or pseudochrome, and the highest for metal.

BOTTOMING: The stylus scraping on the distorted rounded bottom of the groove due to incorrect stylus geometry.

CANTILEVER: The thin rod or tube that connects the stylus to the armature and hence the cartridge body.

CAPACITANCE: An element of electrical impedance that is particularly important when matching pickup cartridge, arm leads and amplifier input characteristics to achieve a flat frequency response from discs.

CLIP ING: This is reached when a circuit is overloaded and overdriven, resulting in bad waveform distortion and audibly unpleasant effects.

COLORATION: A general term used to describe the audible effects of distortions, particularly in loudspeakers and record players. These are usually caused by frequency response irregularities and/or resonances.

COMPATIBILITY: The selection of interdependent components to achieve optimum system performance; notably arm/cartridge mass/compliance matching, cartridge electrical loading, or loudspeaker compatibility with amplifiers.

COMPLIANCE: A measure of the springiness of the cantilever/armature seen from the stylus, expressed in compliance units (Cu), where 1 cu = 10⁻⁶ cm/dyne.

CROSSOVER: An electrical circuit which uses combinations of inductors, capacitors and resistors to divide the signal from the power amp into the required frequency bands and with any necessary equalisation for feeding to the individual drive units of the speaker system.

CROSSTALK: The leakage from one channel to the other in a two channel stereo system.

CUTTER: Mechanism used to cut recorded signal onto lacquer master; consists of turntable, lathe, cutting head, cutting and servo amps.

DIN: German standards body, responsible amongst other things for a popular range of standard plugs and socket specifications.

DAMPING: A means of controlling resonances by means of a resistive medium (electrical, mechanical, or acoustic depending on situation).

DECIBEL (dB): A logarithmic unit that is convenient for expressing ratios that span a wide range on a linear scale. For simplicity it can be regarded as a measure of relative loudness.

DISTORTION: Literally this can mean any deviation from the original, but usually refers to harmonic rather than intermodulation distortions when not specified.

DOLBY: Covers various signal processing/depcessing systems, but normally refers to the B & C noise reduction systems used in cassette record/replay, and the B system used for music-cassette replay.

DOPING: A technique involving the application of damping to a loudspeaker driver cone in order to assist in controlling resonances.

DOWNFORCE: The weight, measured at the stylus, which holds it down in the groove.

DRIVE UNIT (DRIVER): The term used to distinguish the loudspeaker unit itself, be it bass, midrange, treble or fullrange in application, from the complete loudspeaker system which combines drive units, cabinet and crossover into a total design.

DROPOUTS: Momentary reductions of programme level due to inadequate head/tape contact caused by oxide particles shedding off the tape onto the head gap, or inadequacies in tape transport or tape.

DYNAMIC RANGE: The ratio in dBs between the quietest sound that can be successfully recorded and the loudest which can be accepted without serious distortion on an average programme.

EFFECTIVE MASS: The inertia, or mass-controlled resistance to movement, of a device, particularly important with regard to tonearms.

EFFICIENCY: The amount of acoustic power delivered for a given electrical input power.

ELECTROSTATIC: A principle employed in some loudspeaker transducers using static electricity effects to set up a polarising field within which the modulated transducer medium moves.

ELLIPTICAL STYLUS: A specially shaped stylus profile that makes the 'plan view' radius along the length of the groove smaller than the 'elevation view' contact radius viewed from the front.

EQUALISATION: (*general*) The deliberate modification of frequency response, usually in response to some engineering limitation or deficiency.

EQUALISATION: (*tape*) This refers to the necessary change in frequency response required of an amplifier so that overall flat frequency response is obtained from a tape medium. Equalisation is required both on record and replay. Any tape recorded on a good cassette recorder should have the same inherent response when played back on another correctly set up machine, since all playback equalisations should have been standardised. These standards are normally specified by the time constants of the circuits involved, eg 79 μ s or 120 μ s (see 'Microseconds').

FARAD: Measure of capacitance.

FM: Frequency modulated; often used to describe radio transmissions of high fidelity potential on the VHF band.

FARAD: Measure of capacitance.

FERRITE ROD: A short rod type aerial used for AM reception; may be fitted internally or externally to a tuner or receiver.

FERRO-FLUID: A magnetic fluid which is introduced into the voice-coil gap to provide damping and/or improved cooling.

FILTER: A circuit (normally) used to restrict the bandwidth of a system; may be fixed or switchable.

FREQUENCY RANGE OF SPECTRUM: Can refer to any particular group of frequencies, but commonly applied to the audible band from 20 to 20,000 cycles per second (Hz), extending from the deepest bass to the highest audible harmonics.

FREQUENCY RESPONSE: The variation in output over a frequency range, particularly of a transducer; can be expressed as a range with decibel limits, or depicted graphically.

Hz (HERTZ): 1 Hz = 1 cycle per second and is a measure of frequency which corresponds to musi-

cal pitch (the higher the frequency the higher the pitch).

HF: High frequency.

HARMONIC: Harmonics are the whole number multiples of a base frequency called the *fundamental*.

HARMONIC DISTORTION: The addition of unwanted harmonics to a signal.

HUM: A low frequency interfering sound produced by break-through or interference from mains wiring or circuitry.

IHF: American Institute of High Fidelity, an important standards body.

IEC: An international standards body.

IMPEDANCE: Measure of resistance (and reactance) in alternating (ie audio) signals; this is of some importance in the compatibility of both cartridges and headphones with amplifiers. For convenience sake is measured in ohms.

INTEGRATION: Used to describe the success with which the output from two drive units combine to give smooth output through the crossover region.

INTERMODULATION (IM): A form of distortion arising from two or more signals producing non-harmonic signals that correspond to the sum or difference of the two frequencies.

KILO (k): prefix meaning one thousand.

LED: Light Emitting Diode; an indicator light.

LF: Low frequency.

LATERAL FRICTION: The resistance to movement of an arm and cartridge combination in the horizontal plane (ie across a record), caused by friction in its bearings.

LINEAR: A transducer that produces an output that exactly portrays its input over the required operating range is described as linear, and is hence distortion free. Hence also nonlinearities (distortions).

LINE-CONTACT: A special stylus profile that extends the ellipse, increasing contact length up and down the sides of the groove.

LOAD OR LOADING: The impedance (including resistive and reactive components, ie ohms, mH, pF) seen by one component looking back to its interconnected component; of importance in compatibility of cartridge/amp, and amp/headphone.

'LOUDNESS': An equalisation circuit frequency switchable on amplifiers which is designed to compensate for presumed hearing characteristics at low listening levels by boosting bass and treble.

MOL: Maximum operating level of tape normally referring to 5% distortion of 315Hz or 3.15kHz.

MEDIUM WAVE: An AM transmission band incapable of high fidelity signals.

MICRO-(μ): Prefix for units meaning one millionth of.

MICROSECONDS (μ s): The time constant of a resistor capacitor combination involving a frequency response change (equalisation).

MIDRANGE, MIDBAND: The central part of the audible frequency range where the ear is most sensitive.

MILLI-(m): Prefix for units meaning one thousandth of.

MODULATION: The audio signal is 'stored' by means of modulations within a medium, eg the 'wiggles' in the groove of a plastic disc, or the

magnetic coding on a tape.

MODULATION NOISE: An additional noise added to tape noise, which increases with the degree of modulation of the tape, caused by the properties of the magnetic coating. This noise has most of its energy near the modulation frequency (causatory tone).

MOVING COIL: A transducer (eg cartridge or headphone) where the signal is generated by the movement of a coil within a magnetic field.

MOVING MAGNET: The most common form of cartridge transduction, where the magnet moves while the coils are held relatively stationary.

MULTIPLEX FILTER (MPX): A circuit which introduces severe attenuation at supersonic frequencies to decrease interference encountered with the output from some stereo FM tuners.

NANO (n): Prefix meaning a thousandth of a millionth of.

NOISE: Random unwanted low level signals.

NOISE MODULATION: An unwelcome breathing effect that can be heard on some programme material, produced by poor noise reduction systems, or circuits.

OCTAVE: Two-to-one ratio of pitch or frequency.

OFFSET ANGLE: The angle measured between the centre line of the pickup cartridge and the line which joins stylus and arm pivot point.

OHM: Unit of electrical impedance (including reactance) or resistance; also kohm, where 1 kohm = 1,000 ohms.

OVERHANG: The extent to which the cartridge stylus extends beyond the centre of the platter is critical, and controlled by fore and aft adjustment of the cartridge on the arm.

PASSIVE: The most common type of system, where drivers and crossover are driven from a single power amplifier.

PEAK RECORDING LEVEL: A level above which distortion becomes apparent. This distortion is introduced when the oxide particles almost reach magnetic saturation, and thus will accept no more level.

PHONO: The most commonly used plug/socket combination in audio components.

PICO (p): Prefix meaning one millionth of a millionth of.

PORT: An opening in a cabinet which is tuned to characteristics of the bass driver and the enclosure volume to provide reflex type bass-loading.

POWER AMPLIFIER: The part of an amplifier that provides power to drive the loudspeakers: usually integrated, it is sometimes a separate component.

PREAMPLIFIER: The part of an amplifier that accepts the input signals, sorts them, applies any necessary equalisation, and then passes the signal to the (normally integral) power amplifiers.

PRESENCE: A quality of forwardness or immediacy in a sound balance, generally related to an upper-middle frequency response boost.

PRINT-THROUGH: A pre- or post-echo of a loud signal created by magnetisation occurring from one layer to an adjacent layer after the tape has spooled or been recorded.

Q: A measure of the magnitude and shape of a resonance; the higher the Q, the sharper and more severe in amplitude the resonance.

REFLEX: a system of bass loading (using port or ABR) which offers improved efficiency and bass power handling at the expense of subsonic control compared to a sealed box.

RUMBLE: The low or medium frequency sound produced mechanically by any moving parts in a turntable, mainly the motor and platter bearings.

SENSITIVITY: The volume of sound output for a specific electrical voltage input.

SEPARATION: As between the two channels of a stereo pickup; see *crosstalk*.

SHIBATA: A special stylus extending the elliptical to a 'line-contact' type of profile.

SIDE-THRUST: A force acting on cartridges in pivoted (ie not parallel tracking) arms, due to the stylus/vinyl 'friction' acting along the line of the offset angle; hence bias or side-thrust compensation.

SIGNAL-TO-NOISE, SIGNAL/NOISE, S/N: The difference in total output when an applied signal is removed.

STYLUS: The specially shaped piece of diamond in contact with the groove and connected to the cantilever.

SUBSONIC: Below the audible range, ie below 20Hz.

SQUARE WAVE: A signal which consists of a fundamental plus a (theoretically infinite) series of odd (3rd, 5th etc) harmonics in a precise phase and amplitude relationship. It is useful for examining transient performance, symmetry, resonance control and 'ringing'.

THD: Total harmonic distortion.

TRACING: The following of the groove modulations by the stylus; hence for example tracing distortion, caused by the inability of a spherical stylus to trace the high frequency inner grooves on a disc.

TRACKABILITY: The ability of cartridge to cope with large amplitude modulations (or of the arm and cartridge to follow the groove itself properly).

TRACKING ERROR: The discrepancy between the truly tangential angle at which a record is cut and the slightly off-tangential angle at which it is tracked by a stylus on a pivoted arm during some parts of the arm's travel.

TRANSIENT: Signal of very short duration.

TREBLE: Upper part of frequency spectrum, typically above about 3kHz.

TWEETER: A small drive unit designed to operate over the high frequency range.

ULTRASONIC: Frequencies above audibility, ie greater than 20kHz; also *supersonic*.

VERTICAL TRACKING ANGLE (VTA): The angle at which the plane of motivation of the stylus is set with respect to the vertical when viewed from a side elevation of the cartridge. Should match the 20° cutter standard.

WEIGHTING: A factor or function that is applied to a measurement to increase its relevance and usefulness.

WOOFER: A drive unit that operates over the bass portion of the audio range.

WOW AND FLUTTER: Low and high frequency pitch variations (from poor tape transport or turntable platters with speed drift).


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CD65 Mk 2 SE	£299.90
CD75 Mk 2 SE	£349.90
CD 85	£499.90
CD94	£799.90
CDA94 D to A convertor	£799.90

HI-FI CHOICE RECOMMENDED

INTERCONNECTS Stereo pairs terminated gold plated RCA phono plugs

Description	0.5m	0.75m	1.00m	1.5m	2.0m	3.0m	Cable per metre
QED INCON	13.95	—	14.95	16.50	18.00	21.00	1.20
QED INCON (screened)	17.95	—	18.95	19.95	21.95	25.95	1.75
DNM Solid Core	22.90	23.90	25.00	27.25	29.50	34.00	2.30
DNM Solid Core (shielded)	23.50	25.00	26.50	29.50	32.50	38.50	3.00
Deilec Slink	29.00	30.50	32.00	35.50	39.00	46.00	—
Deilec Black Slink	126.00	139.00	152.00	178.00	204.00	256.00	—
Monster Interlink 400	24.00	27.00	30.00	36.00	42.00	54.00	—
Kimber PSB	30.00	33.70	36.80	43.00	49.20	61.60	—
Monster Interlink CD	33.00	39.50	46.00	59.00	72.00	98.00	—
AQ Livewire Ruby	37.00	41.00	45.00	53.00	61.00	77.00	—
Kimber KC1	39.25	46.70	54.20	69.00	83.95	113.75	—
Vector 8045	39.00	—	49.00	59.00	69.00	79.00	—
AQ Livewire Quartz	47.00	55.00	63.00	79.00	95.00	127.00	—
Van den Hul D102 Mk2	53.00	59.50	66.00	79.00	92.00	118.00	12.95
Monster Reference	62.00	—	88.00	114.00	140.00	192.00	—
AQ Livewire Emerald	68.00	83.00	98.00	128.00	158.00	218.00	—
Musical Fidelity Lifeline	43.50	46.25	49.00	60.50	72.00	95.00	—
Van den Hul Thunderline	89.00	114.90	139.90	189.90	239.90	339.00	—

SPEAKER CABLES Stereo pairs terminated 4mm plugs (state if other termination required)

Description	2m	3m	4m	5m	7m	10m	Cable per metre
AQ Livewire Type 2	19.80	23.70	27.60	31.50	39.30	51.00	1.95
AQ Livewire BC 4	20.00	24.00	28.00	32.00	40.00	52.00	2.00
AQ Livewire Type 4	26.80	32.70	38.60	44.50	56.30	74.00	2.95
AQ Livewire Brown	27.80	35.70	43.60	51.50	67.30	91.00	3.95
KIMBER 4TC	76.00	108.00	140.00	172.00	236.00	332.00	16.00
QED 79 Strand	12.50	14.30	16.10	17.90	21.50	26.90	0.90
QED 79 Strand (Flat)	13.70	16.10	18.50	20.90	25.70	32.90	1.20
QED 200 Strand (Flat)	18.50	22.50	26.50	30.50	38.50	50.50	1.95
NAIM NACA 4	19.95	24.42	28.90	33.38	42.34	55.78	2.24
LINN LK20	19.90	24.30	28.80	33.30	42.20	55.50	2.20
DNM Solid Core	19.70	24.30	28.90	33.50	42.70	56.50	2.30
MUSICAL FIDELITY Lifeline	56.00	79.00	102.00	125.00	171.00	240.00	11.50
SUPRA 2.5mm	16.95	19.95	22.95	25.95	31.95	49.95	1.49
SUPRA 4.0mm	20.95	25.95	30.95	35.95	45.95	60.95	2.49
SUPRA 10.0mm	41.00	54.00	67.00	80.00	106.00	145.00	6.49
Van den Hul CS122	37.00	48.00	59.00	70.00	92.00	125.00	5.50
Van den Hul CS352	67.00	93.00	119.00	145.00	197.00	275.00	12.95
VECTEUR 9040 (CV30)	35.00	45.00	55.00	65.00	85.00	115.00	4.99
VECTEUR 8120 (CV90)	99.00	—	—	199.00	—	—	389.00

BRANDS STOCKED: Air Tangent, Albarry, Alphason, Arcam, Apogee, Audioplan, Audiolab, Audio Research, Avance, Beard, B & W, Cambridge, Croft, Celestion, DNM, Denon, Dual, Epos, EAR, Foundation, Goldmund, Harbeth, Heybrook, Jadis, KEF, Koetsu, Kiseki, Kinergetics, Krell, Kuzma, Linn, Linx, Magneplanar, Martin Logan, Mantecore, Marantz, Meridian, Michell, Milltek, Mod Squad, Musical Fidelity, NAD, Naim, Nakamichi, Nitty Gritty, Oracle, Pink Triangle, PS Audio, Quad, QED, Rata, Revox, Revolver, Rotel, Rogers, Stax, SD Acoustics, Sonus Faber, Spica, SME, Sumo, Slate Audio, Systemdek, Tannoy, Voyd, Wharfedale, Yamaha, Zeta.

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THE DIRECTORY

The *Hi-Fi Choice Directory* was conceived as a reference guide to all the audio products reviewed by *Choice* that are currently available. At present this runs to some 700 plus products split into suitable categories, each with its own introduction containing information about the product type and its applications. They are particularly relevant to the uninitiated first time buyer and help sort out the order of priorities when buying a piece of equipment.

Each product along with its retail price is placed in its respective category in alphabetical order. For instance the Acoustic Research *EB101* is presently at the beginning of the Turntables and Tonearms section; however, the Ariston *RD90 Superior* heads the Motor Units section as it is sold and was reviewed as a separate component – requiring a separate arm. Where there are several products with the same name but different model numbers these are in price ascending order.

Then come the ratings for the standard achieved in laboratory and listening tests, with the exception of certain product groups where lab tests were not carried out. One important point to remember is that they cannot be used to compare products from different categories – ie 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 it is best to refer to the original review for this, of which more later.

The next column(s) 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 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 *Bs* denoting the Recommended and Best Buy ratings that are appended to products we consider meritorious. The Best Buy tag means that a product not only offers good sound quality but is reasonably priced as well. With source components a price

limit of approximately £300 is usually used as a guide. Recommended means that either the performance of a product is particularly good irrespective of price or, alternatively that a good value standard is achieved but overall attainment falls short of Best Buy classification. An ideal situation would be to choose suitably priced Best Buy or Recommended products from relevant categories and create a Best Buy system, but, due to the variety in tonal balance that exists in much audio equipment (especially the electromechanical elements – ie cartridge and speaker) system building is not quite that simple. These ratings make a useful guideline for shortlisting components, but only experiencing the actual combination will tell you whether it works for you.

The final column contains a reference to the issue of *Hi-Fi Choice* which featured the complete review. If you wish to get a better idea of a product by reading the complete review it is possible to order a copy (if still in print) through our back issues department. Every *Choice* issue contains a Back Issues page for this purpose.

The Directory is constantly updated with the latest reviews and price changes as well as having discontinued products removed. If a listed product is updated to a 'mark two' form and the alterations are purely cosmetic or not too extensive we sometimes leave the product in with its current model number and an asterisk to denote that it has changed since our original review was published.

SYSTEM BUILDING

Pre-packaged one-make systems have been commercially very successful, with advantages like cosmetic consistency, competitive pricing, and (assumed) technical compatibility. However, despite the mass market clout of the consumer electronics giants, the hi-fi tradition of specialised separate components seems as strong as ever, and certainly represents the route taken by those who place sound quality ahead of other criteria.

Yet those who choose the separates route still have lingering doubts – usually completely unjustified – over the compatibility of components from different manufacturers. Gross incompatibilities are very rare nowadays, only likely to rear their heads amongst the most exotic components. Here the delicate art of 'supercompatibility' really takes over the major role and might be regarded as the key to 'real' hi-fi.

There are now three different pre-recorded music media competing for the attention of the hi-fi user, and to go for all three will either cost a lot of money or involve substantial compromises in the sound quality of each. For this reason many separates purchasers may start with just one source, adding others or a tuner when funds permit.

There will always be controversy over the relative qualities of LP, CD and cassette. LP is still the choice for ultimate sound quality – particularly for those prepared to spend a substantial sum on a good quality turntable system. Furthermore the vinyl repertoire is still the cheapest, largest and most varied.

Cassette has never really challenged vinyl's superior quality, but it is a multiple role format, offering 'go anywhere' flexibility, a uniquely useful recording capability, plus a broad catalogue of pre-recorded music cassette material. As a hi-fi medium cassette suffers from pre-recorded 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 replays best on that machine, which may cause aggravation when upgrading a few years hence. It is worth remembering that though such opportunities are rarely possible or practical, a live recording onto cassette using good quality microphones can be the hi-fi equal of any other source.

CD is the latest challenger to these two established media, using a digital instead of analogue storage format. The sound quality remains controversial, hailed as near perfect by its fans but derided by vinyl freaks, so it is probably fairest to say that CD is fine for most listeners, but may not suit everyone; certainly the lack of background noise, defects and deterioration over time are major strengths

While there will always be arguments about the different music storage and transmission formats available to the hi-fi listener, there is also controversy over the relative importance of the different components which make up the system chain – by which is meant the source, the amplification, and the loudspeakers (and for the pedantic the room itself, though there's often little that can be done here).

For many years the 'weakest link' theory proposed that the loudspeakers needed the most attention, that amplifiers merely had to have sufficient power, and that turntables were pretty well perfect. However, this perspective has become steadily discredited by an alternative 'theory of precedence', which stresses that no subsequent component can make up for the inadequacies of its predecessors – all it can do is supply its own additional degradations. In such a context it is not uncommon to find more than half the system budget allocated to the record player, with scrimping and saving made on amplifiers and loudspeakers, even though these are used all the time whatever the source.

Choosing the components of a system is only part of the task of getting the system as a whole working as well as possible. Good turntables and loudspeakers both benefit to a surprising degree from proper support – from stands that enable them to give their best performance, whether floor-standing or wall mounted.

Siting of components within a room can play a significant role, as can the room itself. Some people may prefer an acoustically more 'live' room than others, but most will agree that the larger it is the better, because this tends to provide smoother and better extended bass reproduction. All rooms create reflections and standing waves, and the effects of these are more severe if all opposing walls are parallel, similar distances apart, and with hard reflective surfaces. Provided that the loudspeakers can be placed fairly symmetrically, slight asymmetry elsewhere in the room is usually helpful.

The loudspeakers are most critical of placement, because it is their job to create the stereo image, and it will be impossible to do this if the sound from each is not roughly similar at the listening position. Each loudspeaker should operate in a similar immediate acoustic environment, unencumbered by other furnishings and structure, and a similar distance from listener, nearby walls, and corners. Some loudspeakers are designed to operate close to a rear wall, others a metre or so out into the room, but all loudspeakers benefit from being closely mechanically coupled via proper stands to the floor.

There is some debate about the best form of fixing, however, adjustable spikes through to the

floor proper or seated into the tops of cross-head screws are generally regarded as the best solution in most circumstances. There is no need for paranoia about using spikes through normal pile carpets because the holes will be almost impossible to find when the stands are removed.

Most decent quality turntables are fairly immune to feedback from loudspeakers, so it should not matter too much if these items are sited fairly close to each other. Indeed it is debatable whether any advantages gained from keeping the turntable well away are not lost through the need to use longer connecting cables.

Mixing and matching the components of a record player to get optimum results can be something of a black art, over and beyond the fairly simple business of choosing a cartridge of roughly the right compliance to suit the arm effective mass. Certainly the combining of turntables and tonearms is not a simple matter, and this is where a good specialist dealer will come into his own, both in terms of recommending good combinations from the models he holds in stock, and then in correctly carrying out the sometimes tricky set up procedures which are often required to get the best results.

The key to getting the best results from a separates system lies in finding an experienced and skilled dealer in the first place, one who takes the trouble to find out what you really want and then demonstrate some likely alternatives, without trying to cram his own particular prejudices down your throat. To some extent the customer's task must be to discover for himself whether the dealer in question is competent or not. Membership of trade organisations like BADA can be a worthwhile pointer to a degree of professionalism, but the bottom line is whether the dealer in question can create a good sound in his own shop. If he can't, there is precious little chance of him doing so in your home. The best dealers should lay on demonstrations so you can hear the differences between components for yourself, and hear the sort of improvements which can be had at different price strata. You can then establish the sort of performance you are prepared to accept within whatever budgetary constraints you have set.

The Directory has been compiled so that it can be used by *Choice* readers as a buying guide. A guide in the sense that you should use the information in it to make a shortlist of equipment suited to your needs and budget, and then audition it at a dealers before taking the plunge. Because tastes inevitably differ it would be unwise to buy purely on the basis of our recommendation and dealers are the most experienced people around when it comes to making systems work as a whole.

THE DIRECTORY

TURNTABLES & TONEARMS

The schizophrenic split between consumer electronics and 'real hi-fi' is most obvious amongst turntables. The former are supplied simply as a means of playing vinyl in a system context. Cheaply manufactured in the Far East, these are complete players with a variety of automatic facilities, sometimes tied into system remote control. But engineering compromises severely limit sound quality, cartridge choice may be P-mount restricted, and such machines are rarely stocked by specialist hi-fi dealers these days.

Specialist turntables offer big sound quality

improvements, but lack so-called convenience features (that practised users often find irksome). Such turntables at the cheaper end of the market (sub-£350) tend to be supplied with matching tonearm, and often include a 'starter' cartridge. Still better quality is found at higher prices amongst the separate motor units and tonearms. Careful partnering and set-up is essential for these individual components, but 'naturally sympathetic' combinations do exist, and the good dealer can help.

Listed separately as integrated players and as turntable motor units and tonearms, our **sound**

quality rating is based on results achieved using a high quality system – but in point of fact the turntable is usually the limiting factor soundwise in any system. **Lab performance** summarises the speed stability, vibration generation and environmental isolation of turntables, along with the friction, alignment and adjustment of tonearms. The tonearm's physical characteristics also define a range of mechanically compatible cartridges (see cartridge listings)

INTEGRATED TURNTABLES

NAME PRICE	LAB SOUND	COMMENTS	FEATURES ARM EFF. MASS	VALUE	BACK ISSUE FULL REVIEW
Acoustic Research EB101 £230	Good Good	This genuine high fidelity product offers an impressive package at a competitive price	Subchassis, manual, 13.5g	BB	48
Alphason Solo/Xenon MCS £365/£262	Average+ Good	The deck is warm and euphonious with high levels of clarity. Wow artefacts occasionally just audible.	3 point suspended motor unit, optional quartz PSU/speed change 13g		67
Alphason Sonata/HR-100S-MCS £695/£412	Excellent Very Good	Highly capable audiophile system with real resolution and control! Bass is powerful and dynamic ability unbridled	Manual, subchassis, belt drive, 10g	R	60
Ariston Q-Deck £150	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	BB	67
Ariston RD60 £219	Good Good	With the Enigma arm, this balanced and communicative turntable falls only slightly short of the RD90 on sound quality	Manual, belt drive, subchassis, 11.5g	BB	48
Ariston Forte £350	Below Average Average	Heavy on engineering, short of soul? The Forte almost makes it, losing out only because of some residual pitch variations and a lack of bass power. The arm is modestly good	Manual 2-speed belt drive player and detachable arm, 10g		67
Dual CS430 £89	Average Below Average	Ragged, sometimes unpleasant cartridge mixes with a modest pleasing player in a very sharply ccd package.	Belt drive, with cartridge, auto return,	R	67
Dual CS503-1 £114	Poor Average	Slated as a replacement for the CS505, the 503-1 needs careful system matching to mask rumble and microphony, but is good enough to benefit from a better cartridge	Semi auto, belt drive, low mass arm	R	55
Dual CS505-3 £139	Very Good Good	Continuous steady improvements have kept this model at the forefront of the budget market. Practicality is excellent and the deck has excellent timing bass/mid and stereo imaging	Semi-auto belt-drive, 8g	BB	67
Dual CS5000 £200	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
Goldmund ST4 £4,000	Very Good Excellent	The Studio turntable takes on a cheaper tonearm than the T3F, yet provides a similar reference standard objective and subjective performance at £2,000 less, in a neatly integrated though bulky package.	Solid subchassis, direct drive, parallel arm, detachable headshell	R	60
Heybrook TT2 turntable & arm £349/£249	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 dealers	Manual subchassis motor with arm, belt drive, 14g	R	67
JVC AL-FQ555 £170	Below Average Poor	Clear midband sound but woolly bass and crude treble. Ease of use however ranks highly, and there's little to out of adjustment	Auto, direct drive, 5.5g		67
Kenwood DP-990 £300	Average Average	Smart, slick and massive player suitable for low compliance cartridges only. A good but not inspired performer.	Semi-auto 2 speed direct drive, 16g		67
Kuzma Stabi/Stogi £575/£349	Average+ Stabi: Good; Stogi: Excellent	Stabi is powerful, spacious but not sufficiently subtle. Stogi is an excellent all rounder with even spread of abilities.	Manual, belt drive, subchassis, 12.5g	Stogi: R	60
Linn Axis £379	Good+ Good+	Setting new performance-for-price standards this cleverly engineered and competent deck has many of the qualities of the Sondek LP12	Electronic, belt drive, semi subchassis, 13g	BB	48/Coll
Linn Sondek/Ittok (Troika) £509/£429 (£669)	Excellent Excellent	Superb sound – the best LP12 combination yet. The Troika gives the system real solidity and strength, stretching the deck and arm qualities to the full	Manual subchassis player, belt drive, 14g	R	60
Manticore Mantra £300/£330 (Arm)	Good+ Good+	Fitted with a Rega RB250 arm variant and AT95E cartridge the Mantra fared very well indeed with a fine midrange and good focus	Subchassis, 12g, manual	BB	48/Coll
NAD5120 £89	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 arm/tube/weight,	BB	67
Omega Point Silver/Black £895/£295	Good Good+	An avowedly stripped down turntable that lacks even an on/off switch, the Omega Point Silver offers fine midrange clarity and good stereo, but some HF compression and a lack of 'wellie'	Manual, solid, belt drive, unipivot, 11g		55
Opus 3/Decca London International (Revised) £399/£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
Rega Planar 2 £135	Average+ Good	A remarkable product at the price, surprisingly articulate and confident	Integrated turntable, manual, 11.5g	BB	48
Rega Planar 3 £188	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	Integrated turntable, manual, 11.5g	BB	48
Revolv Rebel £160	Below Average Below Average	Fat, assured and forward presentation, but ragged and subjective speed stability problems. With a little further development, it will be a winner	Manual, 2-speed belt drive inc cartridge, 13g		67
Revox B291 £660	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, prefitted cartridge		55
Sansui SR-222 Mk V £159	Average— Average	More than acceptable in most areas, the Sansui is detailed and positive, though a little muddled when stressed. Best suited to low compliance cartridges	Manual 2-speed belt drive, 16g		67
Source/Odyssey RP1 £849/£695	Very Good	Mixed. The turntable has tremendous power and authority, but as tested suffered pitch imprecision. The arm is rather ill controlled and lacks resolution and focus	Manual, belt drive, subchassis, motor, outboard PSU, 15g		55
Systemdek IIX £248	Good Average+	Poised, clean sounding deck, forward and explicit in character. A good value deck under £250, and a relatively cheap and satisfactory suspended model	2 speed belt drive manual turntable and arm, 11g	R	67
Technics SLBD-22 £90	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, P-mount	R	48
Technics SL-DD33 £110	Average Average	As with the DD33 though better value	Automatic, direct drive, solid plinth, 7.5g, P-mount	BB	48

INTEGRATED TURNTABLES

HI-FI CHOICE

TO ORDER BACK ISSUES OF HI-FI CHOICE SEE PAGE 123

THE DIRECTORY

INTEGRATED TURNTABLES

NAME PRICE	LAB SOUND	COMMENTS	FEATURES ARM EFF. MASS	VALUE	BACK ISSUE FULL REVIEW
Technics SL-L20 £115	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 £140	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
Thorens TD280 £150	Average Average	Extremely competitively priced package with a trace of lower-mid overhang, but it's very well behaved elsewhere	Semi-auto belt-drive 2-speed, 13g	BB	67
Thorens TD166 Mk II £179	Average Average+	A polished and professional design consisting of a first rate budget suspended subchassis turntable and a mildly disappointing arm	Manual 2-speed, 13g	BB	67
Thorens 160S Mk IV £249	Average+ Average+	Fine familiar suspended player and arm. Faults are few, but include poor arm bearing adjustment. The arm can sound a little messy	Manual 2-speed, 7g	R	67
Thorens TD320 Mk II £349	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
Well Tempered Turntable & Arm £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

MOTOR UNITS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Ariston RD90 Superior £900	Good+ Good	Good but slightly damped sound quality, with powerful and stable bass. The pro quo is a certain lack of pace, energy and resolution	Belt drive, subchassis, electronic		55
Audio Labor Konstant £2,560	Good+ + Very Good	The space-station-like solid alloy frame needs a substantial shelf, but absolute stability renders a confident, neutral sound	Belt drive, subchassis	R	48/Coll
Goldmund Studio £2,350	Very Good Excellent	A reference point for high end audio, only exceeded by the even more extravagant Reference. Currently being reworked into a more competitive (!) package	Electronic, direct drive, solid subchassis	R	60
Michell Synchro £265	Good Good	A particularly 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
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
NVA Turntable £499	Average Good	A surprisingly fast and assured performer, but with lightweight bass and a little aggressive. Easy to set up, the price (necessarily) includes stand	Manual, belt drive subchassis, stand, 33 1/3rpm		60
Oracle Alexandria Mk III £825 - £995	Very Good Very Good	One of the most beautifully presented players made, and fully supported by superb separation, dynamics and a euphonious style of delivery	Manual 2-speed belt drive	R	67
Oracle Delphi III £1450	Very Good Very Good	Stable imaging, good bass and refined detail, it's well made and consistent in service - but very expensive	Manual, belt drive, subchassis	R	60
Oxford Acoustics Crystal Reference £1955	Very Good Excellent	This big, open and powerful sounding turntable works beautifully with Airtangent arm to give superb 3-D imagery	Manual, belt drive, subchassis, stand	R	60
Pink Triangle PT T00 £650	Good Excellent	A state of the art player, easy to set up but extremely fussy about partnering equipment and state of tune. The test sample suffered flutter derived roughness (presumed not typical)	Manual 2-speed, outboard PSU	R	67
Rega Split Slab Modification Kit £74	Good Good	Clever and cheap upgrade kit that protects the initial investment and which adds clarity and environmental isolation to a fine but microphonic original	Conversion suspended chassis kit for Rega 2/3		67
Roksan Xerxes £655	Excellent Excellent	This unique design cuts a swathe through the conventions of turntable design, providing superb resolution and stereo. Setting up is critical, and for experts only	Manual, belt drive, solid/decoupled	R	67
SEE Revolver £135	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
Source So £675	Good Good+	Now an extremely tidy sounding deck, the So has a grip and range at low frequencies that knows few peers, and is at least sufficiently good elsewhere. A successfully refined version of a promising original that didn't quite deliver	Manual belt-drive 2-speed, outboard PSU	R	67
Systemdek IIXE £248	Good Good	Fine, honestly specified and well built player which easily betters its closest stablemate, the IIX	Manual 2-speed, external PSU	R	67
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
Thorens TD521 £629	Average Average+	Nice product. Unexciting, rather undynamic and insubstantial sound quality, but facilities such as ability to accommodate 12 inch arm compensate	Manual, belt, suspended motor unit, 78rpm, pitch control		55
Townshend Avalon £299	Good Good	Some smear and coloration, probably due to structural shortcomings of the plinth, take the edge off this otherwise well turned out and well priced machine. Worth trying if you can't afford the full-blown Rock	Manual 2-speed belt drive	R	67
Townshend Rock £450	Good Good+ +	Tight, tidy sounding player which works with a wide variety of (non-tangential) arms, giving almost CD like precision and clarity. Good bass depth, dry balance - our Editor's favourite deck, in fact	Manual, belt drive, solid, arm damping, various optional extras	R	55

TONEARMS

NAME PRICE	LAB SOUND	COMMENTS	ARM EFF. MASS	VALUE	BACK ISSUE FULL REVIEW
Airtangent II £1998	n/a Excellent	A complex but superbly built arm for high quality systems, giving excellent stereo and resolution	7.5g (vertical)	R	60
Alphason Opal £110	Good Average	This is a straightforward adequate sounding low cost arm, priced just above where it rightly belongs	10g		55
Alphason Delta £165	Good Average+	A highly competent design from Alphason gives good sound quality but with slight blurring and treble fizz	16g	R	48
Alphason Xenon £210	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
Alphason HR100S £395	Good+ + Very Good	This S-shaped arm sounds smooth, but nevertheless reproduces transients with fine attack	10g	R	48/Coll
Ariston Enigma £99	Average Average+	Good but not the best in its class: mid-band sounds a little uneven; treble a trifle "brash"	11.5g		48
Audio Technica AT1130 £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 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		48Summary
Eminent Technology £960	Good+ Good+ +	One of the best sounding tonearms around, the linear tracking Eminent delivers impressive stereo imagery, focus and transparent sound	9g (vertical)	R	48/Coll

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TO NEARMS

NAME PRICE	LAB SOUND	COMMENTS	ARM EFF. MAS	VALUE	BACK ISSUE FULL REVIEW
Goldmund T3F arm £3950	Excellent Excellent	This complex parallel tracker created an "ear-opening" experience when tested with a (since updated) Goldmund Studio turntable	16.5g	R	Coll 2
Grace G707 £299	Good Good +	This venerable is still capable, if not competitive with modern alternatives	7g		48
Helius Orion 2 £490	Very Good Very Good	Very expensive but with a performance that merits recommendation	12g	R	48
Linn LV Plus £129	Good + Good	The fixed headshell provides an improvement over the LVX resulting in better clarity, detail and punch	13g	BB	48
Linn Ittok LVII £429	Very Good Very Good	Suitable for many turntables this top-quality arm performs best with the LP12, the combination exceeding the sum of both parts	13.5g	R	48/Coll
Linn Ekos £895	Very Good Very Good	Superb, state of the art design which builds significantly on Ittok's strengths	9g	R	67
Manticore (Logic) Datum 2 £140	Very Good Good + +	Rated sonically very good with fine depth focus and transparency, good air and life, albeit slightly 'untidy'	15g	R*	48/Coll
Mission Mechanic £700	Good Good +	Nearly right, but inconsistency with level and vague imagery spoil what is otherwise a firm, powerful advocate for black vinyl	11g		55
Moth Arm £65	Good Good +	The ultimate budget arm? Refined, detailed, sweet and natural – performance improves in line with the rest of the system	12g	BB	60
Rega RB300 £90	Good + + 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 £350	Average Good	Excellent but flawed arm which needs some development and refinement before it can be wholeheartedly endorsed. Watch this space. Fits Rega cutout	8g		67
SME 3009 Series IIIS £165	Good Average +	A simplified less flexible (as regards adjustment) Series III with a similarly 'soft' sonic character	5g		48
SME 3009 Series III £229	Good Average +	Comprehensively adjustable and very well made, suited to MM and high compliance MC cartridges	5g		48
SME 3009R £291	Average + Average +	A higher mass version of the Series III designed for low compliance MC cartridges	12g		48
SME Series IV £810	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 £1206	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
Souther Tri-Quartz £895	Average Good	A unique parallel tracking arm that makes up for what it lacks sonically in its unusual appearance	3-4g		48

CARTRIDGES

Very much the 'slave' of turntable and tonearm and to some extent undermined by the supply of free 'starter' cartridges on many turntable systems, the cartridge is still worth taking seriously. The quality of both the stylus itself and the cartridge's tracking performance are important in preserving that most important part of the hi-fi system – the record collection – and the cartridge also plays a significant role in determining the overall balance of a system.

Cartridges fall into two groups: high output models, capable of working directly into any amplifier, and more expensive low output models. Stereotypically, low output cartridges use the moving coil principle of operation, have better mechanical integrity and tighter tolerances, and give better performance but at much higher cost. Most under-£150 amplifiers and many valve designs need either an extra head amp or transformer to cope with the low output. **Cartridge/amplifier**

interfacing can be very subtle, but even basic high output moving magnet designs benefit in overall balance from optimised amplifier capacitance loading. Still more important, the mechanical cartridge characteristic of cantilever compliance ('springiness') needs to be considered in the light of the effective mass of the tonearm which will be used (see Turntable & Tonearm entries).

NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
A&R C77 £20	Average + Average +	A sensible moving magnet package with good bounce at a competitive price	6-16g Normal, MM	BB	48
A&R 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
A&R E77Mg £47.50	Average Average	Our sample had a disappointing stylus, but gave a coherent, rich and laid back sound, with good 'scale'	3-8g Normal, MM	R	48
A&R 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
Audionote 102VDH £795	Good Very Good	One of the best, giving 'an extraordinarily relaxing midrange clarity'. But it picked up a bit of surface noise and dust and needs a transformer	8-18g Very low (transformer), MC		43
Audioquest MC5 £200	Average Average	Offers high-output benefits but the drooping frequency response and severe VTA error preclude recommendation	10-20g Normal, MC		54
Audio Technica AT95E £17	Average – Average	Clear, dynamic if richly balanced, the magnetic '95E is a definite Best Buy	8-14g Normal, MM	BB	48
Audio Technica AT-42DE OCC £30	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-43DE OCC £42	Average + Average	A rising high frequency response yields something of a treble sting, not a good all-rounder	3-7g Normal, MM		67
Audio Technica AT-F3/OCC LE £70	Average + Good	Though the 'limited edition' badge is a trifle tongue-in-cheek the 'F3 still offers excellent value	8-15g Low, MC	BB	67
Audio Technica AT-F5OCC £100	Average + Good	Decent output, good channel balance and a thoroughly refined sound sets the standard at £100	9-20g Low, MC	BB	54
Audio Technica AT-F5/OCC LE £100	Average Good +	This latest sample demonstrated some technical weaknesses but its spacious, fluid sound quality still represents a benchmark at this price	4-10g Low, MC	BB	67
Audio Technica ATOC7 £250	Good + Good +	Technically and subjectively this cartridge represents a new dawn for AT, in the twilight of analogue audio	6-13g Low, MC	R	54
Audio Technica ATOC9 £400	Average + Very Good	Tonal colours were reproduced faithfully while stereo images were clearly isolated and focused despite contributing to a thoroughly integrated whole. Slightly less transparent than more costly MCs	6-14g Low, MC	R	60
Azden YM10VE £12.50	Average Average –	A good tracker. Sounds rather bunched-up but not totally incoherent – for very basic systems only	5-15g Normal, MM		54
Azden GM1E £30	Average – Average –	Of academic interest only, this high o/p MC is seriously flawed in sonic terms	8-18g Low/normal, MC		54

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CARTRIDGES

NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
Azden GMP5L £108	Average + Average +	Although no P-mount system will do this cartridge justice, it can still be enjoyed in its universal mode. The subtle balance may prove irresistible to some	4-10g Low, MC	R	54
B&O MMC5 £24	Average + Average	Cheapest in the family – smooth treble and good focus, but the bass was left in the wings	5-15g Normal, MM		38 (Summary)
B&O MMC4 £43	Good Average +	Solid and well balanced in the midrange, the '4 lacks bass impact	5-15g Normal, MM		48
B&O MMC3 £57	Good Average	Slightly "laid back" sound quality but a good performer for the price. Best suited to B&O equipment	5-15g Normal, MM		48
B&O MMC2 £87	Good Average +	Only a modest improvement on its cheaper brothers (and sisters)	5-15g Normal, MM		48
B&O MMC1 £112	Very Good Good	Great clarity and detail at high frequencies but a slightly plodding bass. It may appeal more to the classical enthusiast	5-13g Normal, MM		48
Cello Chorale £799	Good Very Good	Looking like a piece of NASA gadgetry the Chorale's transparent treble delicacy was without equal. A serious audiophile choice	4-10g Low o/p, MC	R	48/Coll
Clear Audio Gamma £295	Average Average +	Brimming over with enthusiasm, the unusual-looking Gamma is more than an audio oddity, but it lacks a little subtlety at times	4-11g Low, MC		54
Clear Audio Delta £450	Average + Good	Midway between the Gamma and exotic Pradikat, the Delta sounds like neither! Nevertheless, it delivers the goods	6-17g Low, MC	R	54
Clear Audio Pradikat £1225	Average + Very Good	Sounded absolutely glorious, creating a full sense of scale and a large well-focused soundstage – but watch for record wear	8-18g MC		Coll
Clear Audio Accurate £2,000	Good Excellent	A remarkable cartridge, not only by virtue of its effortless and highly neutral sound quality but also because this has been achieved with the same basic design as Clearaudio's cheapest MCs	4-11g Low, MC	R	60
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 DL 103 £99	Average Good	This classic spherical stylus model gives a lively sound with powerful bass, and is popular in broadcast studios	6-16g Low, MC	R	48
Dynavector DV-50X £60	Good Average	A high-output MC model with impressive lab performance, but whose tip and sound quality both disappointed	6-14g Normal, MC		48
Dynavector DV10X IV £60	Average Average +	Fine sounding and realistically priced, damping is recommended to ensure successful tracking ability	8-18g Normal, MC	R	48
Dynavector DV23RS £150	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 DV XX-1 £360	Good Good +	The XX-1 embodies a power and solidity rarely encountered amongst the breed, nevertheless it did exhibit a peculiarly suppressed character that will suit lively rather than wholly neutral systems	7-17g Normal, MC		60
Empire 800 Mk II £33	Good Average	This very high output MM appears to be based on the classic Ortofon VMS series. A trifle uninspiring overall	7-17g Normal, MM		67
Empire MC-5M £110	Average + Good	A very low compliance renders this MC best suited to heavy tonearms while its sweet, non-aggressive sound quality earns it a recommendation	13-20g Low, MC	R	67
Glanz MFG 110EX £24	Average Average	A little bright but giving detailed bass and clear treble this was competitive at the price	6-16g Normal, MM	R	Systems
Glanz GMC-10EH £49	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 £79	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 GMC20E £129	Average Average	You could try haggling but we thought the makers of this number were demanding too much lucre for their product	3-6g Low, MC		48
Goldmund Clearaudio £1500	Average +	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 Elan £15	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 Epic II £23	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 G1010 £36	Average Average	A bit faddy to set-up but rewarding once accomplished. The big and bouncy sound belies its price. Sensitive to amp loading	10-20g Normal, MM	BB	54
Goldring G1020 £53	Average + Average -	This one strutted finely onto stage but couldn't project to the "gods"	8-16g Normal, MM		43
Goldring G1040 £79	Average + Average -	High frequency extension was improved by the van den Hul tip, nice looking model – no great actress	8-16g Normal, MM		48
Goldring Eroica L £95	Average Average +	Open and relaxed sounding, the L version is just that bit more refined than its high output brother	7-18g Low, MC	R	54
Goldring Electro II £149 complete	Average Average +	A pretty decent allrounder that did not excel sufficiently to warrant recommendation	8-16g Normal, MC		43
Grace F9E II £240	Good Good	For lively presentation, excellent separation and generally satisfactory sonic delivery – consider this model	5-10g Normal, MM		48
Grado XTE + I £20	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
Grado XF3E + £43	Average - Average	Downtilting balance disguises the brightness of this cartridge, bit of a mixed bag at this price	9-20g (damping) Normal, MM		54
Highphonic MCA3 £360	Very Good Good +	Exquisitely crafted by a group of ex-Denon engineers, this superb tracker had a sweet and seductive (if rather bright) treble	5-12g Low, MC		43
Kiseki Blue Silver Spot £395	Average + Good	Solid performance from a very solid cartridge but lacks some of the magic of other Kisekis. Compliance too high	5-12g Low, MC		54
Kiseki Purpleheart Sapphire £695	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		Collection
Kiseki Blackheart £1595	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 Lapis Lazuli £3500	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
Koetsu Black K £577	Good + Good +	Impressive in scale and dynamics but with some criticism of bass muddling and high treble fizz. Listen before deciding	6-18g Low, MC	R	48/Coll

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NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Koetsu Red £896	Good + Very Good	Named like a rare, and perhaps dangerous, little oriental fish this famous cartridge sounded "almost larger than life"	10-25g Low, MC	R	48/Coil
Koetsu Red Signature £1298	Good Excellent	Technically this cartridge suffers no faults whilst on a subjective level it offers rare musical insight	10-21g Low, MC	R	60
Linn K5 £30	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 £69	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	48/Coil
Linn Asaka £299	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	48/Coil
Linn Karma £435	Very Good V 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	48/Coil
Linn Troika £669	N/A Very Good	Ex-Karma users have been seen with glazed expressions indicating smug self-indulgence the morning after fitting a Troika	8-18g Low, MC		Coil
London Maroon £109	Average Average +	Now manufactured under the London brandname this Decca cartridge is as iconoclastic as ever	9-20g (damp) Normal, MM		67
London Super Gold £248	Average - Good +	Sometimes a bit fierce in emphasising record surface faults, it is perhaps best at revealing the excitement and tension in music	8-20g + damping Normal, MM	R	48/Coil
Madrigal Carnegie One £685	Average + Good	Looks like a duck but sounds much better, certainly worth auditioning. Compliance too high	5-11g Low, MC		54
Milltek Aurora £198	Good + Good +	An overall feeling of relaxed ease characterised this clear and atmospheric Kiseki-built cartridge	8-16g Normal, MC	R	48/Coil
Milltek Olympia £298	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
Mission 773HC £150	Good Good	A sufficiently well-balanced and competitively priced "old-timer" which still warrants recommendation	6-16g Low, MC	R	38
Monster Alpha 2 £479	Good Good +	In the final analysis this fine allrounder is insufficiently exceptional in any specific respect to justify fully its high price	6-14g Low, MC		Collection
Nagaoka MM4 £8	Average - Average -	Clear punchy sound that delivers the rudiments of a good performance	6-16g Normal, MM	R	54
Nagaoka MP10 £17	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 £38	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 MP10SB £40	Average Average +	Stilton's mods have improved the fine detail resolution of this popular budget model	5-15g Normal, MM	R	54
Nagaoka MP11 Gold £45	Average - Average +	There were mild criticisms directed at most areas, but in general the sound was clear, open and even	3-8g Normal, MM	R	48
Nagaoka MP11 Gold SB £70	Average - Average	Excessive price loading for a blob of aluminium	2-6g Normal, MM		54
Ortofon OM5E £15	Average - Average -	The OM10 is a hi-fi cartridge - the OM5E is not	5-16g Normal, MM		43
Ortofon VMS5E II £14	Average Average	Sound quality was thought fair for the price, though a little 'untidy'	8-18g Normal, MM		38 (Summary)
Ortofon OM10 £20	Average Average	One of the leading "cheapies", this gives a fine level of sound quality for the price, with good matching compatibility	5-15g Normal, MM	BB	48
Ortofon VMS 10E II £21	Average - Average -	Some of its stablemates fared rather better, and showed less evidence of tracking problems to boot	Normal, MM		38
Ortofon VMS20E II £35	Average Average	One of the most popular cartridges ever, sound quality was a bit laid-back and tracking could have been better	3-10g Normal, MM		48
Ortofon OM20 £40	Average Average +	This turned out to be the listening panel's favourite among Ortofon's moving magnet models	5-16g Normal, MM	R	48
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 X1 £50	Average Average	The cheaper X1 scored higher marks with our listening panel than the X3, but both were a disappointment	6-15g Normal, MC		48
Ortofon VMS30E II £52	Average + Average	Rather an old soldier in relation to turntable technology, it will perform undemandingly in demanding circumstances	5-13g Normal, MM		38
Ortofon MC10 Super £70	Average Good	"What a delightfully sweet-sounding cartridge this is..." we said	5-15g Low, MC	BB	48
Ortofon X3 £70	Average Average	A lack of bass power, definition and a "zitty" top end makes this competent but uninvolving	5-15g Normal, MC		48
Ortofon OM40 £80	Average Average +	Highly competent engineering, secure tracking and decent sound quality are major strengths. But it's a little cold, a little polite	3-8g Normal, MM		48
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 MC20 Super £170	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	48/Coil
Ortofon MC30 Super £250	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		Coil
Ortofon MC3000 £800	Good Excellent	Quite simply, the most accurate transcription device yet created - not one for the faint hearted	6-16g V. Low, MC	R	60
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
RATA RP70vdH £99	Average + Good	Able to retrieve bags of musical detail (thanks to the vdH stylus), RATA's top cartridge ranks as one of the most articulate MM's available	11-18g Normal, MM	R	67
Rega Bias £34	Average Average +	Difficult to mount in some arms due to its shallow build, the bias offers a gentle, refined SQ that certainly makes it worthy of audition	4-10g Normal, MM		67

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NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
Rega RB100 £38	Average Average+	Remarkable mechanical performance in the right system context, but "try before you buy"	5-12g Normal, MM	R	48
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 protection. A firm budget	8-16g Normal, MM	BB	67
Shure M92E £15	Average- Average	Though lacking depth, the overall sound quality was competent, but treble was not its forte	10-15g Normal, MM		43
Shure M99E £26	Average- Average-	Sister to the 92E this is a solid but not particularly exciting cartridge	5-10g Normal, MM		38 (Summary)
Shure ME75ED £24	Average Average-	Rather bright and splashy in the high frequencies but nevertheless a competent model	5-10g Normal, MM		38
Shure M104E £32	Average- Average	Capable in many ways, but giving no substantial improvement over the 92E in our view	5-15g Normal, MM		38
Shure ME97HE £44	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 MI 05E £45	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 (Summary)
Shure M110HE £55	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 (Summary)
Shure M111HE £67	Average Average	Early reviews of this cartridge complained principally of the price - which has since come down	5-10g Normal, MM		38 (Summary)
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 V15 VMR £195	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 Ultra 500 £452	Good Good	There was no doubting the accomplishments of what could well be the finest moving magnet cartridge around	6-14g Normal, MM		48
Stilton/AT-F3 £110	Good+ Good+	At a premium of some £40 this modified AT-F3 offers a startlingly refined performance and is strongly recommended	8-18g Low, MC	R	67
Supex SM100E £115	Average Average+	Delivers as much musical information as many moving coils - the bass in particular having an attractive bounce	6-15g Normal, MM		38
Supex SD900IV £350	Average+ Good+	The 900 is an inherently fine cartridge, but despite a recent update it is beginning to show its age	10-18g Low, MC		48/Coil
Supex SD901IV £375	Average+ Good+	This high output model delivered sufficient subjective and objective performance, plus good compatibility, to justify its price	8-18g Normal, MC	R	48
Supex SDX2000 £651 L £721 H	Good Good+	The high-o/p 2000 was preferred on listening tests to the low-o/p model, which even so has a unique place among the designs	6-16g Either, MC		48
Van den Hul MC10 £699	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 MC One £799	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

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.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Acoustic Research A07 £280	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
ADC A-2080E £400	Good+ Average+	Clean and neutral sound but one that lacked depth and spaciousness; MM input favoured above MC or CD	108W, logic sw for 5 line and MM/MC inputs		68
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
A&R Arcam Alpha II £160	Good Good+	Very confident, convincingly musical and punchy sound that sets the standard for other budget amps	41W, 4 line and MM inputs	BB	68
A&R Arcam Delta 60 £250	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
A&R Arcam Delta 90 £350	Good Fair	Well balanced and sweet-natured in any given system with MC capability, but pricey	70W MM/MC 5 inputs tone controls		50
Albarray M408 II £649 pr.	Good+ Good+	Unusually styled transistor monoblok power amplifiers reintroduced with improved performance and sound quality. Needs good warm-up for best sweetness and clarity	40W Power amp only	R	56
Albarray MI 008 II £899	Very Good Good	A larger version of the similarly styled M408II, fairly good all round but only of average quality for the price	80W, monoblok		62
Aria Acoustics Aria 12 £299	Poor Very Good	A plain looking valve power amp that's something of a wolf in sheep's clothing giving many dearer amps a run for their money	12W	BB	63

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NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Ariston Amp £180-200	Average Average +	Slightly veiled and thin sound but proved suitably attractive in the listening tests	32W, full logic control, MM and 4 line inputs	R	68
Audio Innovations Series 300 £389	Poor Good + +	Something of an anomaly the 300 is an integrated valve amp that looks awful in the lab but sounds remarkable in a system	10W, MM, 6 inputs	BB	63
Audio Innovations Series 1000/2nd Audio Amplifier £1199/1999	Poor Excellent	This valve combination offered awesome dynamic range with superb transparency and power to match. Compatibility with other brands is unpredictable	15W, MM, 6 inputs, monobloks	R	63
Audio Research SP9 £1700	Very Good Very Good	This new high performance valve FET hybrid preamplifier sets a high standard for versatility, build quality and sound	5 inputs, MM/MC	R	60
Audio Research SP11 II £5250	Very Good Excellent	Current state of the valve preamp art. A reference point	Straight line MM/MC Disc + phase invert	R	60
Audiolab 8000C £325	Excellent Good	A well established preamp with a highly controlled sound, though it could do with more life and depth	MM/MC, 5 inputs, hdph, tone controls	R	62
Audiolab 8000A £350	Very Good Good	A long running and high dependable classic, versatile and consistent via all inputs	50W, MM/MC, 5 inputs, hdph, tone controls	R	62
Audiolab 800DP £495	Excellent Very Good	A dynamic powerhouse, load tolerant and sonically reliable	100W	R	62
Beard Audio CA35/P35mkII £595/£795	Fair + 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 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 M70 £1995 pr	Good Good +	A substantial British monoblok power amplifier, but not a great deal more impressive than the P35 at half the price	70W		50
Bryston 12B/4B Pre/Power £995/£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
Burmester 838 £1490	Very Good Good	A disc-only minimalist preamp, strong points include excellent build, extreme neutrality, dry clean bass and notably sharp stereo focusing	MC only, MM option		Collection
Burmester 846 £1599	Very Good Good +	Usually coupled with the 838 this high-level preamp provides many and versatile input facilities	6 inputs		Collection
Burmester 850 £3995	Good + Good	Each of these mono power amplifiers contains separate high current 25W amps giving a refined coherent sound over most of the frequency range	100W		Collection
Cambridge Audio P40 £200	Good Good +	A very fine sounding integrated amplifier with simple facilities and MC cartridge capability	5 inputs 40W MM/MC straight line	BB	50
Cambridge Audio C75 £279	Good + Good +	Whilst not quite on par with its A75 companion this preamp provided excellent stereo imagery but was a touch "heavy" in character	MM/MC disc	R	50
Cambridge Audio P55 £290	Very Good Very Good	A grown up P40, the P55 suffers slight noise on the moving coil input but offers great sound for the money	55W, MM/MC, 5 inputs, hdph	BB	62
Cambridge Audio A75 £299	Very Good Very Good	This strong power amplifier sounded open and effortless, with fine bass drive and dynamics, albeit a touch grainy and harsh at high frequencies	100W	R	50
Cello Audio Suite £5280	Excellent V Good/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
Conrad Johnson MV50 £1699	Good + Good +	Coupled with the PV5, this CJ power amp performed well on audition	50W		Collection
Conrad Johnson Motif MC-8 £1995	Very Good Very Good	A cheaper alternative to the '7, this preamp is an undoubted success in maintaining the Motif sound but does not compare on sound quality	MM/MC	R	50
Copland Pre and power amps £649 each	Good + Fair	At £649 each this simple Danish valve pre/power combination is expensive, though the power amplifier sounds very easy on the ear	3 inputs MM, 12W		50
Counterpoint SA7 £747	Average + Good	Simple valve Californian preamp offering inspiring transparency for the price	4 inputs straight line MM/MC		Collection
Counterpoint SA12 £1250	Good + Good +	A real power-house power amp, beefy and load-tolerant although like the SA7 a trifle untidy at frequency extremes	100W		Collection
Creek CAS 4040 II £179	Good Good	The Mk II has no problems and is a fine all rounder	30W, MM, 4 inputs, tone controls	BB	62
Creek CAS 4140 S2 £219	Good + Good	Redesigned for '88, this is a fine allrounder with good moving coil input, plain presentation	40W MM/MC 3 line inputs	BB	62
Croft Micro £150	Average + Good	A real upsetter, this excellent valve preamp put the cat among the pigeons proving good sounds can be made at budget price levels	4 inputs MM straight line	R	Collection
Croft Super Micro A £500	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	4 inputs, MM, straight line	R	57
Croft Series IV(S) £730	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 IVSA £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
Deltec DSP-50S DPA-50S Pre/Power £675/£825	Excellent Excellent	Remarkable pre/power combo based around the highly linear DH-DA32 hybrid op-amp. Unmatched detail resolution, control and transparency	63W, external feedback wiring, 3 line, MM/MC no tone controls	R	68
Deltec DPA 10DS £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
Denon PMA 250 II £125	Good Fair	Despite a claimed increase in power this competent model now slips behind the competition on sound quality grounds	30W, MM, hdph, tone controls		62
Denon DAP-2500 PDA-4400A Pre/Power £549/£599 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, monobloks Opt/Coax dig + 2 tape, 4 line and MM/MC inputs		68
Denon PDA-6600 £1,000/pair	Excellent Excellent	Delivers abundant high quality sound, solid engineering expertise and content clearly compensating for any compromising of purist audiophile principles	250W monoblok, remote power	R	60
DNM 3A From £1000	Good + Very Good	The DNM3 in its acrylic case is a remarkably revealing and neutral state of the art preamp	5 inputs MM/MC twin vol controls	R*	44
E.A.R. 802/509mkII £920/£1550	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, monobloks	R	63
E.A.R. 549 £3,000/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
Exposure VII/VIII £360/£340	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

TO ORDER BACK ISSUES OF HI-FI CHOICE SEE PAGE 123

THE DIRECTORY

AMPLIFIERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Exposure VI/VII Dual/VIII Pre/Power £449/£219/£379	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	63W, Super mod. 4 line and 2 disc inputs with full rec-out switching	R	68
Goldmund Mimesis 6 £2,500	Very Good Very Good	Small and discrete for those who'd rather not flaunt it, this is no powerhouse but sounds subtle, delicate and refined	80W stereo power amp		60
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 monobloks 41 8ohms	R	57
Hafner DH120 kit form £295	Fair	We didn't build one, see below	60W		44
Hafner DH120 assembled £360	Very Good Fair	Sound quality results were decent enough, but this power amp won't set the world on fire at this price	60W		44
Harman Kardon PM635i £159	Good Good	An improved version of the classic PM635 amp which sounds typically dry and articulate. Price is frozen	49W, 4 line and MM inputs A/B speaker o/p	R	68
Harman Kardon 640 Vxi £225	Good+ + Good	Moderately priced but built to HK's high standards; good value and good load tolerance	50W MM, 5 line inputs tone controls		56
Harman Kardon PM645VXi £300	Very Good Good	Fits in well with the Harman Kardon series, giving a competent all round performance at a fair price	75W, MM/MC, 5 inputs, hdph, tone controls		62
Harman Kardon PM650vxi £369	Average+ Good	A tight and slightly over-damped sound lacks any essential warmth or richness. Reduced headroom on MC	71W, 6 line, MM/MC and true A/V inputs		68
Harman Kardon 655 Vxi £449	Very Good Good	Plenty of well built integrated amplifier for the money, with lots of power to drive almost anything, plus versatile inputs	100W MM/MC 6 line inputs tone controls		56
Harman Kardon PM665Vxi £699	Good Good	A versatile and meaty amplifier with high current capability, but sound quality lags behind certain home grown alternatives	150W MM/MC tone controls (switchable)		60
Inca Tech Dirk £215	Good+ Good+	This tiny, minimalist model is effectively a power amplifier with volume control, providing inputs for CD player and tape recorder but not tuner!	50W, 2 line inputs, straight line		56
Inca Tech Claymore £396	Good+ Good+	Limited facilities but a strong, clear, well-focused sound results in auspicious Choice debut for this relatively young company	50W MM/MC 3 line inputs straight line	R	56
Inca Tech Claymore S £415	Fair Very Good	Rich, deep and captivatingly musical this amp prompted a very favourable reaction. Disc sens. too high	60W, CMOS logic controls 7 line and MM/MC inputs	R	68
Inca Tech Claymore 2 £515	Good Average+	Very similar to the well-received 'S' via CD our Claymore 2 had a dodgy disc input which ruined its showing	100W, CMOS logic, as 'S' but with more MosFets!		68
ITL MA-80 £150	Good Good	A promising start for this young company, the MA-80 gave a fine sound with CD but was less wonderful on the moving coil input	30W, MM/MC, 5 inputs	R	62
Jadis JP30/JA30 £6,790	Fair Excellent	Two-box preamp plus monoblok power amps, classic valve design gives stereotype valve sound. Beautiful build, nostalgic styling and delightful sounding midrange transcend limitations at frequency extremes, in lab, and re cartridge matching	30W 2-box pre-, monoblok power, MM-only; 4 line inputs	R	60
JVC AX-222 £110	Good Fair	Not very impressive, JVC need to pull their socks up if their budget amplifiers are to score	35W, MM, 4 inputs, hdph, tone controls		62
Kelvin Labs Junior/130 £295/£295	Good Good	Their heart is in the right place but the class A Junior combination is a bit expensive for what you get	20W, MM/MC, 5 inputs		62
Kenwood KA-5500 £130	Very Good Fair	Having dropped its moving coil input, this latest version has British style dynamics and rhythm but is not first grade yet	35W, MM, 4 inputs, hdph, tone controls	R	62
Le Tube £585	Good+ Good	If moving coil sensitivity is not required then this preamplifier will offer a clean view with very good stereo	3 inputs MM	R	44
LFD £2,995+	Very Good Excellent	Can set the subjective standards that others merely aspire to, but this outstanding if unconventional multi-box preamp needs careful matching to ancillary components (cartridge, power amp)	MC (with care), passive line extra	R	60
Linn LK1/LK280 Pre/Power £459/£595	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
Luxman LV100 £205	Good Fair	Nicely finished modern integrated amplifier, generally competent though not exceptional	45W MM 4 line inputs tone controls		56
Luxman LV105u £685	Very Good Good	This very well equipped and beautifully finished Japanese integrated amplifier has two valves in the early section of the power amplifier. Pleasant and musical it sets no value for money record here	9 inputs 80W, MM/MC tone controls		57
Magnum A100 £1995 pair	Good+ + Good+	Given their massive power rating a pair of A100's make a fine stereo power amp, ideal for high levels and with a wide dynamic range for digital programme	320W		50
Marantz PM25 £125	Good Fair	Soft and sweet like the rest of the range, the PM25 is inoffensive and undemanding	25W, MM, 5 inputs, hdph, tone controls		62
Marantz PM35 £170	Very Good Good	This new generation Marantz is a good allrounder, and shows that extra care is being taken over sound quality; well equipped and versatile	45W MM/MC 3 line inputs tone controls		56
Marantz PM45 £200	Good+ Fair	Generally pleasant and polite with above average clarity; there was some softening in the bass, restricting dynamic output somewhat	40W MM/MC tone controls		50
Marantz PM-75 £400	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 PM94 £1,000	Very Good Good	At 23kg the PM94 is no lightweight in either physical or sonic respects. A very powerful and comprehensively equipped amplifier	140W MM/MC tone controls (switchable)		60
Meridian 201/205 £599/£425 each	Very Good Good+	A fine preamp with additional luxury option of full system remote, plus competent and attractive monoblok power amplifiers with generally good performance	100W MM/MC 6 line inputs remote capable straight line	R/—	62
Mission Cyrus One £180	Very Good Good	A red hot class winner, which caused the whole issue to be re-rated! It's even well built - however, the headphone socket will only take a 3.5mm jack	30W, MM/MC, 5 inputs, hdph, straight line	BB	62
Mission Cyrus PSX £230	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
Mission Cyrus Two £300	Very Good Very Good	Also a top performer in its group with fine moving coil and compact disc sound. Again, only 3.5mm headphone socket	50W, MM/MC, 5 inputs, hdph, straight line	R	62
Mordaunt Short MS-A5000 £350	Very Good Good	With a recognisable pedigree, Mordaunt Short engineers have made a good job of this one. A musical all rounder	50W, MM/MC, 6 inputs, hdph, tone controls	R	62
Musical Fidelity A1 £269	Good Good+	Fine-ranking in terms of overall sound quality for money, the excessive heat output could be hazardous to your vinyl if you're careless	20W MM/MC 4 inputs straight line	BB	56
Musical Fidelity B200 £299	Very Good Good+	Running cooler than other MF's, the B200 delivered fine musical and dynamic sounds with plenty of power	80W MM/MC 4 line inputs straight line	BB	62
Musical Fidelity Pre 3/P140 £379/£349	Very Good Very Good	Delivering true audiophile sound quality well ahead of their price, both components shine in their own right	70W MM/MC 4 line inputs straight line	R	56
Musical Fidelity A100 £459	Good+ Very Good	This is another one recommended for fine sound with which you could keep your Chinese carry-outs warm	50W MM/MC 5 inputs straight line	R	62

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Musical Fidelity P170 £599	Very Good Very Good	Accrued itself well, later samples showing steadily increasing refinements	85W	R	50
Musical Fidelity MA-50 £875 pair	Good Excellent	An audiophile bargain. One of the best sounding power amplifiers made	50W, monoblok	R	62
Musical Fidelity MVT Mk 3 £1199	Very Good Very Good	The MVT preamp was "strong in its class", providing competition for £1500-plus amplifier systems, now rivalled the MF3B	MM/MC 5 inputs	R	50
Musical Fidelity P270 £1299	Very Good Excellent	If the hot-box aspect is not a deterrent, this is something of a bargain. A big amplifier scale of sound which is just a little rough-edged	135W	R	50
Musical Fidelity MVX £2229	Very Good Excellent	Soundwise this preamp puts Musical Fidelity on terms with much more expensive exotics, with class transparency, focus and dynamics	MM/MC, phase invert	R	60
Musical Fidelity A370 £2229	Very Good Excellent	Arguably the finest sounding power-amplifier manufactured in the UK	185W	R	50
NAD 302De £120	Good Fair	A little light in balance and "weight" but superior to run-of-the-mill budget amplifiers	20W MM/MC 4 inputs	R	50
NAD 322DPE £140	Good Fair	Like the 3020E but with more peak power and loudness thanks to the 'power envelope'	20W, MM, 5 inputs, hdph		62
NAD 3225PE £150	Average + Average +	Light and detailed if not as rich or weighty sounding as others. MM input sounds warmer than CD	42W + 70W dyn. headroom; soft-clipping, MM only	R	68
Naim NAIT 2 £322	Average + Fair	Well built with good load tolerance the NAIT delivered a fully competitive sound in spite of its modest measured power output. Recent modifications as yet unchecked	15W pc MM 3 inputs	R*	50
Naim Separates £560-c£8,000	Very Good Good	A consistent and coherent series of 'building blocks' for conventional passive or active operation. Sound quality ignores conventional audiophile standards of presentation, but achieves fine musical communication	40-70W, MM/MC etc	R	60
Nakamichi CA-5E £750	Very Good Good	A fine lab performance and high build quality but rather disappointing sound quality for a preamp of this price	MM/MC, 6 inputs, hdph, tone controls		62
Nakamichi PA-5E £1150	Very Good Good	A strong sound in several respects but one which ultimately failed to satisfy	100W		62
Nakamichi CA7E/PA7E £2500/£1700	Very good Good/Good+	Exceptional build and finish, plus good general performance, remote control and versatility, but expensive	200W MM/MC 6 line inputs, remote, tone controls		56
Nuance £795	Very Good Good	A subtle civilised pre-amp though a little lacking in resolution and detail, suited to some tastes but not top-drawer	4 inputs MC		50
NVA AP30mc £290	Average + Good	Utilitarian in appearance but offers a very refined and beguilingly musical sound quality on MC and line	22W only. MC or MM options, 3 line inputs	R	68
Oakley Image £425	Poor Very Good	An interesting valve preamp from Yugoslavia, the Image on first impression needs a bit of tweaking to warrant Choice commendation but is a nice product nonetheless	MM, 5 inputs straight line		63
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
Philips FA860 £249	Very Good Fair	Well balanced model from Philips' Japanese factory, with versatility, good build and finish	70W MM/MC 5 line inputs tone controls		56
Philips FA960 MkII £299	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
Pink Triangle PIP £2670	Excellent Excellent	This state-of-the-art preamp is one of the few truly high end products to come out of this country this year. It will most certainly worry the competition	MM/MC, 4 inputs, battery supply	R	62
Pioneer A333 £149	Very Good Fair	A rather average but nonetheless competent performer that is pleasant enough	55W, MM, 5 inputs, hdph, tone controls		62
Pioneer A-616 MkII £180	Good + Average	The disc inputs sounded a trifle smoother than the CD stage which was harder and more aggressive	95W, 3 tape, 3 line and 2 disc inputs. Heavy		68
QED A240 CD II £169	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 A240 SA II £219	Good + + Good +	Redesigned 240SA represents a significant allround improvement over its predecessor, and provides a good moving-coil disc input in a competitive price	45W MM/MC 5 line inputs straight line	BB	62
QED A270 £329	Good - Good +	Building on the strengths of the '240, the '270 sounds weighty, fast and dynamic. A bit 'lumpy' via MC	51W, 5 line and 2 disc inputs, pre-out	R	68
Quad 34 £285	Very Good Fair	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
Quad 405 £349	Very Good Fair	Not an impressive power amp but easy on the ear if not pushed and very reliable	100W		44
Quicksilver Mono £1495	Good Good +	Moderately improved for '88 the Quicksilver still rates well despite up and coming competition	60W monoblok 4/8ohms		57
Radford SC25 £862	Very Good Very Good	A very fair price for a solid, well built valve preamp, combining good allround performance and a neutral sound	5 inputs, MM, straight line	R	57
Radford MA75 £977	Good Very Good	A fine quality valve monoblok with good load tolerance and a neutral accurate sound, offering significant gains in power and focus over the STA25	75W monobloks	R	57
Radford STA25 Renaissance £1115	Good Good +	Offering superb midrange performance if not quite as good at the extremes, the Renaissance valve power amp is a genuine audiophile product	25W	R	50
Revox B150 £875	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 £1188	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
Robertson Forty Ten £987	Very Good Good	Here is a neat little power amp (60W) you can fit and forget, it proved most satisfying over long listening sessions	60W		Collection
Rose RV-23 £370	Average Very Good	A very attractive little British valve preamp with a sound that was rich, colourful and reasonably sharp via the CD input but was less impressive on disc	MM, 4 inputs, straight line		63
Rotel RAB10A £100	Very Good Fair	As a cut price RAB20AII this is a very successful little amp that loses little in sound quality to its predecessor. Excellent value	20W, MM, 5 inputs, hdph, tone controls	BB	62
Rotel RAB20A £130	Good + + Good	This A version of an established budget favourite delivers the goods sonically and is fine value for money	35W MM 4 line inputs tone controls	BB	56
Rotel RB/RC850 £145/£125	Good + + Good +	Quality separate pre and power amplifiers at near budget integrated amplifier prices. A notable achievement	60W MM/MC 4 line inputs tone controls	BB	62
Rotel RAB20BX3 £165	Very Good Good	The latest upgrade is not that impressive, but the BX remains a fine amplifier and now has a moving coil disc input	30W, MM/MC, 5 inputs, hdph, straight line	BB	62
Rotel RC-870BX/RB-870BX Pre/Power £190/£210	Excellent Good +	Reduced price makes the 870 combo better value but, despite mods to the preamp, it is the power amp that must take the lion's share of credit	128W or 208W in bridged mode. CD direct, 4 line, 2 tape and MM/MC	R	68
Rotel RAB40BX3 £220	Very Good Good +	Requires a very long warm-up period but rewards with a refined sound that should suit 'lively' systems	59W, 2 tape, 2 line, MM/MC and A/V inputs	R	68

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AMPLIFIERS

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Rotel RA870BX £300	Very Good Good+	A powerful blockbuster with solid and well focused sound, good versatility and fine load tolerance	85W MM/MC 7 line inputs tone controls	R	56
Sony TA-F200 £130	Average— Average	Over-ambitious protection circuit is hardly in keeping with modern amp design. Lean but 'dead' sound quality	74W, 2 tape, 3 line and MM/MC inputs		68
Sony TA-F400 £200	Good Average+	Some lack of integration across the frequency range but still offers a more open and detailed sound than the F200	76W, 2 tape, 3 line and MM/MC inputs. Rec-out		68
Sony TAF 500ES £349	Good+ Fair	Not too hot at the price, lacking in bass action, rating poorly on vinyl, and only marginally improving on CD	75W hdph tone controls MM/MC		50
Sony TAF 700ES £500	Good+ + Fair	Scoring higher than the 500 but still not offering the sort of standards set by the competition. But many buttons to push	100W MM/MC tone controls		50
Sumo Nine+ £1200	Very Good Excellent	Macho styling of this class A stereo power amp conceals a sonic subtlety that is exceptional for the price, limited by lots of waste heat and a noisy fan on our sample (being improved)	65W	R	60
Tannoy SR-840 £1713	Very Good Good	A "muscle" power amp, capable of impressive levels into difficult loads while remaining quite subtle and revealing	250W		50
Vacuum State FVP £999	Good Very Good	This well thought out valve preamplifier is designed for optimum musicality and transparency, a goal which is handsomely achieved	5 inputs, MM, straight line	R	57
Yamaha AX-300 £100	Good Fair	A lively and dynamic performer, offering a credible if bright sound at a competitive price	30W hdph tone controls (MM)		50
Yamaha AX500 £200	Very Good Good	A well built versatile performer with generous power, decent sound	90W MM/MC 5 line inputs tone, var. loudness		56
YBA 2 pre & pwr £1395/£1695	Good+ + V Good/Excellent	Superbly finished French audiophile 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 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 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

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 similar 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	BACK ISSUE FULL REVIEW
Acoustic Energy AE1 £700	Good Very Good	To the author's knowledge, the most awesomely dynamic and articulate miniature ever made	29.5 x 18 x 25cm semi-open space	88dB/W 60Hz	R	59
Acoustic Energy AE2 £1138	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 in free space	88.5dB/W 45Hz	R	66
Acoustic Research AR112 £125	Average Average—	Nicely presented and engineered, but sounds a bit small and boxy without true coherence.	36 x 19 x 18.5cm stands near rear wall	87dB/W 75Hz		66
Acoustic Research AR122 £150	Average Average	Despite a promising enough list of ingredients, the 122 failed to excite real enthusiasm amongst the listening panel	38.5 x 19 x 22cm stands near rear wall	87dB/W 68Hz		68
Acoustic Research AR132 £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 wall	87dB/W 50Hz		66
Alexander Aurora £350	Average Good—	The unusual metal case and slim shape of this grown up miniature provide welcome diversity. It sounds pretty good too	42.5 x 14 x 19cm matching stands in free space	85dB/W 55Hz		66
Apogee Caliper £2550	n/a Very Good	Near state of the art performance, not materially worse than bigger Apogees, just less bass. Rich, subtle and slightly dull, with a clear, articulate midband, but uncommonly system fussy.	122.5 x 71 x 10cm ex. rear foot, free standing, away from walls	n/a n/a	R	60
Apogee Scintilla £4990	Good Very Good	These take-me-to-your-leader speakers gave exceptional transparency and can achieve excellent results in a true audiophile system	145 x 88 x 9cm free space on floor	79dB/W 20Hz	R	46/Coll
A&R Arcam Three £150	Average+ Average—	Arcam's baby speaker did not delight our listeners, but it might do better in less expensive systems	34 x 18 x 23cm close to wall at head height	88.5dB/W 95Hz		53
A&R Arcam Two £260	Good Average	Most things to most men this compact is unlikely to disappoint with its lively "balsy" character though lacking weight... a bit	38 x 23 x 28cm near wall shelf or 40cm stands	88dB/W 55Hz		59
A&R Arcam One Plus £359	Good Average	Provides a solid, weighty and rich sound, but is a little raw in the treble and indefinite in the midband	22.3 x 28.1 x 37.8cm open space, on stands	88.5dB/W 60Hz		59
Ariston Image £185	Good Average	Good engineering content at a reasonable price, the Image delivers fine stereo with low coloration, but sounded too bassy under our listening conditions	42 x 22 x 27cm stands in free space	87dB/W 55Hz		66
Ariston QLN1 Mk 2 £350	Very Good Good+	This very sophisticated loudspeaker has much of the euphony of a LS3/5A but with rather more 'oomph'. A little 'romantic' for some tastes - Schubert and Sting rather than Stockhausen or the Stones perhaps?	35 x 25 x 26.5cm free space, 24 inch stands	84.5dB/W 65Hz	R	59
Audiostatic ES200 £1495	Average Average+	Sounding forward and unbalanced with limited bass power, these excelled in transparency and detail, and might suit some tastes	150 x 53 x 23cm low stands, free space	79dB/W 45Hz		46
Audiostatic ES300 £1995	Average+ Good	Marred by similar problems to its cheaper ES200 stablemate, this line source electrostatic was superb in the upper-mid and treble but lumpy in the bass	44 x 5 x 93cm free standing	83.5dB/W 30Hz		46
Audio Electronics TC10 II £599	Good— Good+	Oddball appearance is rescued by a respectable technical performance, interesting and impressive engineering and fine sound quality at a realistic price.	70 x 33.5 x 33.5cm low stands in free space	87.5dB/W 40Hz	R	68
Avance 120 £279	Average+ Average+	This unusual "after eighties" looking speaker has the recipe for success, but not quite the right seasoning yet	42 x 30 x 30cm 30cm from wall on 40cm stands	86.5dB/W 60Hz		53

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LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
Avance Concrete 2000 £970	Below Average Below Average	Very low cabinet talk, but the system sounds terminally uneven – lumpy bass and over-forward midband dominate	86.5 x 29.2 x 43cm clear of walls	94dB/W 40Hz		60
B&W DM560 £200	Average+ Average-	Fine cosmetic presentation and good engineering for the price; overload protection may be handy but listening panel was overwhelmed	49 x 23.5 x 30cm stands in free space	88dB/W 55Hz		66
B&W LM1 Mk II £249	Average+ Average	Probably one of the best 'micros' ever made, worth considering for special applications (boats or vehicles). Upgraded since our review	24 x 15.5 x 20cm shelf or flush mount	86.5dB/W 80Hz	*	31
B&W DM1600 £399	Good Good	Crisp, dynamic loudspeaker with tight but not especially deep bass and a tweeter that sometimes sounds overcooked	49 x 23.6 x 30cm free space, open stands	87.5dB/W 60Hz	R	59
BLQ Q2 £275	Average- Average	Nearly a good loudspeaker, the basic balance is good, but the midband is very uneven and there are severe losses of resolution, 'space' and dynamics	43 x 25.1 x 24.5 semi open on stands	87.5dB/W 70Hz		59
Bose 6.2 £570	Average- Average-	Wishy-washy (but not unpleasant) sound and vague imagery are the hallmarks of this unusual design	25.4 x 50.8 x 24.4cm free space, on stands	87.5dB/W 55Hz		59
Boston A4011 £110	Average Average-	Competent performance for size and price but below average relative to the UK competition	34 x 21 x 20cm on stands near wall	88.5dB/W 63Hz		41
Canton 60 Karat £600	Average+ Good	Looks a bit of a throwback designwise, but is nicely presented and has a lively, dynamic and generous sound	58 x 31.5 x 31cm stands in open space	90dB/W 48Hz	R	66
Castle Clyde £149	Average+ Average	A tidy little performer packing punch, but beginning to show its age in the light of new competition	37 x 21.5 x 22cm open space on stands	89.5dB/W 64Hz	R	46
Castle Durham £199	Average+ Average	Listening results were encouraging, well engineered and finished, but lean on treble and a bit weak on bass; still recommended	41 x 21.5 x 25cm near rear wall	89dB/W 67Hz	R	46
Castle Pembroke £309	Good Average+	Comfortably recommended, a sweet smooth sound with good overall balance of engineering-based performance	55 x 37.5 x 30.5cm open space on stands	88dB/W 46Hz	R	31
Castle Warwick £169	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 wall	88dB/W 50Hz		66
Ceef Cirrus £180	Average Good	It's nice to see Ceef back in the UK, with this decent sounding small reflex box that seems unusually tolerant of siting	39 x 20.5 x 23cm stands in free space	84dB/W 60Hz	R	66
Celestion DL6 Series Two £149	Good Average	Good tonal colouring and plenty of bass for the enclosure size; the metal dome tweeter is excellent, but bass and mid lack clarity and 'bite'	45.4 x 24.5 x 26.2cm near wall, on stands	87dB/W 65Hz		59
Celestion DL8 Series Two £199	Very Good Good	A refined middle market speaker has a smooth but slightly dull quality, with good definition and deep, if slightly boxy bass	50 x 27.5 x 27.8cm open, stands	87.5dB/W 60Hz	R	59
Celestion SL12Si £580	Average Average	Careful setting up does reveal elements of fine sound quality, but this 'grown up' SL6 variation has a lumpy response alongside its improved power handling	53 x 20 x 27cm matching stands clear of walls	85dB/W 50Hz		66
Celestion SL600Si £780	Good+ Good	This Aerolam high tech miniature has certain remarkable qualities that some will find irresistible, and which go a long way towards justifying the highish price. Needs careful system and room matching.	27 x 20 x 23cm matching stands in free space	82dB/W 52Hz		68
Celestion SL700 £1349 inc stands	Good Good	Very sophisticated, mostly smooth and accurate transducer, with fast but not very deep bass and a rather bright treble	37.5 x 20 x 23.5cm free air on tall stands	83dB/W 45Hz		60
Celestion 6000 £1470	Very Good Very Good	A genuine fullrange audiophile quality speaker system – with Star Wars styling to suit a high tech environment	Complex, on floor in free space	82.5dB/W	R	60
Chameleon 500 £349	Average- Average-	Sounding badly coloured, dull and compressed, it is also amateurishly constructed, despite using good quality materials	38 x 25.3 x 31.3cm free, stands	89.5dB/W 75Hz		59
dbx 1000 £450	Average- Average-	This system sounds soft and woolly, with an effusive bass, an occasionally sharp treble, and a recessed midband. Stereo positioning is poor.	78.7 x 35.6 x 27.9cm against rear wall	91dB/W 60Hz		59
Energy 22 Pro Monitor £600	Good Good	Presentation is a bit rough for the price, but this Canadian entrant is an impressive sonic allrounder that will appeal to most listeners	62.5 x 27 x 30cm stands in free space	87dB/W 40Hz	R	66
Gale 301 £280	Average Average+	Of unusual, distinctive appearance this produced a mixed response, being lively but lacking depth	44 x 23.5 x 22cm on stands quite near wall	86.5dB/W 63Hz		46
Gale GS402 £700	Average+ Average+	Clean but rich and powerful bass; stereo focus was not a strong point, but it is worth considering (Recent revisions not yet checked)	61 x 35.5 x 28cm on matching stands near wall	88dB/W 48Hz	*	46
Goodmans Maxim Two £80	Average+ Average	More wham-bam-thankyou-mam sound that imitates much bigger speakers when you let these babies yell. (A well-controlled yell)	26 x 17 x 19cm near wall on shelf or stand	86dB/W 85Hz	BB	59
Goodmans Point 3 £90	Average+ Average-	Recommended as good value for money, but our listeners' differing opinions mean your ears should judge for themselves	47 x 25 x 20cm shelf/high stand near wall	90dB/W 80Hz	R	53
Goodmans Point 7 £170	Average+ Average	Basically competent performance-mix and a lot of speaker for the money, but a certain lack of refinement nonetheless	69 x 33 x 26cm free space on 35cm stand	89dB/W 47Hz		53
Harbeth LS3/5A £300	Good Average	Still a classic miniature, though not to every taste, and none the better for the recent update under our listening conditions. Limited dynamic range	30.5 x 19 x 16cm stands in free space	81dB/W 60Hz		66
Harbeth HL Compact From £455	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 stands	87.5dB/W 65Hz		59
Heybrook Point Five £129	Average Average	Disappointingly prosaic performance on listening tests; wooden and hollow, with restricted dynamics and 'space'. Earlier samples sounded better	37.5 x 23 x 23cm near wall, on matching stands	86dB/W 65Hz		59
Heybrook Point 7 £170	Average Average	Physically an attractive package, but not entirely convincing in lab or listening panel test; interesting for all that	40.5 x 23 x 23cm stands against rear wall	85dB/W 60Hz		68
Heybrook HB1 £189	Good Average+	No longer an over-bright character, a strikingly clear sound and fine transient performance now merits recommendation	47 x 29 x 23cm on stands near wall	88dB/W 61Hz	R	46
Heybrook HB100 £250	Average+ Good	Well matched for wall siting, the HB100 is a lively and informative performer in the tradition of the popular HB1	47 x 26 x 28cm stands near rear wall	86dB/W 50Hz	BB	66
Heybrook HB200 £369	Average Average	This luxury successor to the HB2 is lively and informative, but sounded insufficiently balanced to convince our listening panel	46 x 23 x 26cm stands against rear wall	87dB/W 55Hz		66
Infinity RS2000 £140	Good Good+	Fast, detailed and assured miniature with quick but not very deep bass. The top end is detailed but sometimes jangly	36.2 x 22.5 x 20cm near rear wall, high stands	91.5dB/W 70Hz	BB	59
Infinity 6 Kappa £650	Good Good	Interestingly styled US loudspeaker has unusual high tech drivers and good neutrality, but the sound seriously lacks excitement	63 x 38 x 24cm stands, free space	85dB/W 35Hz		66
Jamo Concert 2 £240	Good Average-	A thoroughly respectable 'bookshelf' performer that needs free space siting but includes attractive cabinetwork and a neat grille	41 x 24 x 25cm stands in free space	85dB/W 48Hz		66
JBL L 60T £399	Good+ Good	Well balanced and offering realistic value for money, the fine treble and extended bass make it suitable for larger rooms	78 x 30.5 x 26.5cm low stands or floor	88dB/W 40Hz	R	46
JBL L80T £559	Good Average	Large scale, dynamic if rather unwieldy sounding, this is a performer of integrity, if not much subtlety	85.1 x 35.6 x 30.3cm floorstanding, open space	89.5dB/W 55Hz		59
JBL 18Ti £599	Good+ Good	Beautifully engineered, well finished miniature with many good points, but unexceptional overall. Try the cheaper L20T	34 x 24 x 22.5cm 50cm from wall on rigid stands	85.5dB/W 53Hz		46

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THE DIRECTORY

LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
JBL 250Ti £3599	Good+ Good+	In general this speaker did not show the required level of dynamic presentation transparency and stereo depth expected of a pricey flagship model	132 x 57 x 36cm free space on floor	89dB/W 53Hz		46
JPW P1 £125	Good Average+	Honest and basically articulate if not very sophisticated, resolution is good but it can sound a little wearing in bright systems or with rough sounding material	44 x 25.9 x 26.1cm free space on stands	89dB/W 60Hz	R	59
JPW AP2 £145	Good Average+	Few grounds for criticism but purchasers should check out the treble qualities to avoid hammering the ear anvils	46 x 26 x 25cm 40cm from wall on 45cm stands	89dB/W 65Hz	R	53
JPW AP3 £210	Good Average+	Pretty good stereo and well balanced overall it had its own character which is well suited to vinyl replay	52 x 25 x 29.5cm near wall on stands	90dB/W 57Hz	R	46
KEF R102 £335	Very Good Very Good	High class near-miniature with expressive, articulate midband and clean, accurate bass and top. The sound quality of the Kube circuitry, however, is suspect; what would an audiophile Kube sound like?	33 x 20.7 x 26.3cm near wall or open on stands	89.5dB/W 60Hz	R	59
KEF 103/3 £630	Good+ Good	Technically impressive, excellent bass/power handling for size, but not for the audiophile system. Better among cheaper components, and good in a large room	56 x 27 x 30cm supplied stands free space	90-95dB/W 35Hz		53
KEF 104/2 (inc KUBE equaliser) £849 (£948)	Very Good Good+ +	A reference point for dynamics, preferred without KUBE, suited to many rooms. Good stereo, high sound levels	90 x 28 x 41.5cm floor standing in free space	92dB/W 50Hz	R	60
KEF 107 £1890	Very Good Good+	A welcome sense of ease and lack of strain at most normal levels. Minor criticisms included a dulling in the extreme treble. Excellent bass extension	116.5 x 33 x 45cm on floor in free space	87.5dB/W 20Hz	R	60
Linn Helix £259	Average+ Good	Attractive presentation is coupled with an attractively lively sound which is more neutral if less committed than earlier Linn loudspeakers	51 x 25.5 x 28cm stands 1ft from rear wall	88dB/W 53Hz	R	66
Linn Nexus £379	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 supplied stands	89dB/W 60Hz		59
Linn Sara £749	Good Very Good	The new Sara is now much smoother and sweeter, with much better imaging. Bass power and dynamics are as good as ever, and the system is no longer as fussy as before	43 x 34.4 x 26.5cm stand mounting, near wall	88dB/W 50Hz	R	60
Magneplanar SMGa £675	Average- Average	Tonally 'rich', in the right room it proved a satisfactory musical experience	122 x 48 x 4.5cm on floor clear of wall	85dB/W 56Hz		46
Magneplanar MG2.5R £1897		Offers the low coloration and profound musical insight of better electrostatic loudspeakers but without loss of low frequency extension	183 x 56 x 4.5cm Open space	83-85dB/W 35Hz	R	60
Magneplanar MG11a £2650	Good Very Good	Another excellent true-audiophile loudspeaker this American panel speaker helps to convey much of the original character of the music	180 x 62 x 38cm well clear of walls	84-86dB/W 35Hz	R	46
Marantz LD20 DMS £150	Average Average	Recommended more for CD users than vinyl keepers, soundly engineered and built but should be heard before bought	36 x 23 x 24cm free space on 45cm stands	86.5dB/W 55Hz		53
MB Quart 390 £499	Below Average Poor	An aggressive, messy sounding design whose uncouthness undermines the positive level of detail	52 x 31 x 30.5cm open space, on stands	89.5dB/W 60Hz		59
Meridian M30 £725	Average+ Average	Pricy but easy on the ears and worth considering especially where space is at a premium	38.5 x 18 x 32cm free space on stands	Active 40Hz		46
Mission 70 II £100	Good Average	Lively and transparent, the 70 II was favoured for its speed, though the sound had a mildly 'thin' tonal balance	35 x 21 x 21cm on stands or shelf near wall	89dB/W 68Hz	BB	46
Mission 761 £120	Average Good	One helluva speaker for the price, if a shade small and short of subtlety and refinement - should prove a worthy successor to the 70 and 700	38 x 21 x 21cm stands near rear wall	87dB/W 60Hz	BB	66
Mission 700LE £140	Good Average	Mission re-submitted this popular model and again got positive review - which proclaims their (and our) consistency	38 x 21 x 21cm straight ahead stand near wall	89dB/W 66Hz	R	59
Mission 762 £180	Average Average-	Mission's 'bookshelf middleweight' offers high sensitivity and loudness capability, but at the expense of a somewhat untidy and rather 'heavy' sound	50 x 25 x 27cm stand, experiment advised	91dB/W 55Hz		66
Mission R737 Renaissance £250	Average Average	Effusive, over-the-top bass and obtrusive treble get in the way of a marvellously lucid and transparent midband. Inconsistent on audition - wonderful piano, bloated orchestras etc	54 x 25 x 27cm near wall on dedicated low stands	88.5dB/W 60Hz		59
Mission 763 £280	Average+ Average+	A very artful combination of generous volume and good bass extension at a surprisingly modest price that works well in the listening room despite a few rough edges	77 x 25 x 32cm near rear wall	86dB 40Hz	BB	68
Mission Argonaut £500	Good Good	Perhaps not the most subtle or sweet these were recommended for their excitement, drama, power handling and ... good looks	95 x 23 x 31cm floor-standing near wall	91dB/W 40Hz	R	60
Monitor Audio R100 £159	Average+ Average-	Tonally quite neutral, but with small box character, negligible low bass and a rather 'hard' midrange	40.5 x 25 x 21cm free space on stands	87.5dB/W 70Hz		46
Monitor Audio R352/MD £300	Average+ Good	A good value large box that sounds more engaging than subtle, providing a good compromise between bandwidth and sensitivity	64 x 25 x 32cm stands in free space	89dB/W 45Hz	R	66
Monitor Audio R452/MD £399	Average Average	This big, efficient, dynamic sounding loudspeaker has a clean, open treble but a pinched, two-dimensional midband. Can be tiring in the long run	64 x 25 x 31.8cm open space, low stands	89dB/W 55Hz		59
Monitor Audio R852/MD £399	Good+ Good	This finely crafted design has a sharp and clear if occasionally rather rough sound quality. Bass is light but qualitatively very good - an intriguing performer	45 x 25 x 27.5cm open space or near rear wall, high stands	89dB/W 68Hz	R	59
Monitor Audio R852/Gold MD £450	Good Good	Luxury build and 'high tech' tweeter or not, this compact model offers good refinement and detail on an open soundstage	45 x 25 x 26cm stands in free space	86dB/W 50Hz	R	66
Monitor Audio 1200 Gold MD £800	Average Average+	This smooth and civilised slimline floorstanding loudspeaker is well built and nicely presented. But it is also expensive	94 x 20 x 26cm in free space	85dB/W 48Hz		68
Mordaunt Short MS10 II £90	Average Average-	One of the best miniatures around. A borderline Best Buy because of the bass limitations, which may depend on your taste	29 x 20 x 17cm wall bracket	86dB/W 75Hz	R	53
Mordaunt Short MS100 £189	Average+ Average+	A 'mid forward' tonal balance is its main drawback but other aspects such as ambience, transparency and stereo depth compensate	32.5 x 22.5 x 21.5cm stands near wall	85dB/W 80Hz	R	46
Mordaunt Short 45Ti £230	Good Average	A sensitive tandem-bass number that can be driven loud but loses its balance a bit and can be unsubtle	63 x 26 x 30cm low (20cm) stand near wall	90.5dB/W 52Hz		53
Mordaunt Short MS300 £319	Average+ Average+	Not considered particularly competitive in its class, though it has good power handling and stereo focus	54 x 22.5 x 25cm on stands near wall	89dB/W 65Hz		46
Mordaunt Short 442 £1150	Good+ Good+ +	A resounding success with the listening panels. Make sure your room can accommodate the bass	95 x 26 x 38cm floor standing in free space	87.5dB/W 40Hz	R	60
Musical Fidelity MC-2 £300	Very Good Very Good	This exceptionally clean and clear design offers real subtlety and finesse. Bass quality is light but exceptionally clear; the treble is smooth if slightly shallow	48.5 x 25.5 x 16.5cm open space and stands	87.5dB/W 65Hz	BB	66
Musical Fidelity MC-4 £499	Very Good+ Very Good	Achieving a very high standard, the MC-4 sounds detailed and coherent like the MC-2, but with more bass depth and solidity, and large image scale	56.5 x 26.9 x 29cm open space on stands	87.5dB/W 60Hz	R	59
Opus 3 Capella £495	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 bookcase	86.5dB/W 45Hz		66

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LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
Quad ESL-63 £1538	Good+ 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 wall	84dB/W 34Hz	R	60
Richard Allan CD5 £242	Average— Average—	This neatly presented small reflex design can sound engagingly communicative, but is flawed sonically and technically and quite expensive too	38 x 19 x 23cm on rigid stands	88dB/W 80Hz		68
Rogers LS7I £399	Good+ Good+	A fine combination of classic qualities at reasonable price produces the "R" tag, but try to get a pair home on approval to check for bass 'heaviness'	56 x 27 x 28cm free space on 40cm stands	88.5dB/W 48Hz	R	59
Rogers Studio 1a £565	Very Good Good—	The classic BBC monitor style sound sensitively updated—transparent and natural with fine stereo, but a touch 'heavy' in balance	63.5 x 30.5 x 30.5cm stands in free space	87dB/W 36Hz	R	66
Roksan Darius £1265	Average Poor/Very Good	A controversial speaker which when set up right can deliver impressive performance, but with a far from neutral balance	98 x 31 x 51cm integral stands near side walls	88dB/W 50Hz		53
Rotel RL850 II £130	Average+ Average+	Strongly recommended. Well-balanced, clear, with decent focus and fine stereo, but tendency to 'heaviness' needs decent stands and space	44 x 25 x 24cm free space on 40cm stands	86.5dB/W 50Hz	BB	59
Royd A7 Series 11 £99	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 wall	86dB/W 75Hz	R	53
Royd A25 £100	Average+ Average—	Receiving mixed reactions on audition, the A25 is flawed but offers a lot of speaker for the money	51 x 29.5 x 24cm, stands near wall	87dB/W 52Hz	R	46
Royd Eden £235	Average Average+	Delightful mid/treble speed and transparency but determinedly bass light, this oddball miniature threatens cult status but could use a sweeter tweeter	31 x 20.5 x 18.5cm stands close to rear wall	87dB/W 85Hz	R	66
SD Acoustics SD1 £1050	Average Very Good	A large scale, airy and unusually detailed system with excellent dynamics. Balance is light and bright, and the original model could upset some systems/listeners. Current model has more civilised top-end and warmer overall balance	123.5 x 38.2 x 31.9cm free standing, away from walls	90dB/W 50Hz	R	60
Sony APM 10ES £100	— Average	An obvious Best Buy at its highly competitive price point, it can do justice to a good hi-fi system of Sony or specialist origins	40 x 25 x 20cm, 40cm stands 40cm from wall	87dB/W 55Hz	BB	59
Sony APM 22ES £249	Good+ Good	Sounding notably clear, the 22ES scored well on listening tests was easy to drive and achieved high sound levels	51.5 x 29 x 30cm free space on 40cm stands	88.5dB/W 46Hz	R	46
Sony APM 66ES £700	Average+ Average+	Powerful heavyweight sound with a brilliant midband—clear articulate and transparent. But the bass is on the boomy side and the treble can sound grainy	66 x 38 x 36.5cm open space, low stands	89dB/W 60Hz		59
Spendor Prelude II £345	Good+ Good	Good clarity and detail were evident everywhere in this speaker. Though a little boxy or muddy in the midrange, it is strongly recommended	50 x 26 x 28cm open stands in free space	88dB/W 52Hz	R*	46
Spendor SP2 £450	Very Good Good+	Conceding little to the SP1, this 30 litre model displayed good tonal balance with a highly articulate midrange, only slightly marred at frequency extremes	50 x 25 x 30cm free space, stands	87dB/W 45Hz	R	59
Spendor SP1 £680	Very Good Good	A very subtle and musical performer that works particularly well with digital material. An exceptional allrounder	63.5 x 29.5 x 30.5cm stands in open space	87dB/W 41Hz	R	60
Spendor SA3 Passive £1400	— Good+	Same as Spendor SA3 active	85 x 38 x 46cm low	89dB/W 32Hz	R	46
Spendor SA3 Active £2708	Good+ Very Good	Substantial speakers designed to deliver high sound levels and killer bass. Suited to larger rooms and power hungry ears	85 x 38 x 46cm low rigid stands in free space	89dB/W 32Hz	R	46
Spica TC-50 £595	Average+ Good	These American wedge-shaped-cabinet speakers were detailed and clear. However, we've not heard the current version with new drive units	40 x 33 x 28cm free space on 50-60cm stands	85dB/W 48Hz	R*	59
Spica Angelus £1195	Good Average	A little bass shy and soft in the bass and lower mid, the Angelus is otherwise tidy, extremely lively and fluid, if uneven overall	116.8 x 53.3 x 26cm free standing away from walls	86.5dB/W 50Hz		60
Studio Power Sapphire £130	Poor Average—	Balance difficulties are improving, though still prevent the potential of this interesting metal-cone new miniature from being fully realised	30 x 20 x 19.5cm stands near rear wall	85dB/W 70Hz		66
Tannoy Eclipse £120	Average+ Good	Although a little light on essentials are right: hear-through clarity at all frequencies, good dynamics, firm bass	38.8 x 22.6 x 21cm semi open on stands	87dB/W 65Hz	BB	59
Tannoy Mercury S £160	Good Good	A fine budget allrounder in the now established Mercury tradition; good balance and reasonable refinement will ensure wide appeal	49.5 x 25 x 21.5cm stands in free space	87dB/W 50Hz	BB	66
Tannoy M20 Gold £200	Good Average+	Luxury version of Mercury S with real wood and bi-wire frills doesn't necessarily sound any better overall, but still fine value	49.5 x 25 x 21.5cm stands in free space	87dB/W 50Hz	R	68
Tannoy DC2000 £300	Good Good	Remarkably high sensitivity from unique dual concentric driver that has an involving but characteristic sound. Bass could be better	68.5 x 26 x 27cm floor in free space	93dB/W 55Hz	R	66
Tannoy Westminster £3400	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 corners	96dB/W (manuf.)	R	Coll
TDL Monitor £1600	Very Good Very Good	Fine solidity and good accuracy, with enough bass extension to satisfy even organ freaks. Needs a big room and can sound a bit lazy and a shade tinkly	118.5 x 30 x 47cm 0.5m from walls	85dB/W 28Hz	R	66
Technics SBC 250 £130	Average+ Average—	Despite a fairly even tonal balance, the 250EK sounded muddled in the midrange and dull in character	36.5 x 23.5 x 20.5cm free space, stands	86dB/W 60Hz		46
Technics SB-RX50 £500	Very Good Average+	With its unique coaxial drive unit the RX50 proved a smooth and well balanced loudspeaker, its minor weakness being a mildly excessive low bass	48 x 30 x 26cm free space on 40cm stands	86dB/W 40Hz	R	46
Toshiba S33-M £90	Average Average	Providing a benchmark for budget loudspeakers, this Toshiba-inspired but UK designed and manufactured model is a lot of loudspeaker for the money, if a shade on the cheap	40 x 26 x 21.5cm stands in free space	86dB/W 55Hz	BB	68
Wharfedale Delta 30 £79	Good Average	Very clear and surprisingly neutral for the price, with good dynamics and stereo within limited volume ceiling	37.9 x 20 x 16.9cm near wall on high stands	88.5dB/W 80Hz	BB	59
Wharfedale Delta 50 £99	Average+ Average—	"There's nothing obviously wrong, but it seems a bit mundane," is what we said when the Delta 50 was £129. But since then the price has dropped by 30 per cent, making it great value	48 x 27 x 19cm near wall on 40cm stands	88dB/W 55Hz		53
Wharfedale Diamond 111 £99	Below Average Average—	This latest version of the long running Diamond sports a better tweeter, but bass, though deep, is soft, and the midband is indistinct and uneven	24 x 18.5 x 20.5cm near wall, stands	86.5dB/W 75Hz		59
Wharfedale Super Diamond £139	Average Average—	Although there are improvements on the basic "legendary" model, listening panelists did not get airborne about this upgrade	24 x 19 x 19cm close to wall at head height	88dB/W 57Hz		53
Wharfedale 504/2 £140	Average Average	Not strictly accurate, this musically involving miniature sounds unusually coherent and well integrated, if a shade dull in balance	29 x 18.5 x 19cm stands against rear wall	84dB/W 60Hz	R	68
Wharfedale 505/2 £169	Average Good	This lively Wharfedale provides plenty of speaker with unusual refinement for the money, and should be fairly tolerant of room siting	44 x 25.5 x 24cm stands 1ft from wall	86dB/W 55Hz	BB	66
Wharfedale 510.2 £299	Average Average—	Even in it's latest guise, this loudspeaker still sounds hard, cluttered and lacking innate clarity. The bass is uneven and midband coloured	61.5 x 28 x 29.6cm near wall, high stands	89dB/W 50Hz		59
Yamaha NS 100DM £900	Good Good+	Living up to its monitor label, and tonally well suited to digital material, the NS 100DM is superbly crafted and capable of high levels	67.5 x 37.5 x 32.5cm 30cm from wall, stands	90dB/W 40Hz	R	46

* rating refers to original, tested model.

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

THE DIRECTORY

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.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Acoustic Research RD-06 £280	Average Average+	Acceptable middle market player with very simple facilities and cramped control section, but unusually good looks	Dolby B/C HX Pro, fine bias, counter memory, repeat		This
Aiwa AD-F370 £130	Average Average	Adequate but uninspiring recorder with detail shortcomings but good control layout and successful sounding with recorded musicassettes	Dolby B, C, HX Pro, bias adjust		63
Aiwa AD-R470 £150	Average Good	For once, an auto-reverse deck with the performance of a decent unidirectional one at a similar price. The Aiwa is modern in concept and execution, and has good, transparent electronics	Dolby B/C/HX Pro, auto reverse, cue & review, bias adjust	BB	69
Aiwa AD-WX707 £180	Poor Average	Not bad value for a twin deck, but marginal from the high fidelity viewpoint. The review sample was poorly set	Dual deck, auto-reverse, Dolby B & C, bias adjust		57
Aiwa AD-F880 £300	Good Very Good	Modern sophisticated deck which manages to include some very sound under the skin development work in a rather ordinary (if well polished) exterior	Dolby B/C/HX Pro, 3 head, remote, manual tape calibration	R	69
Aiwa XK-007 Excelia £400	Good Good	Downmarket version of XK-009 with simplified bias/equalisation adjustment section and more forgiving but less informative sound. Still good, but less exciting than XK-009	Dolby B, C, dbx, HX Pro, 3 Head, tape alignment		63
Aiwa AD-WX909 £400	Good Good	Convenience meets sound quality, and both win. An essentially clean, positive recorder which works alongside an auto-reverse player of lower standard – a sensible compromise	Dual deck, auto-reverse, track search, Dolby B/C/HX Pro, bias adjust, 3 Head	R	57
Aiwa XK-009 Excelia £550	Very Good Very Good	Excellent detail, stable articulate midband and slightly obvious treble. The most interesting Aiwa for yonks	Dolby B, C, dbx, HX Pro, 3 Head, tape alignment, CD direct	R	63
Akai GX-32 £200	Average Poor	Constrained and smeared sum 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 £249	Very Good 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-6 £350	Good Good	There is a strong sense that someone has really thought this one through; it has an indefinable 'specialness'	Real-time counter, track search, Dolby B, C, bias adjust	R	52
Akai GX-95 £400	Good Very Good	Well designed and finished cassette deck with features well judged to please the audiophile – especially switchable Dolby HX Pro and switchable panel display. 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
Denon DR-M07 £125	Poor+ Average	There were several problems with the test player that render it an unsafe purchase. This is a pity since despite the antiquated control system, the deck is capable of refined sound quality	Dolby B/C, fine bias adjust		69
Denon DR-M10HX £180	Good Good	Very well laid out, a sensible range of features and smooth cam-operated transport. Replay-only sound quality suspect, but the deck is successful as a recorder – clean, precise but slightly 'grainy'	Dolby B, C HX Pro, memory counter, bias adjust	R	63
Denon DR-M12HX £220	Good Good+	Well constructed and pleasant to use, a lack of true pitch constancy kept it from sounding superb	Track search, Dolby B, C, HX Pro, bias adjust	R	57
Denon DRW-750 £229	Good Good	Polished and articulate, the only significant shortcoming is poor performance with prerecorded material	Dolby B/C/HX Pro, twin unidirectional, one records	R	69
Denon DR-M24HX £290	Good Good+	This deck will slot into many high grade systems without disgracing itself – or the cassette medium. Very presentable high resolution sound with good stereo with or without Dolby	Dolby B, C, HX Pro, bias adjust, 3 Head	R	60
Denon DR-M34HR £320	Very Good Good+	Prerecorded cassettes sounded grey and dull, but this may have been a sample fault. As a recorder, the DR-M34 is refined and detailed – and good value	Dolby B, C, HX Pro, 3 Head, manual tape calibration, memory counter		63
Denon DR-M44HX £400	Excellent Excellent	A well designed deck that also performed fine sonically, working very well with ferric and metal tapes	Real-time counter, Dolby B, C, HX Pro, tape alignment adjust, remote control, 3 Head	R	60
Dual CC8010 £110	Average Average+	The only limitation worth noting is a slight opaqueness, the Dual otherwise sounds stable and effective. An excellent low-cost design	Dolby B & C, microphone input	BB	63
Goodmans GSW-5200 £90	Poor Poor	Musically unimpressive but at least it's cheap!	Dolby B, twin, one records		69
Grundig Fine Arts CCT-903 n/a (system component)	Good Good-	[Competent part of complete Grundig system]. Solid and well engineered deck with small but significant problems preventing it scoring highly. Basic design generally – and transport specifically – are excellent	Dolby B/C, twin auto reverse, one records		69
Harman Kardon CD491 £695	Good Good+	Excellent audio engineering and tremendous flexibility make this an audiophile cassette deck excellence	Real-time counter, auto reverse, track search, Dolby B, C, HX Pro, bias adjust	R	52
JVC TD-R411 £180	Poor Poor	Transport irregularity, especially flutter, and poor set-up lead to a sound that although sharp is lacking in body and detail. However, the quick auto-reverse mechanism is nice to use	Dolby B/C, auto reverse		69
JVC TD-W444 £190	Average Average	The 444 offers a satisfying blend of cost and facilities, but musically it is lacklustre, lacking detail, dynamics and grip. Fair value though	Dolby B/C, twin deck, unidirectional play deck, auto-reverse record deck		69
JVC TD-V711 £380	Very Good Excellent	This is a complex recorder which is built on the back of some important ideas with audiophile roots. It has a (mostly) superb technical performance and is very capable, if not always strictly accurate	Dolby B, C, HX Pro, 3 Head, variable bias, track search, 3 line inputs	R	63
JVC TD-W222 £150	Below Average Below Average	Well endowed but somewhat user-hostile twin deck. Sound quality is very tape dependent, but offers tolerable stability with considerable loss of resolution and scrappy musical presentation	Dual deck, auto reverse, Dolby B/C		63
Kenwood KX-440HX £140	Average+ Poor	Uneven, unstable sounding player with limited resolving power, but good control layout and finish	Dolby B, C, HX Pro, intro scan		63
Kenwood KX-660HX £170	Good Good	Well designed control system with useful search aids. Sound quality is positive and detailed	Dolby B, C, HX Pro, track & blank search, intro-scan, bias adjust	R	63
Kenwood KX-5010 £269	Very Good Excellent	This important new middle price deck is a well thought through and thoroughly developed design which eschews gimmicks for the sake of musical excellence	Dolby B/C/HX Pro, auto tape calibration, track/intro search	BB	69
Luxman K-105 £349	Average Average	Rating quite well for an auto reverse deck, and featuring complex track search facilities, it was not sonically competitive on price	Auto reverse, track search, Dolby B & C, remote control		52
Luxman K-112 £349	Average Average	Build quality is not truly consistent with the price. Nor is sound, which veers on the warm, lossy side of neutral	Dolby B, C, HX Pro, bias adjust, 3 Head		57
Marantz SD-35 £150	Good Good+	Rock steady tape transport gives very competitive sound quality for the price, but the slightly bright replay may not appeal to some	Dolby B & C, bias adjust	R	52

THE DIRECTORY

CASSETTE DECKS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Marantz SD-45II £200	Good + Good +	Well built and dynamic sounding player, working better as a recorder than with musicassettes	Dolby B & C, bias adjust Auto selection	R	52
Marantz CP230 £300	Average Average	This is a competitively priced portable recorder though not suited to replay of musicassettes	Dolby B, bias adjust	R	52
Marantz SD585 £300	Average Average—	Sound quality is a little sat upon, and control ergonomics are somewhat opaque, though the twin auto-reverse/recording capability makes this a powerful machine	Dolby B/C, twin auto-reverse & record, parallel recording etc		69
Marantz SD-55 £349	Good Very Good	Slightly tacky feel and restricted signal/noise performance are the main shortcomings of an excellent sounding piece of kit	Real-time counter, track search, Dolby B/C/HX Pro, bias adjust, 3 Head	R	57
Memorex SCT-84 £200	Average + Average +	The playback only transport is a little disappointing, but the record one is a quality item and the deck works well. Ergonomics are good, but styling and control feel are decidedly tacky.	Dolby B/C, fine bias, twin with auto- reverse record, unidirectional play	R	69
NAD 6300 £550	Very Good Very Good	Solid and homogeneous sound quality and very good replay compatibility thanks to 'play trim'. Distinctive, musical — and costly	Dolby B, C, HX Pro, 3 Head, bias adjust	R	63
Nakamichi CR-1E £345	Very Good Good	Modestly equipped by any standards, the CR-1E stands or falls by its build quality, which is high, and sound which is highly competent	Dolby B & C		57
Nakamichi CR-2E £395	Very Good Good +	Ordinary to look at, in some respects rather awkward to use (tape switching especially), the CR-2E sounds very slightly better than the CR-1E, and therefore ranks well. But it doesn't come cheap	Dolby B & C, bias adjust, remote control	R	57
Nakamichi RX-202E £545	Good Very Good +	Fine, clear and articulate sounding player. Excellent with prerecorded material, but idiosyncratic and sometimes obstructive control system	Auto reverse, Dolby B, C, 2 Head	R	63
Nakamichi CR-3E £595	Very Good Very Good	The user interface is a little clumsy, though conceptually straightforward. Sound quality approaches the CR-4E, and is amongst the best at the price.	Dolby B & C, bias adjust, remote control	R	57
Nakamichi CR-4E £745	Very Good + Very Good +	High class deck with a reasonably full range of features and superb sound at a slightly unlikely price	Dolby B & C, bias adjust, remote control, 3 Head	R	57
Nakamichi CR-5E £995	Excellent Excellent	A slightly simplified version of the all-conquering CR-7, the CR-5 has a very similar standard of audio performance — the best	Dolby B/C, fine bias, 3-head	R	69
Nakamichi CR-7E £1500	Excellent Excellent	Remarkably this deck is not only ergonomically but also sonically superior to the Dragon, particularly on record/replay	Real-time counter, track search, Dolby B & C, tape alignment adjust, bias adjust, remote control, 3 Head	R	60
Nakamichi Dragon £1750	Excellent Excellent	Previous to the birth of the CR-7E, this machine stood head and shoulders above the rest. It is still the ultimate for musicassette replay	Auto reverse, Dolby B & C, tape alignment adjust, bias adjust, remote		60
Onkyo TA-2120 £130	Average + Good	Clear, vivid sound with good timing and resolution when using Type II tapes without Dolby. The controls are less inspiring — the meters in particular are plainly inadequate	Dolby B/C, auto tape sensing, block/ side repeat	R	63
Onkyo TA 2130 £160	Average + Average +	Rating fairly well on both pre-recorded and record/playback, ergonomics were a little poor but overall performance was generally consistent	Track search, Dolby B & C, bias adjust		52
Philips FC566 £179	Average + Average +	Mostly well equipped, though some tape search facilities fail to exploit the auto-reverse capability. Sounds clean and stable — with prerecorded tapes too	Auto reverse, track search, Dolby B & C		57
Philips FC567 £279	Average Poor	Well equipped but ergonomically substandard; sound quality is messy and lacking in clarity and dynamics	Dual deck, auto reverse, track search, Dolby B & C		57
Pioneer CT-443 £180	Average Good	Structurally sound and subtly musical recorder. Sophisticated, mildly damped sound quality	Dolby B & C, fine bias adjust, track search	R	63
Pioneer CT-737 £300	Average— Average—	Interesting design and a pleasure to use with rather too many rough edges to really work properly	Dolby B, C, HX Pro, 3 Head, bias adjust, memory counter		63
Pioneer CT-939 £450	Excellent Excellent	High grade and easy to use cassette deck featuring a state of the art transport. The audio amplifiers are not quite in the same class, but fail to seriously damp enthusiasm for an excellent package.	Dolby B/C/HX Pro, 3 head, real time counter, variable bias	R	69
Proton AD-200 £140	Poor Poor	Sound quality is essentially on a par with many portables, and has nothing to do with high fidelity. The main problems are an unrelenting hardness and an almost total lack of detail	Dolby B & C		57
Proton AD-300 £200	Average— Poor	High levels of flutter give sound a roughness and coarseness that rules it out for high quality work. The record and replay electronics certainly deserve better	Auto reverse, Dolby B & C		57
Revox B215 £1461	Good Average +	Superb engineering and good sound, but lacking the subjective qualities that characterise the very best hi-fi equipment	Real-time counter, Dolby B & C, tape alignment adjust, remote control		52
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-X30i £150	Average + Good	Lively, informative and well equipped basic deck, if rather obscure operationally	Dolby B/C/HX Pro, variable bias, track search	R	69
Sony TC-FX 150 £90	Average + Average +	Recording and playing back on this deck itself gave acceptable results, whereas prerecorded stuff was a joke. But it's a good £90 worth	Dolby B & C		52
Sony TC-W300 £150	Poor Poor	Deeply unimpressive and messy sounding deck with bloated quality and poor pitch integrity. Dubbing performance substandard	Dual deck, Dolby B & C		63
Sony TC-RX50 £180	Average— Poor	Terminal inability to play at a steady pitch, (or on prerecorded material) in tune spoiled this simple but otherwise attractive design	Auto-reverse, Dolby B/C/HX Pro		63
Sony TC-WR500 £200	Poor Poor	In many ways a curiously old-fashioned package which lives up (down?) to stereotypes about twin cassette decks	Twin Dolby B & C, 1 records, both auto-reverse		69
Sony (WMD6C) ProWalkman £249	Good + Excellent	"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 TC-RX60ES £250	Average Average	For once a stable sounding auto-reverse deck but sound quality is rather 'dirty' and compressed, especially with Dolby C	Auto-reverse, Dolby B/C/HX Pro, auto tape recognition		63
Sony TC-RX80ES £350	Average + Good	Clean, powerful and detailed sound, especially without Dolby C. Stable pitch — but prerecorded cassettes sounded disappointing	Auto reverse, Dolby B/C/HX Pro, bias/ level adjust	R	63
Sony TC-K700ES £499	Excellent Excellent	Firmly in the esoteric league, this is easy both to operate and to listen to. Best points: first class imagery, focus and stability	Auto reverse, track search, Dolby B & C, tape alignment adjust	R	60
Teac V-250 £89	Average Average	Ultra-basic design which works quite well. Lack of pitch integrity is the main shortcoming, but it wasn't always noticeable	Dolby B	R	63
Teac V-270C £109	Average— Average—	Not quite cheap enough to compete solely on price, the V-270C is a rather messy and unstable sounding deck	Dolby B & C, bias adjust		63
Teac V-570 £199	Average + Good	Metal tapes are not exploited well by this deck, and prerecorded tapes sounded very disappointing. But the underlying sound quality sets a very high standard, assisted by clean electronics and an excellent transport	Dolby B/C/HX Pro, fine bias adjust	R	69
Teac V-670 £249	Average Average	This deck is worth considering, but much has been sacrificed for the third head, both musically and in the range and type of features included. Worth considering	Dolby B/C/HX Pro, fine bias, 3 head/off tape monitoring		69

TO ORDER BACK ISSUES OF HI-FI CHOICE SEE PAGE 123

THE DIRECTORY

CASSETTE DECKS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Teac R-515 £299	Average+ Average+	Expensive, this deck is basically a competent but pedestrian performer which will not fully satisfy the critical user	Real-time counter, auto reverse, Dolby B & C, bias adjust		57
Teac W-460C £299	Good Average	Musically this deck is a little lacking, given the price and despite a notably fine transport section. Nevertheless well worth considering if the programming options appeal.	Dolby B/C, twin unidirectional, one records. Programme memory		69
Teac V-870 £399	Good+ Good	Cut-down V-970X for the proletariat. Expensive and carefully engineered with mostly very good but slightly cold sound quality	Dolby B, C, HX Pro, 3 Head, manual tape calibration	R	63
Teac V-970X £499	Very Good Very Good	An excellent sounding deck with useful features (tape calibration etc) that fully justifies the price	Real-time counter, track search, Dolby B/C/dbx & Dolby HX Pro, bias adjust, remote control, 3 Head	R	57
Teac W-990RX £499	Good Good	A mess with dbx, but taut and articulate otherwise. The 990, though expensive, has a powerful range of features, making it one of the few really ambitious decks to successfully straddle both sets of requirements	Dolby B/C & dbx, dual auto-reverse/record, parallel & sequential recording, remote	R	69
Technics RS-T230 £160	Average- Average	Satisfactory with prerecorded material but otherwise unexceptional, the main features of this deck are its excellent user interface and value for money	Dual deck, Dolby B/C		63
Technics RS-B355 £140	Good Good	Good sound let down by inadequate meters and poor prerecorded replay only sound quality	Dolby B, C, microphone inputs, cue and review	R	63
Technics RS-B505 £160	Average+ Average+	Neatly made recorder with Dolby HX Pro that sounds precise and stable, though sometimes a little processed and grainy too	Track search, Dolby B/C/HX Pro		57
Technics RS-B605 £180	Good Average+	Mixed but generally good sound. Weakest points are dbx and prerecorded sound, best are Type IV (metal) recordings which sound sharp and precise	Track search, Dolby B/C/HX Pro & dbx		57
Technics RS-T330R £200	Average+ Average+	One of the very few dual cassette decks with any real pretensions to audio quality, the RS-T330 is a considerable success musically as well as being a pleasure to use	Dual deck, Dolby B & C	R	63
Technics RS-B705 £250	Average Average-	3 heads for the price of two, but not the sound quality to go with them	Track search, Dolby B, C, HX Pro, bias adjust, 3 Head		52
Technics RS-B905 £350	Good Good	Good, well set up cassette deck with a clean, accurate sound but some compression. dbx circuit sounds poor	Dolby B, C, HX Pro, dbx, bias adjust, 3 Head		57
Technics RS-T80R £400	Poor Poor	Flexible and pleasant to use but poor transports led to poor sound on our latest sample	Dual deck, auto reverse, track search, Dolby B, C, dbx		52
Yamaha KX-200 £120	Good- Good	Cheap, well-equipped and workmanlike with the sound quality less obviously processed than most - the whole is more than the sum of the parts	Track search, Dolby B & C, remote control	R	52
Yamaha KX-300 £150	Average+ Average-	Uncommonly well equipped and adequately made and presented, this model turned out to be a disappointingly uncertain proposition on audition	Track search, Dolby B, C, HX Pro with 'play trim', bias adjust, remote control		57
Yamaha KX-400 £200	Good Good+	A highly commercial package with every widget under the sun. Happily it sounds good too.	Auto reverse, track search, Dolby B, C, HX Pro, remote control	R	52
Yamaha KX-500 £210	Very Good Very Good	An accomplished performer, strongest in the areas of pitch and spatial stability, but slightly rough around the edges	Real-time counter, track search, Dolby B/C/HX Pro with play trim, bias adjust, remote control	R	57
Yamaha KX-800 £330	Good Average	The present Yamaha range seems oddly inconsistent. This sophisticated model sounds fine (almost) but came a clear second best to the KX-500	Real-time counter, track search, Dolby B, C, HX Pro with play trim, bias adjust, 3 Head		57
Yamaha KX-1200 £500	Excellent Average+	A veritable rats' nest of buttons and dials, albeit well laid-out. This is nearly a great recorder, but lacks simplicity of sound	Real-time counter, track search, Dolby B, C, dbx, HX Pro, bias adjust, remote control		52

DAT RECORDERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa Excelia XD-001 £1300	Very Good Very Good	Clear and very listenable recorder roughly comparable to but slightly sweeter sounding than the Sony DCT-1 000ES - but with an inferior front panel design	Track ID and search, remote	R	63
Grundig Fine Arts DAT-9000 n/a (system component)	Good Good	Conventional DAT recorder offering standard facilities. The deck is well made and equipped, and is engineered to a satisfactory quality standard. It performs to an acceptable standard, though it is not state of the art	2/4 hour recording, mic inputs, digital in/out		69
Luxman KD-117 £1499	Good Good	Slightly soggy, earth-bound sound quality, this model trails the other DAT decks tested so far	Two analogue inputs, remote twin address		63
Pioneer D-1000 n/a	Excellent Excellent	Fine, clear, colourful and consistent sounding deck. The Pioneer is lavishly (uneconomically?) constructed and equipped. It shows what is possible, but will probably never be on sale	Many search and memory facilities	R	63
Sony DTC-M100 £799	Very Good Very Good	Clean, clear sounding 2nd generation model with most of the features and sound of the DTC-1000ES	Mid-width, alpha-numeric display, remote, optical interfaces	R	63
Sony DTC-1000ES £1299	Very Good Very Good	Fine, consistent performer with accomplished tape handling and good build quality	Standard track ID and search, remote	R	63

CD PLAYERS

This all-digital music source is well established, despite still high disc prices and the opposition of many hi-fi enthusiasts. Compact Disc's strengths over conventional vinyl are complete freedom from surface noise with automatic and programmable play, plus track skip and fast music scan - frequently under full remote control. However, many vinyl enthusiasts find CDs sound less involving than

top quality vinyl replay.

Introduced five years ago at around £500, CD players now average less than half that price, and for the main offer improved performance besides. Even cheaper players may have the latest decoding chips and the most useful play features; extra money can buy remote control, remote volume control, audio 'tweaks', plus improved build and component

quality control.

Compared with many hi-fi components, CD players give impressive lab performance, though there are differences between players nonetheless. Sound quality variations are even more marked, particularly in a good quality system. As it behaves very like a preamp, there are no problems connecting a player to a normal amplifier.

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
ADC CD 2000E £330	Good+ Fair+	One of the slimmest players in the business but nothing special inside. Nice ergonomics but overpriced	Remote, timeshared 16 bit		64
Aiwa DX-M45 £149	Fair Fair	Cutdown Philips technology, but results are quite good for this British made machine	Manual	R	64
Aiwa CD-001 £300	Good Good	Pretty close to Recommendation, delivering a respectable sound quality and lab performance from an ergonomically attractive package, but ultimately failed to excel in any particular respect	Track entry/volume remote, direct recorder connection etc.		58
Aiwa XC-007 £499	Very Good Good	Creditable sound despite inverted output, high tech engineering with very good lab performance. A worthy contender but not cheap	Remote, keypad, timer, digital output, pseudo 20 bit, dual DAC		64
Akai CD-52 £249	Good Good	A nice surprise from Akai, genuinely good sound from this mid-priced model. Better linearity will help further	Remote, digital output, headphone socket	BB	64

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MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Akai CD-62 £330	Fair Very Good	Looks, build quality and the technical specification are right up to date. As it stands it sounds very good but if the indifferent lab performance could be improved, it would probably sound even better.	Remote, programme, hdph, comprehensive display etc	BB	This
Akai CD-73 £450	Good Average	A little uneven musically, the Akai tends to smother fine detail, but has first class dynamics and stereo imagery. Worth auditioning	Track entry keypad remote, menu display (switchable)		62
Akai CD93 £700	Good Very Good	Undoubtedly a CD player of real class in build, presentation, lab performance and sound quality, but also a shade expensive for formal Recommendation – though that's not to dissuade lovers of black lacquer wood finish.	Track entry remote, menu display etc.		58
Arcam Delta Black Box £250	n/a Very Good	This rich, powerful and articulate sounding DAC transforms the majority of medium price CD players	Needs D-out CD players	R	60
Arcam Delta 70 £500	Good Very Good	This solidly built British player has attractively understated presentation with straightforward, simple ergonomics. The very good sound quality shows a steady improvement over earlier samples.	Simple remote, headphone socket etc.	R	58
Cambridge Audio CD2 £650	Fair Very Good	The finest midrange in digital audio is sufficient grounds for Recommendation, though there remains a tinge of disappointment that the CD2 didn't get closer to big brother elsewhere, notably in the bass.	16x oversampling, remote control	R	58
dbx DX5 £640	Good Poor	Sound quality proved a single disappointment, though it's refreshingly unique in providing semi-pro post-production facilities that some users will undoubtedly relish.	Track entry/volume remote, compression, impact recovery, ambience etc.		58
Denon DCD 610 £200	Good+ Fair+	Lots of Denon player for the money, well equipped with good all round performance	Remote, versatile programming 2x 0/S	BB	64
Denon DCD 810 £250	Very Good Fair+	A good value allrounder bettered on sheet value by the 610 and 910; power volume could sound better	Remote, 4x oversampling, programming	R	64
Denon DCD 910 £300	Very Good Fair+	A well equipped deck of impressive appearance and solid sonic and lab performance	Remote volume, programming, 8x 0/S digital output	BB	64
Denon DCD-1500II £500	Very Good Very Good	The extra build quality over cheaper Denons is justified in terms of sound quality and lab performance, while the feature list is comprehensive and quite nicely presented	Track entry/volume remote, menu display etc.	R	60
Denon DCD-1520 £500	Very Good Very Good	High tech, high profile, high gadget content, good sounding player at an almost affordable price.	Programme, hdph socket, remote, track entry, optical digital output	R	This
Denon DCD 1700 £650	Good+ Very Good	The overall sound was strong and coherent approaching reference standards. Fine build quality and facilities make this a firm contender	Remote, skip, scan, headphone socket, programmable	R	58
Denon DCD-3300 £1200	Good++ Very Good	Sounding tight and coherent though not significantly better than the cheaper 1700. Very well built and comprehensively equipped	Remote control, with volume, keypad programme, scan, search, headphone		51
Dual CD 1030 RC £170	Fair Fair	An up and down performance on test but it is hard to deny the overall value for a machine that includes remote control at this price	Remote, headphone socket, 2x 0/S, timeshared 16 bit	R	64
Ferguson CD007 £130	Good Fair	The cheapest recommendation in the test group, don't expect the earth but the value is good	Manual, digital output, headphone socket	R	64
Ferguson CD008 £150	Fair Fair	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 GCD300 £129	Average Average	It may be adequately made, but with cheap good sounding players available this particular Goodmans isn't quite good enough	Programmable, skip, search, repeat		This
Goodmans GCD550 £199	Average+ Fair+	A slow autochanger with a weakish lab performance but the sound is fair enough, the features good and the price is low	Remote, 6 disc autochanger, 2x 0/S	BB	64
Grundig CD9000 £1000	Good Good	Aimed at a market which puts external styling above sound quality. Although this player is of slightly above average competence in most departments it is expensive	Remote, programme, hdph socket, calendar display etc		This
JVC XL333 £170	Good Good	This player provides lavish facilities at a budget price (no remote though) and it produces a good sound and performed well in the lab	Track key entry, 32 track memory, comprehensive display	BB	This
JVC XL-Z444 £255	Good Fair+	An average performer, unremarkable though well equipped and fair value for money	Full feature remote, digital output, headphone socket		64
JVC XL-M400 £300	Good Fair	JVC has produced a competent autochanger which works well. Average sound quality doesn't create any great enthusiasm	Autochanger, key pad remote, hdph socket, multi disc programming		This
JVC XLZ 555 £350	Good Fair	The display is something else, but the rest of the player, although displaying fine build quality is too average everywhere	Keypad track select, comprehensive display, optical digital output etc		This
Kenwood DP-660SG £180	Below Average Below Average	Build quality and ergonomics are good, and the range of features far exceeds the price norm. However, sound quality is messy with a soft bass, recessed mid and sometimes spiky top	Remote control, calendar/menu display, keypad, 20 track memory		62
Kenwood DP-880SG £250	Very good+ Fair+	A fine CD transport for the price, fine sound, very good lab results, good for a decoder?	Remote volume, programming, headphone socket	BB	64
Kenwood DP-990SG £400	Very Good Good	Falling just short of the required subjective standard for Recommendation at this price level, this is a doughty player nonetheless, with a build quality and technical performance that arguably justifies its premium price.	Track entry remote, menu display, sprung feet etc.		58
Kenwood DP-8010 £449	Good Fair	Top build quality and novel technological features seem to achieve little success here. While the technical performance is fine, the sound quality doesn't match its competitors	Track entry remote, memory display, sprung feet, optical digital output etc		This
Kenwood DP-1100SG £450	Very Good Good	Something of a high tech flagship, this model doesn't quite make the grade on sonic grounds but is well built	Full remote, optical and coax digital outputs, headphones		64
Kinergetics KCD-30 £1700	Very Good Very Good	Definitely a technical oddball with its distortion-cancelling circuits, the pricey KCD-30 nevertheless does sound very good, and also noticeably 'different' – not necessarily to our collective tastes, but possibly to yours	Favourite track selection, remote, high output (vol, bal)		60
Luxman D-90 £300	Fair Good	Despite technical ingredients that do not seem particularly inspiring, this is a nicely judged package that is ergonomically neater than most, with decent sound quality for the price and distinctive finish and presentation	Track entry remote, programming etc.	R	58
Marantz CD583 £150	Very Good Good	Devoid of all but the CD essentials it makes up for in sound quality what it lacks elsewhere	Memory, track skip, search, etc	BB	This
Marantz CD65IISE £300	Very Good Very Good	Scorching sound quality from a competitively priced player, which is the new middle market reference	Remote, programming, digital output	BB	64
Marantz CD75IISE £350	Very Good Very Good	Remote volume version of the 65 SE with an optical digital output as well. A sonic superiority complex in a cheap plastic box	Remote volume, hdph socket, FTS, optical output etc	BB	This
Marantz CD85 £550	Very Good Very Good	This player may just miss a top sonic rating but it's well made and has plenty of features befitting a Marantz heavyweight	FTS, key pad remote, comprehensive display, programming, optical output etc	R	This
Marantz CD94 £800	Good++ Very Good	Clearly the best Marantz CD player, with high build quality and good objective and subjective performance	10 digit keypad, headphone socket, favourite track selection, remote	R	58
Marantz CD94/CDA94 £1600	Very Good Excellent	Taking its logical place at the top of the Marantz CD hierarchy, this two-box combination delivers reference standard lab and listening test results, albeit at a price which seems a little steep. Very refined	Favourite track selection, remote, balanced output etc	R	60

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CD PLAYERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Marantz CD12LE £2500	Very Good Very Good	This may be very expensive but it is very well made. Technical performance is very good and the sound is the best from Marantz yet!	Two box, digital processor, FTS, optical connection, hdph socket, comprehensive display, balanced output etc	R	This
Meridian 207 £1050	Very Good Excellent	Not only arguably the prettiest model around, but also one of the best sounding and most versatile – on-board preamp now accepts vinyl disc for an extra £100, and Meridian plans round-the-house future-readiness	On-board preamp, remote (inc volume)	R	64
Mission PCM2 £500	Good + Good	A matured design with good features it is the best sounding power volume player available, it even tests well. It accepts the £200 PSX power supply option	Remote volume, display and phase invert	R	64
NAD 5220 £230	Average – Poor	Conforms sonically to a stereotype of the medium that most players have grown out of. Hard, thin and raw sound with poor stereo and resolution	Time/track display, memory		62
Nakamichi OMS-1E £395	Good Good	This neat enough player doesn't really follow the Nakamichi tradition of providing exceptional sound quality while at the same time perpetuates that of selling at an above average price	Simple remote etc		58
Nakamichi COP-2E £495	Very Good Good	It's ergonomically superior and has above average sound, but it isn't cheap. The standard of build quality and finish is first class which isn't quite matched by the sound quality	Programming, hdph, remote track entry, digital output		This
Nakamichi OMS-3E £995	Good Good	Superbly built and presented this expensive machine was a bit of a "stuffed shirt" when it came to sound quality	Remote control, skip and scan, headphone socket		51
Nakamichi OMS-4E £1200	Very Good Very Good	Solidly controlled and comparatively simple this clearly represents one of the major benchmarks for CD sound quality, though the midrange sounded a touch thin	Skip and scan, headphone socket		51
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, manual control		51
Nakamichi OMS-7EII £2000	Good + Good	The only serious criticism here is of the price. And in our not always humble opinion you can better sound quality for less elsewhere in Nakamichi's range	10 digit track entry keypad programming, headphones		51
Onkyo DX-1500 £170	Average Fair	Ruled out on the grounds of its poor DAC filter, but it's not so bad really given the price	Manual, 2x 0/S, timeshared 16 bit		64
Onkyo DX-3500 £250	Very Good Fair	It offers a lot of facilities and fine build quality for the money. Lab performance is very good but the sound quality doesn't inspire	Key pad remote, memory, hdph socket, comprehensive display etc		This
Onkyo DX-7500 £450	Good Very Good	This comes close to the state of the art performance in many areas. It has lots of facilities and is well made too.	Key pad remote, memory, hdph, very comprehensive display, optical digital output etc	R	This
Philips CD582 £200	Very Good Good	Build quality and finish are only adequate but in every other respect it's more than competitive	Simple remote, programming, large display, hdph socket	BB	This
Philips CD473 £225	Good Good	In the forefront as regards sound quality, this is one of the best sounding Philips players yet; we were unable to catch it out on classical through Jazz program	Favourite track selection, remote control with volume, headphones etc	BB	58
Philips CD782 £230	Very Good Good	In the present market this Philips offers an amazing performance in all areas at a most affordable price. The styling is a little bland	Versatile volume remote, FTS, variable headphone socket etc	BB	This
Philips CD880 £500	Very Good Very Good	The '880 is an impressive blend of luxury build quality and features at a far from extravagant price, and also delivers the subjective goods.	Volume remote, FTS, menu display etc.	R	60
Pioneer PD4100 £170	Fair Good	It's not perfect in the lab; the facilities are few, but the sound quality sets it apart	Programmable, skip, search, repeat	BB	This
Pioneer PD5100 £220	Fair Fair	It's well made and has good facilities. The lab performance is generally fine, but it's only average for sound quality	Remote, volume, programming, hdph socket, etc		This
Pioneer PD-6100 £245	Good Good	A budget audiophile player; fine sound even if its lab performance seems a little uneven	Full feature remote, digital output, variable hdph	BB	64
Pioneer PD-M500 £265	Good Good	A high performance autochanger for the money, good value all round and generously featured specification	Full remote, digital output, variable hdph	BB	64
Pioneer PD7100 £300	Good Good	External build quality is fine, the level of facilities are lavish, but the sound it produces only just takes it into the good category	Remote, volume headphone socket, versatile programming, faders etc		This
Pioneer PD-M700 £400	Very Good Fair +	Top class autochanger, surprisingly fast, high specification and a good allrounder	Remote, optical digital output, headphone socket		64
Pioneer PD-91 £800	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, index search, etc.	R	64
Revox B126 £645	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 remote system compatible		This
Revox B226 £756	Good + Good	The traditional Revox house style is combined with the fine Philips 16 bit chip set, but this player doesn't really offer sound quality to match the price	Infra-red remote control, full search, scan, programming		51/Coll
Rotel RCD820B £210	Good + Fair +	A budget Philips based player of dependable sound quality and offering very good value. Build is a touch lightweight	Remote, basic facilities	BB	64
Rotel RCD820BX2 £250	Good Very Good	Start with a good base and then make it sound better. The '820BX2 CD player maintains the reputation established by its namesakes, and comfortably deserves*Recommendation.	Direct track entry remote etc	R	58
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, though styling is unusual.	Remote (inc volume), skip, scan etc.		58
Sansui CD-XM510M £295	Average Fair	Not designed to appeal to the audiophile, but with its 12 disc facility it's ideal for background music or as a second player for the kids	12 Disc, 2 magazine autochanger, comprehensive remote, programming etc		This
Sansui CD-X501i £300	Fair Fair	Weak dynamic range for an upmarket player which shows in both lab and listening tests	Remote, programmable, digital output, headphones		64
Sansui CD X70 1i £445	Good Good	A stylish attractive player which sets itself apart from mainstream mediocrity by means of its external appearance. It works well too, has plenty of facilities and good sound quality.	Remote, key pad track access, digital output, variable headphone socket etc	R	This
Sharp DX150 £125	Fair Fair	This is a none oversampled player which is rather outclassed for technical and sonic merit by the vast majority of the competition. Pretty enough but would want to discs in it?	Programmable, skip, search, repeat		This
Sharp DX750 £175	Fair Fair	It has a remote control but it's too like the 150 which is rather outclassed for technical and sonic merit the vast majority of the competition	Remote, programmable, skip, search, repeat		This
Sharp DX-620 £200	Good Good	A surprising achievement but it shows what can be done. Another high value budget package	Remote, headphone output, 2x 0/S, timeshare 16 bit	BB	64
Sharp DX-R700H £225	Average – Poor	A workmanlike player that does not offer exemplary lab or sound quality but which is well-built with good facilities and should perform well in use	Remote control, track selection keypad, skip, scan repeat programming		53
Shure Ultra D6000 £455	Average + Fair	Ergonomically well thought out with full function remote control, but not really scoring sonically considering its price	Remote control (full function inc volume)		51
Sonographe SD1 (by CJ) £795	Good Very Good	Distinctive with oak end-cheeks, using Philips based 14 bit x 4 oversampling, Conrad Johnson electronics make this a musically rewarding player	Full search programme and timing	R	51/Coll
Sony CDP-M35 £170	Fair Fair	There is no disguising the lightweight plastic construction of this player, but the technical performance, sound quality, aesthetics and ergonomics all deliver more than one has the right to expect for £170	Skip, scan, programming etc	R	58
Sony CDP-350 £180	Fair Fair	A fairly basic machine. The lab test showed up some faults and it didn't do particularly well sonically	Programming, skip, search, repeat, hdph socket		This

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MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Sony CDP-M55 £190	Fair Fair	£20 buys a remote control handset to operate your M35. Sony call it an M55 (see CDP-M35 review).	Simple remote, skip, scan, programming etc.	R	58
Sony COP-550 £200	Good+ Fair+	Another dependable Sony, it doesn't have a digital output but at the price who's complaining? Fit and forget	Full remote headphone output, 4x 0/S	BB	64
Sony CDP-M75 £230	Good Good	This midi version of the '750 saves £20 on the price (see CDP-750 review).	Track entry remote, menu display ect.	BB	58
Sony CDP-750 £250	Good Good	A seductive blend of fine presentation and solid performance, all at a very realistic price that should ensure its success.	Track entry remote, menu display etc.	BB	58
Sony COP-C50M £250	Fair Fair	The Sony concept of an autochanger is interesting and executed with characteristic thoroughness. The lab and sound test results reveal it to be of only average quality	Carousel autochanger, remote, multi disc programming, variable hdph socket		This
Sony CDP-M95 £280	Very Good Fair+	Very well equipped mid sized player fine build and finish, incorporating Sony's custom file disc labelling	Remote, programmable, variable hdph output	R	64
Sony COP227ESD £400	Good Good	The cheapest of the ESD range offers plenty of ergonomically arranged facilities. It performed well in both the lab and on the listening tests, and its reasonable price makes it hard to miss	Remote, keypad track access, volume, hdph, comprehensive display, FTS, custom index, etc	R	This
Sony COP-337ESD £550	Good Very Good+	Well built, high grade player with excellent if undemonstrative sound. Excellent resolution, dynamics and bass weight, though arguably not control	Random access remote, calendar display, FTS, memory	R	61
Sony 557ESD £1000	Excellent Good+	Superbly built flagship model that produced excellent lab results and very good sound. Many luxury features though not that good value	Full remote, disc directory, digital output, power volume, 8x 0/S, 18 bit		64
Teac PD135 £180	Fair Fair	Particularly easy to use, this lags a little behind the pack when it comes to sound quality, but it still represents a valid alternative for those who find the presentation attractive.	Skip, scan, programming, repeat.		58
Teac PD470 £250	Fair Good	Pleasant sounding though unexciting, ergonomically functional though predominantly plastic. It doesn't achieve the sonic status required in a hotly contested market segment	Remote, track key pad, autospace, comprehensive display, hdph socket		This
Teac ZD880 £450	Good Fair	Decent enough in most respects with a very good build and finish. Its sound isn't competitive enough to inspire any real enthusiasm	Remote, track key access, auto space, comprehensive display, hdph socket etc		This
Technics SL-P350 £250	Very Good+ Good	Nicely built, good features and fine sound, what more do you want for £250?	Remote, digital output, variable hdph output	BB	64
Technics SL-P770 £350	Excellent Good	Sophisticated, high resolution player, but inconsistent with level with some coarseness and compression during loud passages	Remote, 18 bit, rotary cue wheel, comprehensive display	R	61
Technics SL-P990 £450	Excellent Good	An obvious technical tour de force, with ample engineering and build quality to justify the price, but some subjective reservations nonetheless.	Track entry remote, menu display, search dial etc.		58
Technics SL-P1200 £800	Good+ + Good	Looking more like a desk workstation than a stackable component, this will appeal to the creative recordist and semi pro user. Sounded pretty good	Headphones, remote control, search dial cueing, etc		51
Toshiba XR-9318 £150	Good Fair+	A basic Philips based player perhaps but just look at the price/performance equation	Remote via system, manual, non oversampled, 16 bit	BB	64
Toshiba XR-9128 £190	Very Good Good	A well equipped Philips clone with a very good performance for the price	Remote, programmable, digital output, hdph	BB	64

CD MIDI SYSTEMS

So you want a hi-fi, but you don't want to make a fuss about it. A pre-packaged system with everything matching up and no aggravation may not rank with carefully chosen separates on **sound quality**, but there's no denying the attractiveness or popularity of this approach – the market for pre-packaged component hi-fi systems is at least as big as that for separate items, even ignoring the vast numbers of low-cost single unit stacker systems.

The arrival of compact disc led to a new fashion for shelf-standing compact systems, or 'midis' as

they are known in the trade, as a replacement for earlier floor-standing rack systems (themselves the upmarket development from music centres). Only some 330mm wide, midis can more or less match full-size (430mm) rack components for performance, and are certainly cheaper to make, ship, sell and buy.

Whereas specialist hi-fi is moving steadily towards ultra-simple 'no frills' components, midi systems tend to be sold on a feature count at a price point, usually with little opportunity for

demonstration and comparison. Our test programme includes extensive auditioning and lab testing, while making allowance for the different aspirations of designers and expectations of users. Key features valued highly by customers include system remote control, automatic switching, double 'dubbing' cassette decks, and elaborate equaliser tone controls. And the top end of the market is developing with surround sound audio/video-ready packages.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa X-55 £380	Average Average—	The turntable was slightly better than usual, the cassette deck highly limited, but the dreadful loudspeakers are the clincher	Combined cassette tuner-timer/amp, dedicated T/T speakers, & optional CD		65
Aiwa X-78 £550	Average+ Good	Good. The loudspeakers are disappointing and the turntable is excessively microphonic, but the rest of the system works well.	Auto reverse cassette/tuner/amp & timer, T/T and CD	R	65
Aiwa V1500DX £999	Good Good	Remarkable features level even includes independent record feeds to each cassette. High class build, satisfying sound, but best without loudspeakers	Separates system, twin auto-reverse cassette, full remote, timer	R	54
Akai M.50CD £550	Poor Poor	Cassette lacks Type II compatibility, general sonics mediocre or less	Devolved from M.80 but simplified, part remote		65
Akai M.80CD £800	Good Good	Good all rounder with minor ergonomic shortcomings but generally practical layout	Separates based, twin auto-reverse cassette	R	65
Goodmans 5300CDM £400	Average— Average+	Crisply styled system with gutsy amplifier and sophisticated speakers. CD player works well, other sources are variously mediocre	Combined cassette/tuner/amp, plus T/T and CD with remote	R	65
Goodmans Maxim-Midi System £520	Average Average+	De-luxe version of 5200 system – very good value for money and readily upgradeable. Sonics rough but OK and speakers good. CD crude	All separates with twin cassette	R	54
JVC Midi-W900CD £1000	Good Good+	A competent allrounder, with important convenience related features, and powerful linked recording facilities. Less strident speakers would be appreciated	Separates system, equaliser, auto-reverse cassette	R	65
Marantz MX583 £750	Below Average Poor	The system has potential in an A/V context, but is patently lacking in a purely audio one. Only the CD excels	Component system with A/V amp, no speakers		65
Marantz MX673CD System £900	Average+ Average	Tremendously flexible audio/visual system. Sound quality is satisfactory at best and ergonomics a mess	Various A/V inputs, remote, speakers optional		54
Philips F777 £850	Good Good	Excellent CD player, tuner and amplifier, offset partly by poor cassette deck and turntable	Separates system, optional remote, no speakers		65
Pioneer System 300 £1000	Very Good Very Good	Sharp, articulate and powerful system that works. The turntable is a weakness as usual, but the only real weakness in an uncommonly sophisticated package.	Remote separates system, optional multi-disc CD	R	65
Proton AI-3000 £550	Good Good	There are a host of minor problems, including no LW, but the unit is attractively packaged and can be made to sound very good despite a woolly sounding amplifier	One piece CD, cassette, tuner and amp, remote	R	65

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Sanyo System 22 £350	Average Average+	Some careful detail design has given this system sound quality out of keeping with ordinary appearance. More than the sum of its parts	Single piece, plus speakers	BB	65
Sanyo W40CD £380	Average Average	Low cost, no options package with attractive displays, cassette had high wow and flutter, but the rest worked OK	Semi auto T/T, auto record start, twin cassette	R	54
Sanyo System 33 £400	Average Average+	Similar to the 22, and better when extended, but the price (and value) advantage is dissipated	As 22, separate T/T, remote	R	65
Sharp SA-CD800H £700	Average Average-	A superficially high grade, high spec system, the SA-CD800H actually sounds clean but a little synthetic	One-piece, 6-disc CD, no T/T		54
Sony Compact 350CD £480	Average- Average-	Visually stunning appearance hides very basic audio attributes, the turntable and cassette deck suffering severe pitch related shortcomings. CD is too expensive in this company.	Integrated one piece, (ex CD), 5 disc non-cartridge player		65
Sony Compact 500CD £550	Average+ Average+	Impressive visuals are matched to electronics which in audio terms lack inspiration. The speakers are particularly poor	Combined amp/cassette, 36 preset tuner, T/T component CD		65
Sony Compact 700CD £700	Average+ Good	Loudspeakers and (to a lesser extent) turntable spoil a fine sounding and stylish - if rather costly - package	Separates system, auto reverse cassette, 36 preset tuner		65
Sony Series 1000CD £1500	Very Good Excellent	Very sharp, articulate sounding system from CD and FM. Cassette deck good and flexible, turntable as usual is not in keeping	Separates system, twin auto-reverse cassette, amp with DAC	R	65
Technics X900CD £470	Average Average-	Good build and mostly good sound is offset by mediocre amplifier and loudspeaker and some operational oddities	Main cassette/tuner/amp, separate T/T and CD		65
Technics X950 System £850	Good Good	Fine sound from CD, FM and AM radio and cassette. The record deck is a little better than normal too, but the loudspeakers are disappointing	Component based, CD, twin auto-reverse cassette, tuner, auto T/T, amp and speakers	R	65
Technics X990D System £1250	Good Very Good	Powerful, flexible and well built system - loudspeakers apart. Even the turntable is on the rough side and the loudspeakers should be changed if possible. The rest of the system is AI	Twin deck, programmable T/T, amp, CD, speakers	R	65
Toshiba V17CD £370	Average Average+	Loudspeakers are the weak link, with cassette and turntable also indifferent. Tuner and CD worked well though, so reasonable value for money	Twin cassette, semi-auto T/T	R	54
Toshiba V18CD £400	Poor Poor	Neat and simple to use basic system with good CD but poor elsewhere and abysmal loudspeakers	Integrated amp/cassette deck, other components separate but dedicated		65

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 receiving certain transmissions in the UK.

Something of a hi-fi afterthought, tuners are often selected merely to match a chosen amplifier

cosmetically. However, the task they carry out is far from simple (or cheap), combining the skills of RF (reception) and audio (signal processing) engineering. The importance of the former will depend on local reception conditions, but money invested in a high quality outside aerial system is well spent

Tuners come in two basic types. Analogue models tune gradually (and usually manually) 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.)

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Akai AT-52L £150	Very Good Very Good	Holds its own on FM against many much more expensive tuners, but AM is very poor	All bands	BB	65
Akai AT-93L £250	Good+ Good+	By AM standards presentable (good) while FM delivers the goods	All bands, aerial switch	R	65
A&R Arcam Alpha £149	Good Average+ +	Attractively classic British analogue tuner with sound quality comfortably better than most	FM/AM Analogue	BB*	50
A&R Arcam Delta £270	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
Denon TU 450L £130	Average+ Average+	Poor AM sound quality may be a deterrent but the FM performance fully merits recommendation	FM/AM Digital MW/LW	R	50
Harman Kardon TU920 £299	Good Average	Rather weak sound quality for the price despite good lab test results	16 presets, AM/FM, digital auto scan, active tracking		55
Harman Kardon Citation 23 £559	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
Hitachi FT-MD 5500 £200	Excellent Good+ +	A powerful, good sounding tuner with versatile facilities	16 presets, FM, AM, MW auto scan digital, signal meter	BB	55
Hitachi FT5500 II £200	Very Good Good+	Soundwise highly rated on FM, and on AM basically satisfactory - a versatile all-rounder	Auto and manual tuning, 16 presets	R	44
Kenwood KT-660L £130	Fairly Good Fairly Good	You get your money's worth of gadgets and the radio's basically sound although programming is complicated. AM - fairly good	Timer, clock, all bands	R	65
Kenwood KT-1100D £300	Good+ Good+	Behind a gaudy and rather useless display the radio is much better than you might first think. AM - good	Firework display FM/MW bands only	R	65
Marantz ST35L £125	Good+ Average-	It works well enough but the sound could be better for the money	16 presets, AM/FM, digital auto scan, active tracking		55
Meridian 204 £525	Good+ Good	Pleasant sounding with a fine finish but does not make the grade at this price	FM only, auto scan, digital, remote, clock timer		55
Musical Fidelity TI £300	Good+ Very Good	Top class FM stereo sound on good signal strengths from this audiophile model. Watch out for local CB!	FM only, analogue box dial, manual tune, signal meter	R	55
NAD 4020B £139	Good Average+	Not the quietest or most sensitive tuner tested, it still provided good sound for the money, being "musical and ambient"	Analogue FM/AM	BB	50
Naim NAT 01 £1098	Very Good Very Good	There may be better sounding tuners in the world, but we have yet to hear one	No presets. Two box, flywheel tuning FM only, Analogue	R	50
Nakamichi ST-7E £750	Good+ + Good+	Exceptionally good for weak-signal areas, and good all round	16 AM/FM presets, Schotz enhanced sensitivity, auto time digital		55
Pioneer F551L £100	Good+ Good+	High value budget tuner, very little to argue about (includes long wave)	12 FM, 12 AM presets, auto scan, digital and signal strength meter	BB	55
Pioneer FT 443L £130	Poor Poor	The pretentious "computer controlled" features don't amount to much. AM - very poor	All bands		65
Pioneer F-737 £230	Good+ Good+	Terrific separation and selectivity on FM, but AM still lacking. AM - fair	FM/MW only	R	65
Pioneer F91 £350	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

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TUNERS					
NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Proton AT-300 £199	Good Good	The AT-300 is pretty on the outside, orthodox on the inside and rather dear. AM – poor	FM/MW only	R	65
Quad FM4 £289	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 £918	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-830AL £110	Good+ Good	Fine sounding budget audiophile material, no frills, no fuss	Manual dial analogue, FM, MW, LW	BB	55
Rotel RT-850AL £160	Good+ Good+	Scoring well on listening tests and one of the best sounding tuners at its price level, it was a bit let down on AM but RF performance was good	FM/AM, digital	BB	50
SAE T-102 £449	Good+ Good+	Expensive for all the radio you get, but sounds interesting. AM – Poor	FM/MW only	R	65
Sansui TU-D99XL £249	Very Good Good+	This slimline compact model gave good FM sound quality and strong RF performance. But the AM sounded unpleasant	FM/AM, 16 presets	R	50
Sony ST-S300L/ ST-S100L £140/£100	Good Good	A reasonable entry point, not for difficult areas. AM – Poor	All bands	R	65
Sony ST 500ES £200	Good+ + Average –	Disappointing sound quality but good lab performance. (Includes long wave)	10 AM/FM presets, auto scan digital		55
Sony ST-S 700ES £299	Very Good Very Good	First class in every respect including FM sound quality. Even AM was well above average	FM/AM, 10 presets, digital scan	BB	60
Yamaha TX-L 400 £130	Good+ + Good+	Good FM sound, let down by poor AM but otherwise good value	16 presets, auto scan, digital, FM, MW, LW	BB	55
Yamaha TX-500 £150	Average+ Average	Under a gaudy coat, this sensitive tuner gave reasonable stereo results. However, the AM had again been thrown down a well	20 presets (10 buttons) digital		50

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 via a

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 and irritate 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 or ears. 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.

NAME PRICE	SOUND COMFORT	COMMENTS	TYPE	VALUE	BACK ISSUE FULL REVIEW
Aiwa HP-X8 £49	Good Very Good	Very slick Walkman oriented phones which are tonally well balanced and go loud without becoming painful	Supra-aural, closed-back, dynamic	R	63
Aiwa HPEX-200 £90	Good Good	Modern looking and well finished the Excelsas, as they are dubbed, had meaty bass and sounded reasonably open for the type	Circumaural, closed-back, dynamic		63
AKG K135 £35	Fair Poor	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 K240 Monitor £60	Good Very 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 £110	Very Good 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
Audio Technica ATH 909 £55	Average Average	Quite impressive in the treble though a bit bass shy, the 909s worked well at high levels	Circumaural, semi-open, dynamic		55
Audio Technica ATH 910 £65	Good Average	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 £75	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 £30	Fair Very Good	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 £45	Poor Good	Not the most revealing 'phones encountered, the 330s were nevertheless enjoyable and rarely offended	Circumaural, semi-open, dynamic		55
Beyer DT550 £69	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 £90	Good Good	Well made cans with a warmish sound but fairly solid midrange, though they're not that informative for the price	Circumaural, semi-open, dynamic		63
Beyer DT990 £119	Very Good Very Good	The 990s are definitely a significant pair of dynamic headphones; they have a smooth and yet revealing, neutral sound that is hard to criticise.	Circumaural, open-back, dynamic	R	55
Jecklin Float Model One £79	Very Good 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	Very Good 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
Jecklin Float Electrostatic £399	Excellent Good	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
Koss K/GX Plus £30	Poor Fair	'Sixties-style' phones from the good ole US of A, their sonic style is unique and can make a system sound quite different	Supra-aural, closed-backed, dynamic		63
Quart Phone 30 £40	Fair Good	Whilst not as seductive as their PMB25 predecessor the 30s are reasonably neutral and do improve on some of the competition – though not stunning	Circumaural, semi-open, dynamic		63
Quart PMB 25II £40	Good Good	Despite a somewhat unconventional suspension system the 25s put in a convincing and enjoyable performance with warm yet lively balance	Circumaural, open-back, dynamic	BB	55
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 PMB 65 £70	Good Good	Quite revealing and neutral albeit with the usual closed back sound, this competes well with more established models	Circumaural, closed-back, dynamic	R	55
Quart PMB 85 £90	Very Good Fair	These more expensive Quarts bear a striking resemblance to the Jecklin Float models and use two drivers per ear. Sound is a bit bass heavy but not bad overall	Circumaural, open-backed, dynamic		63
Ross RE-2760 £35	Fair Poor	Stylish white cans from the only British firm in the business. Unfortunately sound quality is not up to par in this price range	Supra-aural, closed-back, dynamic		63

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HEADPHONES

NAME PRICE	SOUND COMFORT	COMMENTS	TYPE	VALUE	BACK ISSUE FULL REVIEW
Sennheiser HD30 £13.50	Poor Good	Built specifically for the personal stereo market these small and light Sennheisers have a slightly synthetic sound, but are an upgrade on the average Walkphones	Supra-aural, semi-open back, dynamic		55
Sennheiser HD450 £27	Fair Good	Modern, simple and lightweight phones that are remarkably robust and which turned in a relaxed if weighty performance that was at worst pleasant	Supra-aural, semi-open, dynamic	R	63
Sennheiser HD480 £37	Fair Good	Using the same shell as the 450s, the 480s were a little softened and unrevealing by comparison with their competitors	Supra-aural, semi-open, dynamic		63
Sennheiser HD420SL £47	Good Good	The 420s gave a full and tangible quality to instruments and voices; whilst not the most revealing headphones around they would suit slightly brash sources	Supra-aural, open-back, dynamic		55
Sennheiser HD540 Ref Gold £160	Very Good 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
Sony MDR V3 £30	Good Fair	Portable stereo oriented phones that are very nicely made and combine clarity with a pleasant lack of distortion	Supra-aural, closed-back, dynamic	BB	63
Sony MDR V6 £70	Good Very Good	A lot more civilised and dynamic than the V4s, these were pretty good for their type and fold up to boot	Circumaural, closed-back, dynamic	R	55
Sony MDR V7 £70	Very Good Very Good	Classy sounding cans that are very slick and work well with all types of music, setting the standard in their price range	Circumaural, closed-back, dynamic	R	63
Stax SR34 £140	Very Good Fair	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
Stax Gamma pro/SRD-X pro £296/£230	Excellent Very Good	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 SR Gamma £299 (inc. SRD-6 Adaptor at £100)	Very Good Very Good	The next model down the Stax range from the Lambda, the Gamma is an excellent headphone with little to criticise but the price.	Circumaural, open-back, electrostatic	R	55
Stax SR Lambda Pro £545 (inc. SRD-7SB Mk 2 Adaptor at £185)	Excellent 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

PERSONAL STEREO

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 Discmen going for £300.

Despite their diminutive size personals attempt to incorporate as many gimmicks and features as

possible, cassette players often incorporating tuners, graphic equalisers and Dolby noise reduction. CD players are still relatively expensive and don't tend to vary that much on the features front, rather the amount and quality of accessories differs. Most models come with a mains adaptor and some include 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. 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 NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa HS-G35 MkII £30	Poor Fair	A reasonable player for the price but not well suited to classical material and let down by the headphones	Autoreverse, graphic EQ, types I & II		56
Aiwa HS-J36 £89	Good— Average	Comprehensive facilities and reasonable sound are no mean feat for the price.	Dolby, autoreverse, types I, II & IV, AM/FM, recorder	R	56
Aiwa HS-PX101 £149	Average— Good	A very slick little number with soft touch controls and remote control headphones	Dolby B, C, autoreverse, types I, II & IV	R	56
Ferguson 3T46 £35	Very Poor Poor	Not particularly subtle but having reasonable speed constancy, it's OK with most material but can get painful	Autoreverse, AM/FM		56
Philips D6658 £30	Very Poor Poor	The low price limits sound quality, and this is not a spectacular machine, but it does a reasonable job nonetheless	Graphic EQ, AM/FM		56
Saisho PS90R £40	Poor Poor	A bit of a jumble of features and gadgets, the PS90R has on-board speakers, an extending aerial and even records, but sound quality is dubious	Graphic EQ, types I, II & IV, AM/FM, recorder		56
Sanyo MGR-77 £35	Very Poor Very Poor	Rather a basic machine with a raw edgy sound, not helped by poor speed stability	Graphic EQ, AM/FM		56
Sanyo MGR-87 £50	Very Poor Fair	The 87 came up with a slightly fast but rhythmic sound. Although lacking in finesse, it worked OK with pop material	Autoreverse, graphic EQ, AM/FM		56
Sanyo MGP 6000 £50	Average + Average—	With styling aimed at the fairer sex the 6000 sounded a little better than the similarly priced MGR-87. Lacking in clarity, it was still quite endurable	Dolby, autoreverse, graphic EQ, types I, II & IV		56
Sanyo JJ-P4 £100	Poor Good	Claimed by its makers to be the world's smallest personal stereo the JJ-P4 is a tasty looking object that's capable of good sounds to boot	Dolby, autoreverse, tape types I, II & IV, rechargeable		56
Sony WM-34 £40	Poor Average	This straightforward no frills Walkman makes pretty plausible sounds at a reasonable price and apart from the Walkman Pro was the only model to earn a Best Buy rating	Dolby, types I, II & IV	BB	56
Sony WM-F63 £100	Average— Average—	This attractive Sports Walkman is nicely built but sonically flawed by rather hissy intra-aural headphones	Dolby, autoreverse, types I, II & IV		56
Sony Walkman Pro £249-£289	Good + Excellent	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
Toshiba KT-4027 £35	Very Poor Very Poor	Not a very wonderful machine, the 4027 sounded pretty appalling with all but the most unsubtle music	Graphic EQ, AM/FM		56
Toshiba KT-4047 £60	Average Average	This model proved capable of making the most of better recordings, and sounds reasonably tuneful	Dolby, autoreverse, graphic EQ, types I & II, AM/FM	R	56

PERSONAL CDS

MODEL NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Goodmans GCD-10 £120	Average— Poor	Cheap, flashy and not short on accessories the GCD-10 is a rather noisy player that left a lot to be desired on the sound quality front	13.5 x 3.7 x 18cm, 478g, mains adaptor		66

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PERSONAL CDs

MODEL NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Kenwood DPC-77 £270	Good+ Very Good	Very chunky and well made, the DPC-77 is the only player to include a digital output and sounds very good through its analogue output – a suitable domestic alternative	12.8 x 3.5 x 14.5cm, 750g, digital output, mains & in-car adaptors	R	66
Philips D6800 £130	Average Average-	A competitively priced and reasonably attractive looking player whose sonic performance is somewhat marred by a rather grainy top end	13 x 4 x 17.5cm, 516g, 3" ready, twin hdph sockets		66
Sanyo CP-12 £260	Fair Good+	Sonically amongst the more enjoyable personal CD players and capable of revealing the musical aspects of a disc in an interesting and entertaining fashion	12.5 x 2 x 12.7cm, 380g, wired remote, mains adaptor	R	66
Sony D-20 £150	Average+ Fair	Not bad for a machine at this price, it's nicely designed and reasonably robust, with reasonable sound quality	13.8 x 3.8 x 15cm, 450g, mains adaptor	R	66
Sony D-40 £200	Fair Good	A 'largish' but attractive player that works well as a Discman being fairly immune to shock and capable of making a good job of reproducing the discs it's given	13.6 x 3.7 x 14.7cm, 480g, mains adaptor, slinky case	R	66
Sony D-88 £300	Average- Fair+	A stylish and 'cutish' object, the D-88 is very small and has an adjustable disc drive for three and five inch discs. Sound quality doesn't quite match appearance	9.4 x 3 x 9.8cm, 300g, 3" ready, mains adaptor, no line out		66
Sony D-150 £300	Fair+ Very Good	One of the most enjoyable machines encountered, sounding informative and sweet and looking very tasty to boot. Comes complete with a tough carrying case	12.6 x 2.1 x 13.5cm, 420g, 3" ready, mains adaptor	R	66
Toshiba XR-9458 £250	Average+ Good-	Accompanied by a plethora of accessories including a meaty plinth and infra red remote, the Toshiba didn't quite make it on the sound quality front but is worth considering	12.6 x 2.4 x 12.9cm, 460g, 2 remotes, mains adaptor, 3" ready etc		66
Xenon CDP-03 £180	Average- Fair+	A well made and competitively priced machine that is ergonomically spoiled by flat slightly unresponsive buttons. Sound quality ain't too bad but a trifle boring	12.6 x 2.7 x 12.6cm, 560g, high frequency filter, key lock		66

CD PORTABLES

CD Portables or Yuppie Blasters as we classified them are basically portable stereos gone digital, ie a compact disc player is included alongside the usual AM/FM radio and single or double cassette deck. Compact disc is a novelty that seems to add a fairly hefty premium onto the price of the standard ghetto blaster, but the improved sound quality over standard cassettes may justify this for some. In virtually every case a CD output socket is

fitted which means that it's possible to play silver discs through a domestic amplifier and loudspeakers, thus they are some sort of substitute for standalone mains machines (as are the personal CD players). One drawback with having a CD player on board is that batteries are gobbled up even quicker than usual, up to ten batteries being required in some cases. Neither are the units particularly light, the heaviest weighing eight kilos!

However they do all run off the mains too, and come with an appropriate lead for this purpose. Other useful features common to most are spare input sockets to record from an external line source such as a preamplified vinyl disc signal, and microphone sockets for recording live events (although the usual lack of record level adjustment is a nuisance).

MODEL PRICE	SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Ferguson RCD02 £300	Poor	A large, slightly tinny midi system-esque unit with removable speakers and a slightly brash sounding CD player	Twin cassette, graphic equaliser, spare input (DIN)		53
Fisher PH-D473F £300	Average	The Fisher is quite a neat and compact player which is nice to use but doesn't offer particularly great sound quality	Autoreverse, AFC		53
Hitachi CX-W800 £300	Average+	This meaty Hitachi lives up to Blaster expectations, its super woofer bass speaker giving maximum street credibility	Twin cassette, graphic equaliser, phono input	R	53
Memorex CD-3300 £280	Average	A little bit tacky, the Memorex put in a plausible if unenthalling performance, and will work with external speakers	Spare input		53
Panasonic RX-FD80L £300	Average-	Shiny in a glitzy way, this Panasonic features a reasonable cassette deck but a below par CD player with tiny transport controls	Autoreverse, spare input		53
Sharp WQ-CD15 £250	Good	A reasonably compact machine with a quite impressive CD player and a novel twin cassette mechanism	Twin cassette, graphic equaliser, spare input	R	53
Sony CFD-66L £350	Good	A very attractive player in the true yuppie mould of white plastic with silver details, it even sounds OK	Spare input, shuffle play, AMS (tape search system)	R	53
Toshiba RT-7096 £250	Poor	Quite a large box for the money, the Toshiba isn't too special when it comes to sound quality but does have partly wooden detachable speakers	Twin cassette, graphic equaliser, spare input		53

STANDS AND 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 speaker 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.

LOUDSPEAKER STANDS

MODEL PRICE	TYPE FINISH	COMMENTS	TOP PLATE SIZE HEIGHT	VALUE	BACK ISSUE FULL REVIEW
Appolo A820 £40	4 leg Fair	A light open-framed budget design slightly lacking in rigidity and subjectively superceded by other stands costing £10 more.	19 x 19cm 53cm		58
Appolo A10 £47.25	4 leg Fair	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
Foundation Fred £65	2 leg Average	With sand filling the Freds made speakers sound tight and coherent with a more even balance.	19 x 19cm 36/43/59cm		58
Foundation Maggi £159	Pair Very Good	Made for Magnepanar 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 £250	2 leg Very Good	Overpriced in material terms the Pi nevertheless has a very positive effect on the low frequency performance of conventional speakers.	20 x 20cm 25/38/46/53cm	R	58
Heybrook Point 5 £50	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
Heybrook HBS1 £75	4 leg Very Good	With its new aluminium base frame the HBS1 fared very well in the listening tests. It allowed much of the speakers own 'sound' to remain intact.	23 x 21cm 47cm	R	58
Linn Kan II £79	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

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LOUDSPEAKER STANDS

MODEL PRICE	TYPE FINISH	COMMENTS	TOP PLATE SIZE HEIGHT	VALUE	BACK ISSUE FULL REVIEW
Linn Sara £85	4 leg Very Good	The Sara exhibits some odd properties so its use other than with the Sara loudspeaker should be viewed with caution.	25 x 21cm 53cm		58
Monotrak Engineering M1 £58	1 leg Good	The M1 gave the mid and treble a commendably smooth and detailed presentation but bass sounded rather lacklustre and muddy.	19 x 18.5cm 48cm		58
Monotrak Engineering M4 £58	4 leg Very Good	Begging comparison with Heybrook's HBS1 the M4 maintained much of the openness and forthright detail of that model.	23 x 21.5cm 53cm	R	58
Monotrak Engineering M4S £58	4 leg Very Good	Its stature and stability would seem to mark it out as most suitable for smaller, lighter cabinets. The M4S possessed an open midband and clear treble.	20 x 17.5cm 53cm		58
Mordaunt-Short IS1 II £45	3 leg Good	Suited to low mass speakers, preferably using spikes to effect coupling, they sounded slightly 'jazzed up' but the overall sound was quite unuddled.	18 x 15cm 56cm	R	58
Origin Live £117	3 leg Good	An unusual tripod stand devoid of top plate and taking up more floor space than normal, subjective and technical performance was exemplary.	(support area) 22 x 17.5cm 52cm	R	58
Partington PP4 £50	1 leg Good	The PP4 offers a rather mixed performance, though when damped with sand infill it was less ready to embellish the overall sound and low frequencies became tauter and quicker.	18 x 16.5cm 48cm		58
Partington Oreadnought II £120 (filled)	1 leg Very Good	Ideal for systems on the light/bright side of neutral, the Oreadnought IIs nevertheless still need some careful re-examination by Partington.	17.5 x 16.5cm 63cm		58
QED TS22 Tristand £50	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
RATA Torlyte £190	2 panel Excellent	Suited to low mass speakers, these unusual stands are hardly discreet but offer transparent and clean sound – much like the Torlyte table!	25 x 21cm 48cm	R	58
Target HS20 £53	1 leg Excellent	This monopod stand can be used either filled or unfilled and encourages different characteristics in the sound accordingly.	19 x 16.5cm 53cm		58
Target HJ15/3 £83	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

EQUIPMENT SUPPORTS

MODEL PRICE	TYPE FINISH	COMMENTS	SIZE (H x W x D)	VALUE	BACK ISSUE FULL REVIEW
Audioquest Sorbothane Feet £10 each	Feet Good	These large gumdrops are very useful for damping vibrations in amplifiers and especially CD players.	6.5 x 2.5cm (circular)	R	57
Cornflake TCS5 £50	Table Very Good	A little too close to the ground for comfort, perhaps, but this novel and stylish little table is certainly worth seeking out.	29 x 43 x 33cm	R	57
Cornflake TCS6 £50	Shelf Good	A squat and rigid frame supports a Medite top board with four adjustable spikes, better suited to suspended sub-chassis turntables.	43 x 23 x 33cm		57
Deltac Isolation Base £135	Platform Good	Designed for all CD players, amplifiers and separates, but not suspended sub-chassis turntables, the isolation is second to none.	50.5 x 40cm	R	57
RATA Model A £125	Table Very Good	A three-legged Torlyte turntable support that has become something of an industry reference.	46 x 46.5 x 38.5cm	R	57
RATA Amplat £40.25	Platform Very Good	A lightweight and rigid Torlyte slat with spikes for floor or shelf mounting, it works well in conjunction with the Target TT2.	4 x 44.5 x 35cm		57
Sound Organisation Table £55	Table Very Good	A deceptively simple structure that just happens to be engineered in a thoughtful, and ultimately successful manner.	37 x 45 x 35cm	BB	57
Sound Organisation Wall Stand £40	Shelf Very Good	The first of its ilk and still amongst the best, this simple framework represents a vast improvement over standard furniture shelves.	27.5 x 43 x 35cm	BB	57
Target TT1 £46.50	Shelf Excellent	This rigidly braced shelf offers both good sound quality and material value for money.	26 x 46.5 x 35.5cm	BB	57
Target TT2 £47.50	Table Very Good	Standing up to the best in most areas, the TT2's only real foible concerns a slight loss of bass 'slam'.	52 x 46.5 x 35.5cm	BB	57
Townshend Suspension Base £145	Platform Fair	Designed to complement the Rock turntable, this platform will bring subjective improvement to a wide range of electronics.	43 x 36cm	R	57

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 the quality of that

signal.

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.

The features column contains information on the material make-up of the different cables with the following abbreviations: OFC – oxygen free copper, OFHC – oxygen free high conductivity (Audionote define the HC as high crystal), PC-OCC – pure copper by ohno continuous casting, LC-OFC – linear crystal oxygen free copper.

INTERCONNECT CABLES

MODEL PRICE (per metre)	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Apature LSD N/A in UK	Poor Fair	Faint resonant boom was audible at very low frequencies, but otherwise this cable sounded remarkably neutral.	Silver plated copper, PTFE dielectric		59
Audioquest Reference 2 £29	Good Fair	Ultimately Reference 2 simply damped much of the atmosphere and emotional charge of a musical performance.	OF copper		59
Audioquest Livewire Topaz £29	Good Fair	Sounding 'bigger' and faintly richer than Reference 2, Topaz was also slightly grainy at the top end.	Gold-plated plugs, OFHC copper		59
Audioquest Livewire Ruby £45	Fair 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 Quartz £65	Good Good	Quartz has an ideal, neutral balance that embodies sparkling clarity without the drawbacks of harshness or compression.	3 piece plugs, PTFE dielectric	R	59
Audio Technica AT6115 £50	Very Good Fair	This cable sounds somewhat 'quieter' than the original LC-OFC interconnect, but is also less transparent and three dimensional.	PC-OCC copper coaxial		59

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INTERCONNECT CABLES

MODEL PRICE (per metre)	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Audionote Copper ANC £35	Fair 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
Audionote Flexible Silver ANS £85	Fair 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
Audionote Silver ANV £140	Poor Fair	Far weightier-sounding than the flexible ANS, ANV interconnect also possesses a fair degree of treble clarity and sparkle.	21 strand silver Litz		59
Aural Symphonics N/A in UK	Poor Good	This cable enjoyed an open and transparent midband and sounded remarkably neutral and faithful to the source.	OF copper PTFE dielectric	R	59
Budget Patch Cords see text	Fair Poor	As thrown in gratis with cassette decks and the like - frequency extremes were restricted and performances were veiled.	Thin coaxial		59
Budget OFC circa £7	Fair Fair	Subjectively, this cable did lift much of the aural fog experienced with scrawny standard hook-up leads.	OFC		59
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
Deltec Black Slink £152	Excellent Excellent	Inherently neutral the cable faithfully reproduced broad and deep stereo soundstages with precise focus and a sense of tactility.	8 silver plated OFC strands PTFE dielectric	R	59
Denon LC-OFN N/A separately	Very Good Fair	Supplied with Denon's dealer CD players this cable introduced a peculiar 'twangy' coloration at high frequencies, and a slightly soft bass.	LC-OFN, non-magnetic gold plated plugs		59
DNM Solid-core £15-£25	Fair Good	Transparent in the midband and full of sparkling detail in the treble, low bass was slightly curtailed (unterminated price £4.60 per m)	Single strand nickel-plated copper. Unshielded	R	59
Kimber Kable PSB £32	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
Kimber Kable KC-1 £47	Very Good Fair	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 KC-AG £375	Good Very Good	Treble detail resolution was perceived in a slightly abrupt if wholly controlled fashion. Depth re-creation and lateral separation were excellent.	Multi-gauge silver, PTFE dielectric	R	59
MDM Interconnect £14.95	Good Fair	The subjective performance of MDM did appear a little imprecise at the frequency extremes, but a worthwhile upgrade on budget interconnect.	Coaxial, solid core, gold plated plugs		59
MIT PC-Squared £75	Fair Good	This multi-gauge cable produced a very open and buoyant midband but sounded slightly 'peculiar' at frequency extremes.	OFC, multi-gauge	R	59
MIT Spectral MI330 £193	Poor Fair	MI330 displays a marvellously open and enticing midband quality, bass is warm and rich but this character has a tendency to dominate.	Multi-gauge balanced bandwidth		59
Monitor PC 0100381 £17	Good Fair	There is more than a hint of instrumental muddling and bass is slightly soft, however, the slightly 'shut-in' sound is par for the course at the price.	OFC, coaxial	R	59
Monster Interlink 400 £30	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
Monster Interlink CD £44	Fair Fair	Low frequency is commendably weighty, but the top-end sounds vague and lacking in image focus. Suited to some systems better than others.	Multi-gauge		59
Monster Interlink Reference £88	Good Fair	Protracted listening indicated a lack of dynamic speed - a subjective sluggishness. It may prove well suited to up-front systems.	Multi-gauge Balanced bandwidth Gold plated plugs		59
Myst Tm £15.60	Fair Good	Fairly neutral with a pleasantly open and transparent midband. Some deep bass detail is lost but treble is sharply focused.	Solid-silver PTFE dielectric	BB	59
Origin Live Soli-Core Super £60	Good Fair	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 P1-Gold £14.95	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
QED Incon Graphite GPI Gold £18.95	Fair Fair	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
Sony RK-C310ES £40	Excellent Good	Possessing deep firm bass and a sparkling top end it offers a balanced perspective with negligible coloration.	Coaxial LC-OFN	R	59
Sterling £250	Fair Good	Possessing a neutral if faintly rich overall balance it supplies a pleasantly open and transparent perspective. (Reviewed in pre-production form.)	2 silver strands per conductor		59
Thorens SAC 100 £50	Good Fair	Performance is undermined by a slightly coarse and splashy treble, not necessarily bright, simply rather confused - and fine detail lacks resolution.	Silver-plated OFN, coaxial		59
Van den Hul MC-D300II £59	Poor Good	It tended to highlight some upper mid detail, but a generally open and spacious acoustic proved its saving grace. Slightly soft at LF.	Silver plated single strand VdH plugs	R	59
Van den Hul MC-1021II £69	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 MC-D502 £77	Fair Fair	The tonal balance was 'tilted' by a strong and authoritative bass line, which had the knock-on effect of muting treble detail. A bit dear.	Twin axial silver plated copper, teflon dielectric		59
Van den Hul Thunderline £147	Good Fair	Thunderline essentially parallels the sonic performance of the cheaper D102. HF is occasionally tainted by a 'tizzy' coarseness, bass is tight and dry.	Silver plated 'matched copper'		59
Van den Hul MC-Gold £247	Fair 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 £747	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
Vecteur 8045 £49	Very Good Good	Sounding solid and forthright it might seem slightly cold in some systems but the treble 'edge' is mercifully clean. Very low frequencies were a little lacking in 'slam'.	LC-OFN signal & screen	R	59

LOUDSPEAKER CABLES

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Absolute Wire Force 4 £4.50 per metre	Good Fair+	By current standards there was a loss of fine, sharp detail at the frequency extremes, but it has a big and friendly sound.	744 OFN strands, PVC dielectric		64
Audionote OR-200 £16 per metre	Fair+ Fair+	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
Audionote AN-SP £100 per metre	Average— Good	A clean and open sounding cable that offered a deep and pleasantly detailed perspective. Bass was slightly restricted, but seemed tight and coherent nonetheless.	15 silver strands, polyethylene dielectric		64
Audioquest BC-4 £2 per metre	Average+ Good+	There was a slowing of fast transient edges to contend with but in general BC-4 offered a delightful clarity and sparkle throughout the highest octaves.	4 OFN strands, PVC dielectric	BB	64

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THE DIRECTORY

LOUDSPEAKER CABLES

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Audioquest Livewire Black £15 p metre	Good Good	It proved clear and punchy but with some grain across the treble. Nevertheless Black remains an interesting concept and proved better than Livewire Green	OFHC, surface only – foam core construction	R	64
Audioquest Livewire Green £30 per metre	Good Fair+	Green proved more overtly dynamic and forward than BC-4 with simple music, but complex passages tended towards a mushy and ill-defined perspective. FCL – functionally crystal less	FCL, surface only – foam core construction		64
Audio Technica AT6120 £95 – 10m	Fair+ Fair	Compared to earlier LC-0FC cables this PC-0CC derivative sounded smoother and less aggressive	PC-0CC, PVC dielectric		64
Bellwire 12p per metre	Poor Average—	Broadly speaking it delivered a bright and fizzy sounding treble with a fairly open and detailed mid with little or no bass resolution	0.5mm single strand, PVC dielectric		64
Deltec 8S £144 – 5m pair	Good Good+	The unerring transparency and detail resolution of 8S throughout the midband makes it a far cleaner and more spacious sounding cable than others at the price	4 silver plated OF copper strands, PTFE	R	64
Deltec Black Sixteen £456 – 4.5m pair	Very Good Excellent	Bass was deep and rhythmically secure, the mid tonally pure and free of additional sibilance while the treble was both relaxed, sweet and highly detailed	16 silver plated OF copper strands, PTFE dielectric	R	64
DNM Solid core £2.30 per metre	Average Fair	DNM cable seems too unbalanced for general consumption but excellent results have been obtained in sympathetic systems	0.54mm single strand, webbed PVC dielectric	R	64
Exposure £2 per metre	Good Good	It could sound a trifle matter of fact but this emotive flattening was also somewhat dependent on the music program. It is also highly suited to long runs	56 OFC strands, webbed PVC dielectric	R	64
Kimber Kable 4PR £49.45 – 5m pair	Fair Fair+	This directionally marked cable benefitted from an open and airy treble quality but seemed notably leaner than 4TC. Bass was well round and satisfyingly taut	4 x 7 copper strands per conductor, PVC dielectric		64
Kimber Kable 4TC £16 per metre	Good Good+	4TC made a great impression in the listening tests with an open midband, a smooth and unfatiguing treble with slightly rich but suitably weighty bass	OF copper, PTFE dielectric	R	64
Linn K20 £2 per metre	Good Fair	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
Marantz ML-55S £24.90 – 10m	Fair Fair	Subjectively this cable offered a loose and splashy treble which, though not overtly bright, did compromise both tonal and timbral accuracy	30 OFC strands, 3 conductors PVC dielectric		64
Mission Cyrus £2.50 metre	Average+ Good	Because of its impedance characteristic this cable will deliver a smooth and unfatiguing treble balance with loudspeakers offering an easy load	0.8mm single strand, PVC dielectric	BB	64
Monitor PC Silverline PC4 £5.75 metre	Good Average	Sonically it laboured under a heavy and claustrophobic balance, lacking the see through transparency and lucidity of the better solid core cables	2072 x 0.07mm silver plated copper strands		64
Monster Superflex £2.50 per metre	Fair+ Fair+	Treble detail was both reserved and confused though there was little in the way of harshness and grain. Deep bass notes were also found to be lacking	OFC, multistrand, Duralflex dielectric		64
Monster Original £4 per metre	Good Fair+	Original sounded relatively congested and murky at higher frequencies but possessed weight and conviction in the bass	Multistrand		64
Monster Powerline 2 £12 metre	Good Good—	Powerline stamped its own hallmark on the sound with a strong taut bass and an essentially clear midband giving tactile stereo images	Multistrand, helical construction		64
Musical Fidelity Lifeline £11.50 metre	Fair Good—	Lifeline did demonstrate a strong directional inclination, affording a laid back but fairly neutral balance when correctly oriented	4 x 0.8mm PC-0CC strands	R	64
Naim NAC-A4 £2.25 per metre	Good Fair+	Tinged with brightness while the deep bass response seemed both over heavy and poorly integrated compared to the immediate competition	Multistrand, webbed PVC dielectric		64
NVA £6 per metre	Average+ Good	A light and breezy sounding cable best suited to short lengths, NVA benefitted from a clear and transparent outlook	7 x 0.25mm silver alloy strands, PTFE	R	64
Origin Live Soli-Core Ordinary £1.80 per metre	Good Fair+	Subjectively it bettered the performance of the costlier Super version, affording a pleasantly detailed and spacious soundstage with firm bass but slightly coarse treble	1.8mm and 0.5mm single strands	R	64
QED 79-Strand 90p per metre	Good Fair	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 Incon Graphite £1.75 per metre	Fair+ Fair+	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
QED Flat 200 £1.95 per metre	Good Good	I detected a degree of confusion at low frequencies but this did not stifle the acoustic atmosphere which remained open and positive	200 strands, flat webbed PVC dielectric	R	64
Rotel Supra 4 £2.49 per metre	Good+ Good	Ideal for both long and short runs, it furnishes a big sound that benefits further from a smooth, unfatiguing treble	1,036 OFC strands, webbed PVC dielectric	R	64
Rotel Supra 10 £6.49 per metre	Good+ Good	Supra 10 provided a very free and open sound that was unhindered by any excess at low frequencies. Worth its weight in scrap copper!	2,562 OFC strands, webbed PVC dielectric	R	64
Sony RK-S5ES £59.95 – 5m	Fair+ Fair+	The sound of this cable was also somewhat controlled and over damped. The treble was relatively free and airy but lower octaves, including the midband, were constrained	350 x 0.08mm OFC strands, heat shrink dielectric		64

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LOUDSPEAKER CABLES

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Solid core mains cable 36p per metre	Fair+ Good	It enjoys much of the smooth treble and articulate midrange usually associated with the better solid core derivatives. Lean but taut and rhythmically coherent	1.5mm square, 3 cores, PVC dielectric	BB	64
Sterling £499 - 5m pair	Fair Fair	This pre-production sample possessed a strangely muddled and reserved sound quality. It suffered from a progressive instrument modulation that totally confused more complex orchestral passages	Pure Silver, PTFE dielectric		64
Townshend Isolda £400 - 5m pair	Fair+ Good	Isolda possessed a truly dark background out of which rose a very solid and extended bass together with an excellent sense of transparency through the upper octaves	8 coax cables per conductor - very thick	R	64
van den Hul CS-122 £5.50 per metre	Fair+ Good-	Characterised by a driving and powerful bass, CS-122 proved to be 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, webbed rubberised dielectric	R	64
van den Hul CS-352 £12.95 per metre	Good Fair+	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 dielectric		64
van den Hul SCS-12 £29.95 per linear metre	Good+ Good+	SCS-12 set a high standard with a tight and well focused soundstage populated with tactile stereo images. Bass wasn't as extended or resolved as some other cables	19 silver plated strands of 12 different gauges, PTFE dielectric	R	64
van den Hul SCS-2 £99.95 per linear metre	Good+ Good+	Overall it was commendably neutral and transparent but nothing less would be acceptable bearing in mind the tremendous cost of a stereo pair	665 silver plated matched crystal copper strands, PTFE dielectric	R	64
Vecteur R-CV30 £4.99 per metre	Fair Good	Subjectively the better of Vecteur's three-strong cable line-up offering a neutral overall perspective but with a slight loss of detail resolution at both frequency extremes	4 x 0.8mm LC-0FC PTFE insulated strands	BB	64
Vecteur S-CV90 £199 - 5m pair	Fair+ Fair+	It seemed both less transparent and integrated throughout the midband than R-CV30, though both frequency extremes were spruced up with a tighter sharper delivery	6 x 0.7mm LC-0FC strands		64

IN-CAR ENTERTAINMENT

In-car entertainment is an area not usually associated with the esoteric world of domestic hi-fi. However, it represents a source of musical entertainment that many of us are exposed to every day. The majority of new cars are fitted with some form of radio before they leave the showroom and in many cases this usually very basic player is taken for granted and accepted as representative of in-car audio standards.

For the price of a budget amplifier or more, there is a wide variety of in-car machines to choose from,

including cassette, CD and even DAT players. The majority of sub £300 players are integrated units featuring a cassette player, AM/FM tuner and amplifier, all in one remarkably compact standard sized box. At this price level the cassette players tend to be fairly basic affairs, although autoreverse and noise reduction systems are both fairly common. Tuners are usually of the digital variety with varying degrees of sophistication in signal tuning and presetting, with some machines featuring as many as 18 FM presets. The emphasis is on the frequency

modulated band and AM often suffers as a consequence, but fortunately for radio enthusiasts there are some exceptions.

The amplifier is usually designed to drive two pairs of speakers mounted fore and aft of the vehicle, and a fader is fitted to adjust the balance between the two. The dearer machines feature separate bass and treble controls which can be quite handy given the unusual acoustic of the car environment and the variety in balance and presentation to be had from car speakers.

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Alpine 7282L £250	Good Very Good	A very attractive and seductive sounding player. The matt surfaced transparent preset keys are especially sexy	Bass/treble controls, 12 FM 6 AM presets, chrome eq., clock, 8W	R	61
Alpine 7905M/3539 £650/£350	Excellent Excellent	An easy to use and attractive CD/tuner, partnered with a powerful and flexible amplifier to give an effortless source of in-car entertainment	Bass/treble controls, 12 FM, 12 AM presets, slide-out, 150W	R	68
Aiwa CT-Z3500YL £199	Fair Fair	A nicely designed machine with a flip up lid for disguise purposes. Sound quality from cassette is a bit poor but the radio is exemplary especially on AM	Bass/Treble controls, 6 FM, 12 AM presets, Dolby, chrome eq., 8.4W	R	62
Blaupunkt Paris SQM 48 £253	Average Average	A powerful and sensibly designed player but let down by a very dull sounding cassette. The radio is a bit better	Bass/treble controls, 5 FM, 10 AM presets, uni-directional, 11.5W		62
Blaupunkt Windsor SQR 38 £275	Good Average	Not very enthralling sonically, the Windsor is rather low powered but does have a reasonably stable tape transport	5 FM, 10 AM presets, 3.1W		62
Clarion 916HP £160	Good Average	With its rubbery buttons and touches of white this is a modest looking player let down by a weak cassette	Bass/treble controls, 5 FM, 5 AM presets, 9W		61
Clarion 946HP £250	Very Good Very Good	A good FM side let down slightly by AM performance. This Clarion is particularly nice to use with its nifty SAM tuning system	Bass/treble controls, 12 FM/6 AM presets, Slot-in, 15.1W	R	61
Clarion CDC7000/10028HA £650/£250	Very Good Excellent	Despite a slightly off-beat cartridge system the Clarion combo put in a performance that had the sonic edge over other CD/tuners in its test group	Bass/treble controls, 12 FM, 12 AM presets, security code, 80W	R	68
Goodmans GCE229 £150	Fair Average	If knobs, switches and legends are your bag then the GCE229 is the one for you - a lot of gizmos for the price and it even sounds OK	Bass/treble controls, 6 FM/6 AM presets, Chrome eq., clock, MSS, 10.1W	BB	61
Hitachi CSK-402E £250	Good Good	An attractively designed little player that for once doesn't disappoint when it comes to playing music, and it even has a security system	Bass/treble controls, 6 FM, 12 AM presets, Dolby, chrome eq., music search, 7.4W	R	62
JVC RX-318 £200	Average Average	This JVC sounded quite enjoyable and turned in an impressive performance on FM. It even looks quite nice	Bass/treble controls, 5 FM, 10 AM presets, slot-in, 8.8W	R	62

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IN-CAR ENTERTAINMENT

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
JVC RX-418 £250	Average Fair	An attractively designed machine with a fair selection of features – even an aux socket for a portable CD player	Bass/treble controls, 10 FM, 10 AM presets, Dolby, chrome eq., slot-in, aux socket, 7.7W		62
JVC XL-C30E/KS-A102 £499/£130	Very Good Very Good	Not sonically as impressive as the other CD cartridge players in its group, the C30/A102 combo however, a versatile and fast sounding player	Bass/treble controls, 10 FM, 10 AM presets, direct track access, 30W		68
JVC KS-D1 £1000	n/a Excellent	The only in-car DAT player we've tested proved musically quite impressive and if software ever becomes prolific it will be able to offer CD a run for its money	Bass/treble controls, no tuner, direct track access	R	68
Nakamichi TD-400E/PA-300 II £450/£275	Very Good Excellent	If you want your in-car entertainment to compete on sound quality grounds with your domestic system, this combo offers a very strong challenge	Bass/treble controls, 5 FM, 10 AM presets, uni-directional, chrome eq., Dolby B, C, 75W	R	62
Nakamichi TD-700E/PA-300II £795/£299	Very Good Excellent	For those who appreciate the wonders of analogue there are few in-car players to really compete with this superb cassette/radio. You can even adjust azimuth	Bass/treble controls, 6 FM, 6 AM presets, music search, Dolby, 75W	R	68
Panasonic CQ-497 £117	Fair Poor	The CQ-497 has a traditional style analogue tuning system making it easy to use. AM reception was good but the other sources are less encouraging	Bass/treble controls, chrome, NR, 7W		62
Philips 553 £120	Average Average	Not the most ergonomic player on test but sound quality was quite refined for the price. Presets are a bit gauche	4 FM, 4 AM presets uni-direction cassette 3.1W		61
Philips DC680 £180	Average Good	A colourful and musically competent player that despite a gammy volume knob is well worth checking out	8 FM, 4 AM presets 3.5W	R	61
Pioneer KE-3030 £150	Poor Fair	A tasty looking, if sonically bass heavy, little box well suited to blasting out rock or dub	18 FM, 6 AM presets 4.2W		61
Pioneer KEH-5080B £230	Fair Good	A chunky and neatly styled player with healthy power output and an easy relaxed sound. Just the thing for pumping the volume	Bass/treble controls, 18 FM, 6 AM presets, anti-theft device, slot-in, 9W	R	61
Pioneer DEX-M300/CDX-M100/ GM-3000 £300/£450/£280	n/a Very Good	Separate control unit and boot mounted multi play autochanger make this a bit of a hefty installation but it uses the same magazines as their domestic players and sounds fine	Bass/treble controls, 18 FM, 6 AM presets, 80W, removable fascia		68
Proton 214CD/D275 £300/£175	Very Good Very Good	This Proton cassette/tuner offers good power and a level of fidelity appropriate to its price. Musically it has a Decca-like charm that is very appealing, plus a sensitive radio	Bass/treble controls, 8 FM, 8 AM presets, Dolby B/C NR, chrome eq., 85W	R	68
Sansui RX-3100L £180	Poor Fair	Quite flash looking with a reasonable feature count but FM sound and cassette replay quality could be a bit stronger at the price	Bass/treble controls, 12 FM, 12 AM presets, chrome 8W		61
Sansui RX-5100L £250	Good Very Good	One of the cleaner machines around the 5100 has an excellent AM section and a reasonable cassette player	Bass/treble controls, 12 FM, 6 AM presets, chrome eq., slot-in, 12.5W	R	61
Sharp RC-F816E £200	Poor Average	Nothing if not novel the 816, with its unusual anti-theft system is custom built for the furry dice brigade, but is sonically a bit lacklustre	Four band graphic, 8 FM, 16 AM presets, ASP, Dolby, MSS, 10.9W		62
Sharp RC-F882E £220	Average Average	Again a glitzy full feature machine with a flip out control panel and plenty of lights. However, sound quality is a bit disappointing	Seven band graphic, 5 FM, 10 AM presets, ASP, chrome Dolby, 8.5W		62

RECEIVERS

Purists will look down their noses at the very idea of combining two functions into one box, and indeed they always have done. But unless we're talking about the exotic elite, the creme de la creme of amplifier and tunerdom, intrinsic technical shortcomings simply aren't an issue.

One obvious reason why you should buy a receiver if you were otherwise considering an amplifier and a tuner is that there are savings, ie of

size. Generally you end up with one box in place of two similarly sized boxes, which has got to be a good idea. Receivers are also simpler to operate, in principle anyway. At the very least you save on one power switch, and typically you are presented with an integrated control system that is bound to oil the wheels of ergonomics.

But there is one important point to watch. Because receivers don't sell in vast quantities in

this country, and because this is one of the very few countries to use Long Wave for public service broadcasting, many – no, most – receivers on sale in this country cover FM and MW only. Remember that LW is the home of Radio 4, where it can be heard on the all too frequent occasions it is not on FM.

MODEL NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Harman Kardon HK330Vi £259	Average Average—	No LW, and FM section best suited to strong, local transmissions. The amplifier is quite powerful but favours the treble. Bass is tuneful but lacks weight	5 inputs (inc 2 tape), FM/MW tuner		This
Harman Kardon HK440Vxi £329	Good Good	Clear, dynamic, slightly bright sounding design, a little grainy in extremis. Mono switching and LW missing from tuner, which otherwise performs well	5 inputs (including 2 tape) with FM/MW tuner	R	This
JVC RX-777VL £500	Good Good	Sharp, lively but euphonious sound quality from line and phono source is matched to a high grade tuner. However, many half-baked facilities blunt value for money	A/V capable with 6 inputs, equaliser, digital ambience, FM, MW/LW		This
JVC RX-1001V £770	Average Poor	Power output is well below spec, and sound quality is cluttered and messy on all inputs	Digital ambience processing, Dolby Surround, 2/4 speaker, 40 FM/MW presets		This
Revox B2B5 £1782	Average Average—	Sophisticated and capable tuner is married to a muddled, compressed sounding amplifier, which also has low sensitivity preventing the amplifier being driven fully in many situations	70 watts/ch, 4 inputs (inc 2 tape), 29 FM/MW/LW presets		This
Rotel RX-850AL £230	Good Good	Well built and sensibly equipped receiver with outstanding sound quality for the price via the tuner, phono and line sources alike. It majors on subtlety however, and may not impress the heavy metal brigade	4 inputs (inc 1 tape), FM/MW/LW tuner BB		This
SAE RT02 £599	Average— Average	This is an uneven but mostly good performer. It sounds constrained but musical, but the tuner is weak on both wavebands.	4 inputs (inc 2 tape), FM/MW tuner		This

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PERSONAL MESSAGES

Paul Messenger examines a new unipivot from Naim.

Like valve amplifiers, unipivot tonearms were once highly favoured by hi-fi enthusiasts. Back in the pre-boom, austerity 1950s when a lot of equipment was home brewed or hand rolled, constructing such an arm was often the best course of action for those who couldn't find the £18 5s (plus £6 5s purchase tax) for an SME 3009, simply because of the inherent simplicity of a self-centering, single-point bearing doesn't necessarily require access to precision machinery.

Again like valve amplifiers, unipivots also possess the sort of characteristics that gave hi-fi a bad name, as a hobby for fanatics prepared to enter into emotional relationships with their equipment. In an age when Ford is line-fitting Ricaro seats, the unipivot is the ergonomic equivalent of a second class railway carriage on the North Kent line.

Despite this fundamental flaw, there have been a number of notable unipivots over the years, from Decca and Hadcock in the UK; from Stax and Audiocraft in Japan. But with the arguable exception of the unconventional Well Tempered, the unipivot breed seemed to be getting close to extinction, given the success of recent ballrace types from Linn, SME and Rega.

Now Naim is introducing the ARO. For a unipivot entering the arms race it's an appropriately nostalgic name, but apparently is actually derived from the use of very precise arrow-shaft material for the main tube.

Given the stiff new competition from the Linn *Ekos*, Roksan *Artemiz*, not to mention plenty of well established models, can something as apparently antedeluvian as the ARO succeed? My answer is a qualified yes, but you shouldn't take my word for it (not least because I'm a known Naim sympathiser!) What you should do is drop into your nearest Naim dealer and ask to hear this strange device for yourself. But do make sure you've got £500 left below your credit limit just in case the temptation proves irresistible.

I'll come back to some impression of the sound later. The reasons why the ARO works as it does are just as interesting. Historically it owes as much as

anything to Jean Walton's exceedingly artful designs for Decca, more than twenty years ago. The 'budget' Deram arm/cartridge combination was particularly clever, utilising the 'rocking' mode of the unipivot to counter the cartridge's fundamental resonance. I don't think ARO goes far in that particular direction, but I do believe that it puts the unipivot 'rocking' characteristic to excellent use, and in so doing provides an unusually stable platform for the cartridge to do its job.

Indeed, I believe the undamped rocking mode is the key to both the performance success and the ergonomic failure of this device. Cueing and lifting off are entirely manual, with no lever assistance, requiring steady nerves and hands, not to mention a reasonable level of compos mentis. One obvious design weakness is that the armlift should operate from along the line between stylus and pivot, rather than offset to one side as at present.

But ergonomics aside, the crucial factor in the performance of this arm is that the geometry and centre of gravity have been so arranged that the 'rock' takes place about the line of stylus/cantilever and hence generator. So any mechanical energy that finds its way into the system is not translated into any net force between stylus/cantilever and cartridge body - hence no unwanted movement or spurious output (of what is usually a

pernicious low frequency variety).

The only theoretically detrimental effect of this arrangement might be to reduce stereo separation, as the stator mechanism is no longer being held too tightly at 45°/45° to the platter surface. But in practice stereo precision is subjectively very good. So there's probably a trade off of some sort operating here too, to do with reducing the dynamic stress operating on the cantilever itself.

In fact walking heavily (or dancing) on my suspended floor anywhere near the turntable causes the arm to rock quite alarmingly - yet with apparently no net audible effect and perfect tracking stability. Which is a pretty tight practical confirmation of the above geometrical ramblings.

Describing the ergonomics of the device would tax the imagination of the most enthusiastic student of Anglo Saxon epithets, but the sonics are a little bit remarkable, especially in the midrange, where I have never heard such dynamic range and clarity before.

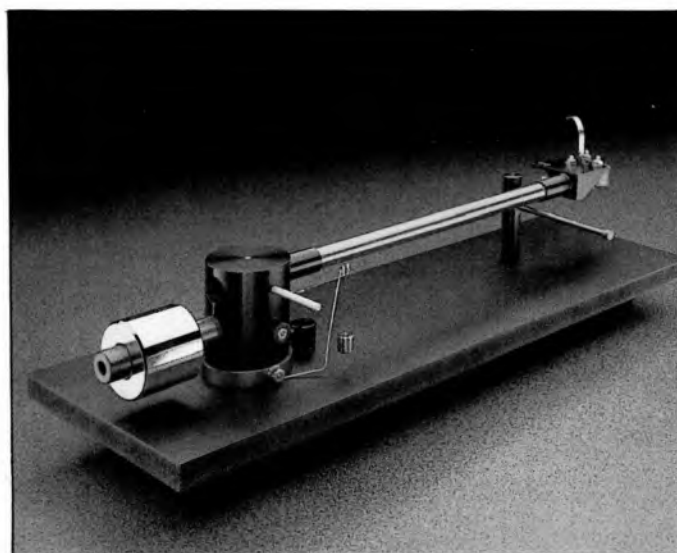
An initial impression was that the bass lacked a little weight, power and extension, though with more exposure I am less sure now that this is the case. In balance terms the sound does seem a trifle lacking in the bass output compared to what I had become accustomed to, but it also delivers significantly more detail and contrast down into the bottom octaves, which is more than fair compensation. Perhaps

the apparent loss of weight is actually due to a reduction in unwanted 'sludge'.

The unusual resolution and extension at low frequencies is repeated at the other end of the audio band too, and the net result is a tonearm which provides a very wide 'window' onto the soundstage, both in terms of dynamic and frequency ranges. Indeed one could question whether this window might not be a shade too wide, for the arm is certainly most capable of revealing the shortcomings of partnering cartridges. I have so far tried just the Linn *Karma* and *Troika*, both cartridges I have known for years and which share more similarities than differences, but the latter were much more noticeable using the ARO than with other tonearms I have tried.

It's not a universal arm, and has no adjustment to compensate for specific cartridge geometry other than by changing the pivot height, or in extremis the armboard. It has clearly been optimised for Linn moving-coils, but could presumably be used with other top models providing a little care is taken in set-up. And the unipivot does have one possibly handy byproduct. The entire armtube, bearing and counterweight assembly may be electrically unplugged and lifted clear. So the cartridge fanatic can run two or more cartridges without the sonic compromise of detachable headshells, arguably for the first time ever. And your conscientious Naim dealer will now have no excuse not to offer you the chance to make your own comparison between *Karma* and *Troika* as described above, for example.

The ARO is currently providing fresh insights into an extensive vinyl collection and further increasing my disinterest in CD. But it is a hair shirt product that makes demands and sacrifices on the user that are undoubtedly out of step with the mood of the 'eighties. And my left-handed partner refuses to even touch it, for fear of wiping out a \$500 cartridge, irreplaceable LP or both. But anyone who takes recorded music seriously ought to give themselves a chance to be seduced by a beguiling if idiosyncratic device.



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