

# HI-FI CHOICE

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

120 AMPLIFIERS AND 28 TUNERS - SUMMARISED

10 IN-CAR STEREOS UNDER REVIEW

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COMPACT **disc** DIGITAL AUDIO

CD

PHONO

TUNER

TV / AUX 1

VIDEO / AUX 2

MONITOR

TAPE 1

TAPE 2

DIRECT

35

45

52

60

75

80

12 ONE-NAME SYSTEMS ON TEST  
TEST SUMMARIES ON OVER 650 HI-FI PRODUCTS

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*"In certain respects it is the best of all the amplifiers tested, it has the sweetest and, in many ways, most natural and unforced delivery. There is virtually no sense in which it points to itself in circuit, it is self-facing to the last, while the system it powers just sings."*

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DAVID PRAKEL, NEW HIFISOUND, DEC 1986.



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*"The tuner performed well and was simple to use. With strong FM signals it gave a clean and detailed stereo sound..."*

*The Delta 80 is thoroughly competitive and can be recommended as good value for money."*

JOHN SEABURY, WHAT HIFI, MAR 1987.



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MARTIN COLLOMS  
HIFI CHOICE LOUDSPEAKERS.



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JIMMY HUGHES HIFI ANSWERS OCT 86.



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NEW HIFISOUND, OCT 1986.



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ALVIN GOLD HIFI ANSWERS JAN 87.



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

# HI-FI CHOICE

ISSUE NUMBER 61: AUGUST 1988



Cover photograph of the Philips system by Chris Richardson. See page 64.

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## CD PLAYER REVIEWS

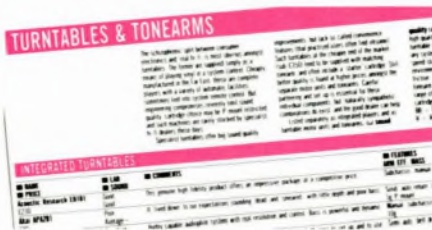
Alvin Gold skips and scans through a bunch of five new players.

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Next month's Choice brings you a host of new amplifiers comprehensively tested by Martin Colloms, plus another ten in-car machines and much more.

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# MENU

**I**t sounded easy: let's assemble a dozen 'one-name' systems made up of manufacturers' separate components and see how they shape up. Our reviewer Paul Miller liked the sound of it too. What could be easier than testing (say) a Sony CD player combined with a Sony amplifier, Sony tuner and Sony speakers? But hi-fi, much like life itself, is never that simple.

First we had the problem of selecting the components. Some manufacturers make turntables and not CD players, others make CD players but not turntables. Some make loudspeakers, some don't – and some make loudspeakers which they'd rather we didn't review! Eventually, after countless hours spent cajoling manufacturers, we got our dozen systems; if some of them appear somewhat mismatched blame the manufacturers, not us.

Then came the task of reviewing the systems, a project the complexity of which we all underestimated. Meticulous to a fault, Paul decided that the only way to make any sense out of what he was hearing from each system was to substitute individual components one at a time into his reference system. Three weeks, and several dozen cardboard boxes later, our deadline was looming and our reviewer not far short of suicidal.

Still, we made the deadline and the results are here for you to digest. Some of the systems proved a synergistic match, others were less successful.

Our long-promised survey of affordable in-car players begins this month, plus we're doing our level best to keep pace with the constant flow of CD players appearing on the market. In addition to the five models reviewed this month, five more are scheduled for next month's issue.

Meanwhile next month's major review topic is amplifiers. We've 30 new models lined up, including Rotel's recently launched 'entry level' *RA810A* costing under £100, the brand new version of the *Pip* preamplifier from Pink Triangle (\$2,670), new models from Akai and Technics featuring on-board D-to-A converters and A&R Cambridge's *Arcam Delta 60* hot off the production line.

*John Bamford*

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PUBLICATION

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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.

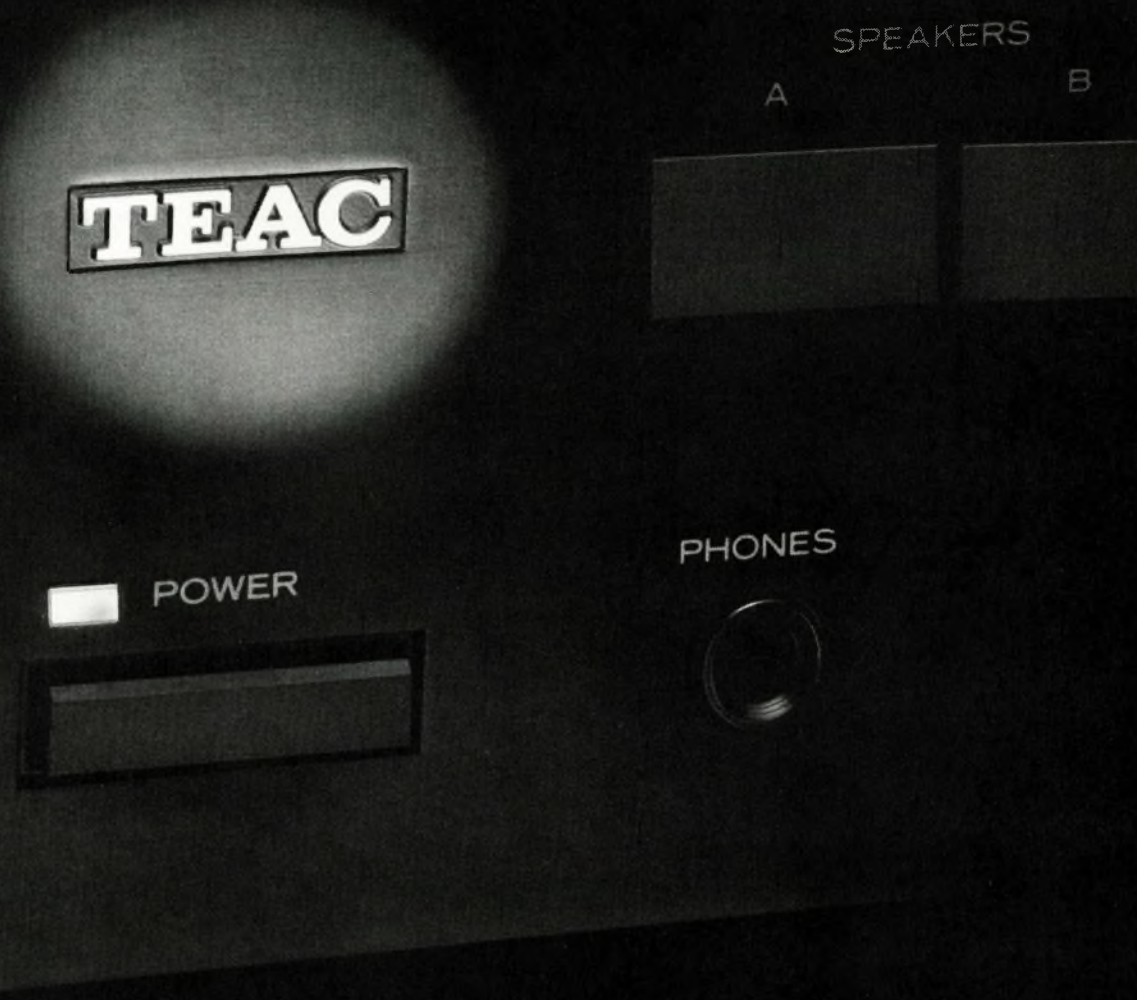
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## PRODUCTS

### EXCELLENT AIWA

Aiwa's 1988 model programme strengthens the company's already strong hold on the personal stereo market, with an increasing number of upmarket models that now include a personal CD, plus a clutch of 'credit card radios' for personal listening.

The 1988 midi systems follow Technics' lead in being slightly wider (360mm) than usual, and use cassette units to improve competitiveness. The 'budget' X33, complete with equaliser and twin deck, sells at £150, its partnering DXM-45 CD player a further £150. Three other new midis fill price points up to £400 excluding CD.

More interesting from the hi-fi perspective, Aiwa's best selling budget separate cassette decks have been facelifted, each model number adding ten points. The new basic budget 270 now costs £100, while the 370 and 470 both add the worthwhile Dolby HX-Pro circuitry which particularly improves performance with basic grade tapes.

Three new CD players include two midi system companions, plus a £500 prestige XC-007 that bristles with the latest technology - optical bitstream transfer, 18-bit with 4x oversampling, anti-resonant chassis, twin power supplies etc.

Best news of all is Aiwa's decision to return to the top end of the cassette deck market, with one £300 AD-F880 remote control twin deck plus two single-transport models which could

offer Nakamichi some real competition. The £400 XK-007 and £550 XC-009 marketed under the Excelia banner have a number of advanced features, including a special clamp that rigidly locks and mass-loads the cassette shell, amorphous alloy heads with PC-OCC copper windings, and off-tape 3-head monitoring to name but three.

The company is also re-entering the UK ICE market.

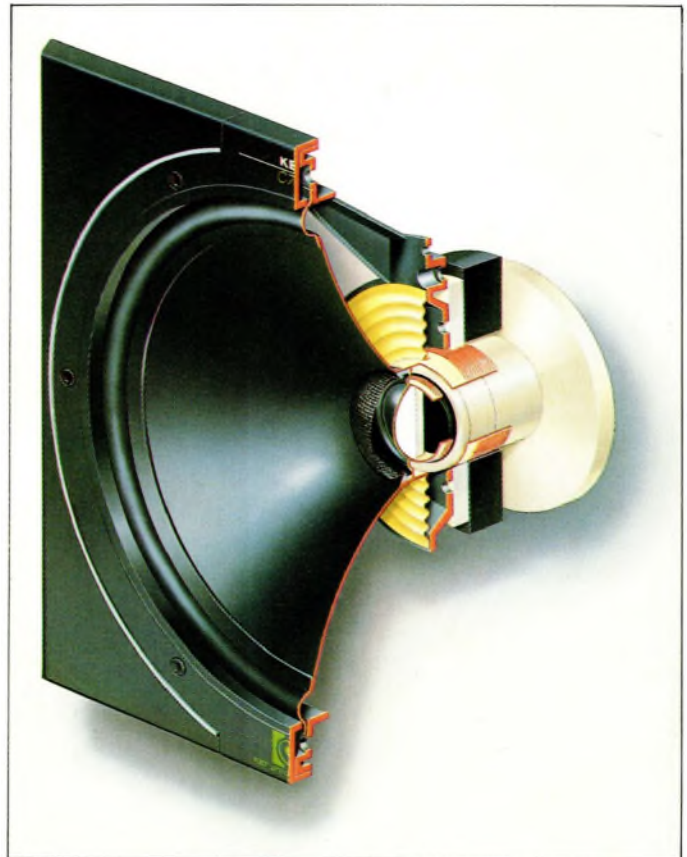
### SABRE'S READY

Inca Tech are planning to launch their new Sabre amplifier at the Heathrow Penta Show, in September. The 50W (RMS) Sabre features seven inputs and will retail for around £199. Inca Tech also have a new Claymore which should be ready for Penta as well. The new Claymore will be more powerful than the existing model at around 90W per channel and should retail for the cheaper price of about £320 say the manufacturers.

Ergonomic differences for the firm's new blades are said to be pushbuttons instead of a rotary selector (for the huge number of inputs required by today's hardware hoarders) and a headphone socket in the middle of the face. The makers say they can do any colour and promise both models as well as some other projects at the show.

### YUGOSLAV AUDIO

Audiofreaks are importing a valve pre-amplifier from Yugoslavia. The £445 moving magnet pre-amplifier is being named the Oakly Image - apparently its maker wanted an English sounding name. A



moving coil transformer is promised for the near future.

And once well-known Empire cartridges are being re-introduced to the British audio market, also by Audiofreaks. So far seven of the Swiss-made cartridges are available priced between £30 and £475.

### C FOR COINCIDENCE

The wraps came off the new KEF C-series in Chicago, revealing a high-tech coincident/coaxial drive unit that fully endorses the company's enviable track record

*Slice of KEF dear? X-ray view of the Uni-Q drive unit.*

in radical innovation.

Loudspeaker designers have managed to deliver tolerably flat on-axis frequency responses for a number of years, but the very different off-axis sound radiation characteristics of cone-type midrange units and dome-type tweeters inevitably leave serious off-axis discontinuities around the crossover (where the cone is directing sound energy in a narrow beam from its neck, while the dome produces a much wider radiation pattern from the front baffle surface). This inconsistent off-axis response then interacts unpredictably with the acoustics of the listening room to create unwanted colorations.

A special Uni-Q drive unit where the 'acoustic centres' of midrange and treble unit are physically coincident is KEF's solution, used in four of the six new models. The coincident radiation centres simplify network design and avoid any off-axis phase cancellation. And



*Solid appeal from the Aiwa Excelia.*

since the immediate environment of each driver is effectively identical, the radiation pattern (ie polar/off axis responses) should stay consistent right through the crossover region – indeed the manufacturer's on- and off-axis response curves show a marked similarity to the Quad *ESL63*, which is one of its closest neighbours in acoustic design philosophy. Whether any problems are caused by the tweeter output reflecting off a moving cone rather than a stationary baffle must remain to be seen.

Representing a refinement of coaxial drive unit design (as practised by Tannoy, Urei, Technics and others), a special miniature tweeter is actually built onto the pole-piece of the bass/mid driver. The miniaturisation is achieved using the very latest rare earth magnet technology – neodymium-iron-boron, which is twice the specific strength of samarium-cobalt and ten times that of ferrite.

Despite its size, the tweeter has ample sensitivity, while the construction (mounting the crossover network on the rear of the bass unit magnet, feeding the tweeter signal wires down through the polepiece) enables the whole unit to be assembled and tested as a complete independent system, prior to cabinet installation.

The smaller, bottom-of-the-range *C15* (£100) and *C25* (£130) are conventional two-unit loudspeakers, the former a free-space 3.5litre miniature with a reasonably extended bass and somewhat below average (85dB/W) sensitivity. The 7litre *25* has a larger 6.5inch bass unit to improve sensitivity, power handling and bass extension.



*What a coincidence! KEF have done it again.*

The £160 *C35* brings in the 8inch *Uni-Q* unit as a full range driver, in a 12litre closed box, giving slightly improved performance over the *25* as well as the coincident directivity feature, while the £200 *C55* goes a few steps further still, adding reflex-loaded bass efficiency by using an 8inch passive ABR driver.

The floorstanding £350 *C75* reverts to a closed box, now of 30litres, and combines a higher power handling *Uni-Q* driver with an additional driven bass unit, giving high 91dB sensitivity with LF -6dB at 47Hz. Finally, the £600 *C95* is something of a crossover product between C and Reference series, adding the

latter's conjugate load matched crossover and coupled cavity bass loading techniques – the latter used to provide extension down to 39Hz, -6dB.

Expected to appear on the UK market early this Autumn, the decision to market the unique new *Uni-Q* technology from £160 is potentially very exciting. The proof of this particular pudding is therefore awaited with eager anticipation.

## FOR YOUR EARS ONLY

The top of the range Stax headphone system has at last arrived in this country at the premium of £1,365.

The *Lambda Signature* and *SRM-T1* Vacuum Tube Energiser is based on the *Lambda Pro*. The Earspeaker, as Stax describe it,

uses a one micron thick electrostatic diaphragm. *Signature* uses PC-OCC cable and can be bought for £469.

*SRM-T1* uses dual FETS in the first, and twin triode tubes in the second, of its two-stage configuration. There are no ferromagnetic materials used in the chassis or components. *SRM-T1* features a pre-heat switch on the separate transformer which heats the tubes; you don't need to let the system warm up before use.

The *Lambda Signature* was launched in Tokyo in October but Stax haven't been able to import any before now (they say) due to the strain on production from US and Japanese orders.

## FORT SUPPORT

Loudspeaker manufacturers Castle Acoustics are making a stand in the equipment support market.

The *CS 18* and *CS 21* are single column loudspeaker stands made from heavy gauge steel internally damped with Vermiculite which is lighter than sand but with apparently the same damping properties. The stands are finished in semi-gloss black texture-paint and cost £59.90 for the 18-inch-high version; £64.90 for the 21-inch stand.

## NAME OF THE ROSE

A new valve preamplifier from a new company has been launched under the name of Rose.

The £370 preamplifier promises audio quality that belies its market price and comes in simple but sophisticated

*Rosy Future? This debut valve preamplifier costs £370.*





packaging. Rose are planning a compatible transistor power amplifier and step-up moving coil transformer for their preamplifier in the near future.

The name of this Rose? *RV-23*. Rose Industries Ltd, Didcot, Oxon. Tel: 0235 814631.

## BUSINESS

### TIME OUT LIVE

Over 220 exhibitors gathered to promote their activities at *Time Out Live* – the lifestyle show in Kensington's Olympia 2 over the May bank holiday. Two floors of the exhibition hall were used for stands with variation being the theme; downstairs Marlboro promoted smoking by offering free cigarettes(!), while upstairs earnest folk handed out leaflets about the dangers of tobacco.

Seven firms promoted hi-fi, which has sadly lapsed in the public mind to number 14 on the list of aspired to possessions (below yer Bar-BQ even). But they seemed to be having some success; Doug Brady had rigged up an Absolute Sounds system with the help of Ricardo Frassavoci; Kinergetics CD player, Jadis amplification and Sonus Faber Electra loudspeakers had no right to be sounding so good in the usual show stand setting. And elsewhere Celestion, Bose, Quad, Philips, Marantz and the Cornflake Shop never seemed short of listeners.

The crowds presented as much variation and colour as anything the stands could produce and it was wildly different from a hi-fi show. There was a question as to how much disposable income some of the more outlandish *Time Out* readers had, but generally the feeling by Monday evening was that the show had been worthwhile. On Saturday the feeling had been entirely different – outside a gorgeous blue sky made Hyde Park a much better option, however the bad weather and pressing crowds on Sunday and Monday righted that.

*Celestion's Richard Allen and our publisher Marianne McNicholas raising money for Telethon '88.*

*Time Out* joined in the ITV Telethon '88 charity bash, raising £12,000 plus for the Terence Higgins Trust which helps AIDS sufferers. *Hi-Fi Choice* thanks the following manufacturers for contributing equipment for auction in the Telethon: Hayden Laboratories, HW International, Marantz, Beyer Dynamic, Teac, Mordaunt Short, Appolo, QED, Partington, Linn Products and Target Audio.

Marantz, Quad, Celestion, Sevenoaks Hi-Fi, Covent Garden Records and ourselves raised over £1,000 for charity with a Rock in America Lucky Draw. The draw was to see a "major band" in concert and was won by Ingrid Darracott, from North London. Indications were that the concert would be Elton John in New York in September.

### NEEDLE TORQUE

Rega's latest product is a torque wrench! Intended for sale to dealers to help with the installation of the new 3-bolt fixing *Elys* cartridge, this dinky little device applies predetermined torque to cartridge fixing screws with an Allen key head. Rega claims that achieving even bolt tension is particularly important to get best out of three-legged cartridges.



*Making sure dealers get it right: Rega's cartridge torque wrench.*

## EARLY BIRDS CATCH WORMS

Philips are offering early compact disc technology investors a special deal on their top CD player. People who bought the pioneering range of Philips CD players five years ago will be offered the flagship *CD960* at the same price they paid for their first Philips machine in 1983 – saving £150 on the current price, and getting all the benefits of a state-of-the-art machine five years along the learning curve.

Whilst not wishing to cast any aspersions on the altruism (to use the current media buzzword) of this electronics giant, the move does seem a little like a stock shifting exercise in the light of the other top Philips (*CD880*) machine not being brought onto the market until October – while we reviewed it in March. Could people possibly be buying other machines?

## SOARING SALES & SLIPPING PRICES

Sales of CD players in 1987 soared some 40+ per cent over the 1986 figure, according to figures recently published by Ferguson, based partly on BREMA (British Radio and Electrical equipment manufacturers) statistics. Standalone separate players accounted for a fairly small increase of under 10 per cent, and were overtaken by component systems with CD (up 75 per cent), with one-piece music centres following hard. CD personals and portables also showed substantial increases, though in-car remained negligible.

Current predictions from the same sources show a similar growth rate during 1988, with acceleration in the separates sector, strong growth in all other sectors bar personals, and the start of the ICE CD market proper.

Demand will doubtless be fuelled by steadily dropping prices. Under £100 separates are available from little known (and reviewed) brands such as Crown,

while Ferguson have a Singapore-made model for £130 and Philips come in at £150. There are a number of sub-£150 personals and portables around too, including models from Philips.

## CONSERVATIVE LISTENERS

A recently published Home Office survey on attitudes to UK radio services, based on a representative sample of 1,000 adults, suggests that listeners' tastes are very conservative, and generally satisfied with the current radio network. Less than 15 per cent wanted extra national or local stations, though the numbers dissatisfied with the current situation rose significantly amongst ethnic minorities and amongst Londoners.

## TECHNOLOGY

### MISSION IMPOSSIBLE

New regulations introduced by the government mean video owners will have to wipe clean their tape recordings after a 28 day period. In the classic bungling style of politicians trying to please all interested parties the Copyright, Designs and Patents Bill aims to bring the existing 1956 legislation (which makes home taping illegal) into the era of technology. The compromise is proposed to control the widespread practice of home video libraries being built up which infringes the copyright of the programme owners and the International Berne Convention on Copyright.

But Labour's spokesman on the subject, Tony Blair MP, attacked the time limit as unrealistic and absurd. The government believes the Bill is reasonable and Consumer Affairs Minister, Francis Maude told MPs: "Faced with a reasonable law people will ordinarily obey it." Presumably the new law (when passed) will create demand from the law-loving but absent-minded populace for a self-destructing tape with a lunar month's delay mechanism built in; we don't want to get caught now do we?

### PERFECT FOREVER?

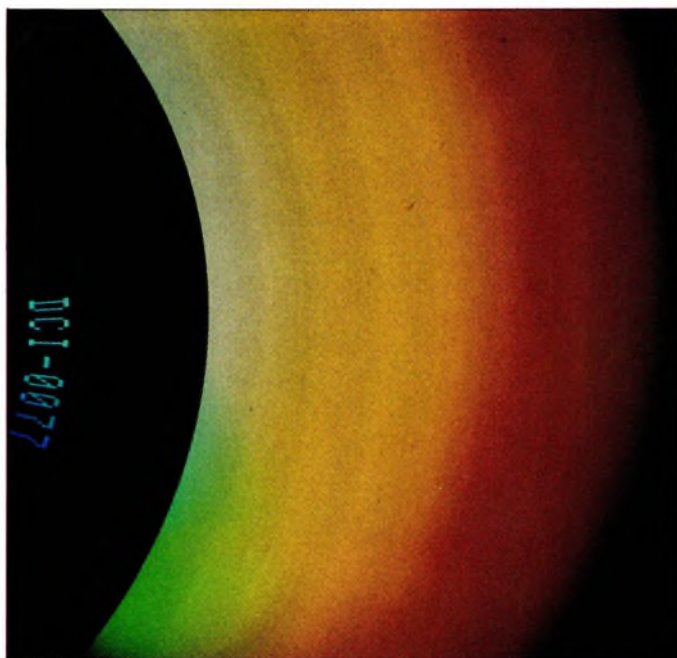
Questions have recently been raised concerning the long term stability of the aluminium reflective layer currently used in compact discs, US 'audiophile' record label Mobile Fidelity introducing premium price discs using gold in its place. Engineers

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THE SOUND ORGANISATION

*SANCTUARY*



Perhaps the silver disc should have been gold . . .

in Japanese giant Matsushita's laboratories are reportedly investigating the phenomenon, comparing silver and gold test discs, but the experiment will take a year to run, even using 'artificial ageing' techniques.

## WHITHER MAC?

Early June, the dynamic duo Rupert Murdoch and Alan Sugar (Amstrad) announced what amounts to a pre-emptive strike on UK satellite TV broadcasting. The plan is to use transmitters on the forthcoming Astra 16-channel medium power satellite to beam four channels of unscrambled PAL (ie compatible with current TV sets) Murdoch Vision (ie recycled US programmes, on current evidence) down to the million or so £200 (+£40 installation) dish/receiver kits that Amstrad (and probably others) hope to sell by the end of 1989.

By going for compatible conventional transmission standards and low cost hardware, Murdoch hopes to get sufficient viewers quickly enough to break

the ITV monopoly on TV advertising. Other English language channels should also be available from Astra, possibly adding to the incentive to purchase the receiving kit (or adding to the complexities of the receiver). The launch date is currently November 4th, but programming is unlikely to get underway until the new year even assuming no launch postponement.

## DECIBEL WORSHIPPERS – ON WHEELS

Everything's bigger in America – they call the North Atlantic a pond; a telegraph pole a toothpick.

The latest sport for a society founded on car culture is the cranking-up of in-car systems to unbelievably loud levels.

A recent Wall St Journal report described a contest in Bakersfield, California, where 149 in-car audio aficionados strove to be the loudest on the pitch, with recorded noise levels of up to 134 decibels blaring from their throbbing vehicles. The

report points out that while conversation measures at about 60 decibels, a jet at takeoff produces about 125 and a concentrated beam of 180 decibels has been used to bore a hole through three feet of concrete! The loudest noise level measured so far was at a "Thunder on Wheels" contest in Beaumont where Wayne Guillory, a 43 year old car stereo dealer produced 151.1 decibels from his van's \$33,000 system. Needless to say banks of speakers, extra batteries and as many as six amplifiers are used to produce something that will outblast the voice of God – Mr Guillory uses 36 speakers and powers them with amplifiers producing 5,600 watts (we guess that's not per channel!).

## QUAD NEWS

Quad have paid Philips \$25,000 US, for a licence to make CD players. Ross Walker, Quad's MD, said the firm had been considering making a CD player for some time and that some R&D (research and development) had gone into the project. However he could not comment on how long it will take to see a Quad CD player in the shops and would not be drawn on cost, features or design. Watch this space.

## WINDY CITY

British firms showed up in strength at the Chicago Consumer Electronics show last month with over 30 companies flying the flag. Steve Moore, of the Cornflake Shop, went to Chicago to see the latest goodies. We don't have room for his full show report this month, (that'll be in issue 62) but here's a taster of what's in store:

Tonearms were shown from Roksan and Naim, the former with an interesting unipivot design on the counterweight, the latter with a detachable section for audiophiles who want to use more than one cartridge. Roksan's new cartridge, the £300 *Shiraz* was also pushing out some good sounds. The star of Naim's show was the exciting *IBL* loudspeaker (a simplified *SBL*) which will cost around £700. Linn launched their new cartridge and loudspeaker, the *K5* and *Helix* respectively. And a new Onix pre and power amplifier combination was also launched.

QED won an Innovation '88 award for their Systemline switching system for multi-room listening. The Ariston analogue lineup was impressing economically minded Americans,

*Ship shape for Chicago, Linn's K5 cartridge.*



Trying to lick the competition, Linn's new Helix loudspeaker.

and a range of new panel speakers are being launched by Highwood Audio from Alberta, Canada.

The long heralded *Finial* laser turntable – an analogue player which reads vinyl grooves with a beam of light, was also being shown to invited guests.

Acoustic Gold's range of furniture for hi-fi caught Steve's eye, and the Alphonson end of side arm-lifting gadget (£15) looks brilliantly neat too.

Details and descriptions on these and more next month.

## IN BRIEF

### COMPETITION WINNER

The winner of our gold-plated Source Odyssey Signature turntable, and Audio Technica *ATOC7* cartridge competition is Mr. Henry Warne, a solicitor from Morpeth, Northumberland.

All Denon products will have a two-year guarantee starting on July 1 1988 – and the guarantee period on products sold before that will be interpreted generously.

Indications as we go to press are that Rotel look likely to distribute Oracle turntables as part of their hi-end initiative.





# LISTENING POST

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## ASPIRATIONS

*When a professional couple moved from Hertfordshire to London's Docklands they took nothing with them; the architect had a field day. Text: Dan Houston. Photographs: Chris Richardson.*

URBAN

# Regeneration



*The purist approach: Meridian CD207 and FS Audio monoblocks are tucked away to be heard and not seen.*

**S**o the kids have left home, you have no pets or financial constraints, the business is doing fine and there's plenty of life left. What better than to re-immense yourself in city life; in an area where the biggest urban regeneration yet is taking place, and just a stone's throw from the bright lights and Royal Festival Hall?

This was just the decision taken by the owners of this penthouse flat on the South side of the River Thames, with its panoramic views across to Tower Bridge and the City. A few years ago the flats were still a dream and the sad evidence of lost trade in the form of warehouses which nobody wanted loomed like a cloud over the river's banks.

Built in the Victorian heyday of shipping many of these warehouses are listed as being of architectural significance, including the building under this flat, which has since been transformed from being industrially functional to providing 80-odd waterfront homes. The Penthouse was built four years ago and was sold as a shell to the couple; these days you pay more for the privilege of being allowed to design your own home.

The services of architect Simon Conder, were called upon and his eyes "lit up" when he was informed they were bringing no furniture from their existing home in Harpenden, Hertfordshire. However, no steps on interior design were taken until the timbre for the furniture had been set; principally with the first acquisition of round-table and chairs designed by



*Guardians of the sound: the architect who designed the room also designed the Amadeos.*

Charles Rennie Mackintosh. The clean, monochromatic Mackintosh accent was the inspiration for Conder, and he went to town creating what could pass for a piece of live-in sculpture.

The entrance hallway curves like an open 'S' into the main living space so one is drawn into the home rather than presented with it in the usual Mondrian fashion. The colour scheme throughout is black and white but because of the shapes





*The Mackintosh table and chairs inspired Conder and set the tone for the rest of the room.*

# *Elitist*



and textures, and the use of colour from outlandish ornaments, books, plants and the ever-changing river view, one does not get that cold outer galaxy feel that can prevail in less skilfully designed monochrome interiors. Conder's belief is that people and their belongings – their objets d'art – should give a home its colour and warmth.

On entering the main area one of the curvilinear hall walls snakes off to the left, while the other leads past the spare bedroom and study to the kitchen. This is walled off from the main area but is open at both sides allowing free passage to cook. On a raised Italian Marble dais across the room, the high back Mackintosh chairs are arranged around the table with its 'chinese-style' revolving centre.

From the dais, diners get a spectacular view of the river up to St. Paul's (or at least its dome) and down to Limehouse Reach with the new (rather twee) Wapping waterfront in front. On my arrival a Tha-

The owner's penchant for spiral staircases led to the architect putting one in the bedroom to lead up to a little inner sanctum where a small workstation affords peace for the owner to indulge his hobby with electronics.

Back in the main room the black shelving along the white wall houses books and five year's collection of compact discs, all arranged on their side (for readability) in racks in mostly alphabetical order. The problem with arranging CDs thus is that the latest addition means moving all the others in order to keep them alphabetical; the owner is considering computerising his collection on a Psion organiser which will remember where everything is.

The whole pace of the flat is very measured and consequently there is no confusion of styles. The furniture, by coincidence I was informed, has all been designed by architects – there is that by Mackintosh of course, a leather sofa and armchairs by Le Corbusier as well as one of

ist, uncomplicated, chosen for style *and* performance, and is expensive. The award-winning Meridian 207 CD player fronts the line-up, with PS Audio power amplifiers feeding the Amadeos. The owner converted to CD upon its invention, giving away his entire record collection. CD is more user-friendly and he couldn't stand the whistles and pops of a vinyl system. Only the Amadeos are on show in the room; even when in use the cupboards are kept closed for aesthetic reasons.

After much trial and error with loudspeakers, including some Magneplanars which a cat used to climb up, the owner got so tired with the lack of imagination in modern audio design that he just went ahead and founded Amadeo to make some loudspeakers that would sound good and be OK to live with in this setting.

*The River Thames, once the dirty old man of London, is at last becoming recognised as a pleasant place to live.*



mes fireboat was doing its stuff, sending four white plumes of water into the air, the mists of spray falling away downstream. The owners can enjoy such displays from an open balcony which serves as another eating area in clement weather.

The main room is floored with black wool carpet while the ceiling curves down to one side. The snaking wall offers plate-size black wooden handles on chunky doors opening in to the bedroom with its huge white corner bath (inbuilt Jacuzzi) and corresponding monotones. Walk-in wardrobes curve away on one side matching the back of the wall in the main room.

his leather and chrome listening couches, glass tables by Eileen Gray and the main music-listening swivel chair with (dare I call it?) footstool by Charles Eames. All the furniture, except the tables, is in black leather supported by chrome.

Fairly central to the room a structural pillar could not be altered so Simon Conder made a feature of it, creating both a drinks cabinet and the hi-fi cupboards. From the seating the two extraordinary Amadeo loudspeakers flank the cupboards like Cleopatra's needles and look more like sculpture than audio equipment.

The hi-fi, like the rest of the flat, is pur-

After enlisting the services of ace audio engineer Ted Jordan linked with the vision of Simon Conder he has got his speaker and is now retailing the model through Subjective Audio in Palmers Green (who sold him the rest of the system) and such meccas of design as Atrium and Authentics in London's West End. Even the name Amadeo has designer appeal: giving images of both love and Mozart in an auto-suggestive way.

Each 50 litre enclosure uses two rear-facing 127mm bass drivers and four small (50mm) mid/treble drive units contained within their own six litre loading chamber.

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Rear elevation of the Amadeo: "standing in front people ask, 'where are the speakers?'"

The midrange units are placed in a row and face inward two-thirds of the way up the cabinet. Beneath the main enclosure is another chamber which may incorporate amplifiers if active drive is used.

One can see that some healthy engineering has gone into the speakers and the style speaks for itself: they are featured in *The Design Year Book 1986/87* (Thames and Hudson). Although he would not call himself an audiophile the owner didn't see why he had to compromise himself as an aesthete in order to get a sound he could enjoy. As a regular concert goer he has plenty of experience of live music and his aim was to create a good soundstage and realistic sound. So we sat down and had a listen. (In the Eames chair of course).

One of the first things I noticed was how superb the room was. The design effectively soaks up echoes that can sometimes give that "doubled up" effect to music, with a resulting headache for the unaccustomed listener. The carpet, curves, nooks and crannies as well as the open plan layout let the sound dissipate naturally.

The second was surely the soundstage. We put on Manuel de Falla's *Three Cornered Hat* (Charles Dutoit, Montreal Symphony Orchestra) and an effusive Spanish senorita suddenly sang mezzo-soprano in the kitchen. This is always odd when you are expecting sound to come from the speakers; the senorita was, of course, several feet beyond my expectations. The experience is therefore very lifelike, enhanced by the 207's clarity and ability to make something digital come back to the analogue fold as it were.

We proceeded through a whole range of music types all of which I felt the system handled extremely well, the only criticism being "some brightness". But then, as my host pointed out, even the Royal Festival Hall can lend itself to brightness, and it was not glaring or hissing in nature. Anyway, I suspect one is more used to being fed bass to compensate for lack of atmosphere. And these speakers *did* give atmosphere. The lilting third movement



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moments of Mahler's *Fourth Symphony* came across beautifully with a feeling of being closer to an orchestra than I have ever been able to afford. I mean we were hearing someone fluff at his cello strings just on the right there! So in terms of recreating the live performance the Amadeo acquitted itself well – even more so when one can also sit back and enjoy its design.

The owner himself gave some criticism to the ergonomics of the Meridian 207 and commented that in his business – computers – millions of pounds was spent on researching ergonomics and user-

friendliness so that computers will not only do their job but will be logical and easy to use. Much hi-fi not only looks ghastly but is also difficult to use he opined. "None of them (*manufacturers*) has paid the slightest attention to the usability of the equipment, they should use industrial designers," he told me. That said, the Meridian does behave beautifully through amplifiers and speakers but only after some patience with the buttons (and when it is out of sight for our host).

The expert use of colour and styles in this waterfront home belie rumours that colour on a Battle of Agincourt scale is due for revival. With monotones great skill is needed not to kill any feelings of homeliness. And here the curvilinear, which features strongly in man's memory as the home, stimulates the imagination in three dimensions. The style of this hi-fi system at last offers some real alternative to the square or cube, and the sound has to be heard to be believed.

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# READERS WRITE CHOICE ANSWERS

## A RESPONSIBLE APPROACH

*Hi-Fi Choice* and Mr Houston are to be congratulated on the excellent article in the March '88 issue regarding market response with its emphasis on reliability and consistency.

Such forthright and concise comment is long overdue and I'd all but given up hope of ever seeing a British magazine take a responsible attitude to a growing problem regarding many of the more popular makes of British audio equipment. Three of the principal delinquent companies mentioned in your article have at one time been suppliers to our Company, and it is no coincidence that we are no longer stocking their products.

Could I suggest that Mr Houston carry out a repeat market survey to see whether the relative rankings of product unreliability remain unaltered, and also to list the comments from those suppliers under the spotlight when faced with the evidence of poor reliability.

Bearing all this in mind, it's with some sadness that I note that Myst are no longer producing the *TMA3* integrated amplifier. Over our short period with them, we sold in excess of 80 of these units and to my knowledge never experienced one single failure. If ever there was a model of reliability, quality of construction and attention to detail, Myst and their products were most assuredly the benchmark.

It is ironic that companies with bigger mouths and more clout are able to project worthless products into a soft market and it's even sadder that reviewers rarely, if ever, pay much attention to inconsistencies between product batches let alone long and medium term reliability.

On a positive note, I feel that SME deserve a special mention in having the most obvious and seemingly total commitment to product perfection that I've ever encountered in the UK. Surely this must be Britain's finest audio equipment manufacturer?

I apologise for the length of this letter, but hope you find the space to print it, and hope that

some of my fellow dealers will write you their own commentary on unreliability, in a joint effort to improve the overall standard of equipment and reduce the complacency which I sometimes feel is endemic in certain parts of this industry.

HOWARD POPECK,  
MD, SUBJECTIVE AUDIO, LONDON.

## ILL LOGIC

From my own enquiries it seems that Logic International are no longer trading, which is a bit of a pain in the proverbial as my *Tempo Electronic* turntable has broken down – at just over a year old.

It seems the main resistor is burnt out and the printed circuit board needs to be replaced.

Naturally I got in touch with my dealer, Acoustic Arts in Watford who were also trying to get hold of Logic, with no success. Under



*The late lamented Logic Tempo with Datum II tonearm.*

the circumstances I would be interested to know what the situation with Logic is and whether they are likely to surface at any time in the near future. Alternatively, are there any other firms able to repair my deck or should I scrap it and start saving for something else, eg a Linn *Azis*, and put this experience behind me?

I would be grateful for any light you may be able to shed on my dilemma.

G. BRUCE,  
INSCH, ABERDEENSHIRE.

*Logic International have recently been bought out by Manticore Systems Engineering, makers of the Mantra turntable. They will be marketing the old Logic C1 under their own name and continuing production of the Datum tonearms, which will*

*most likely be appearing on the Mantra. They will be able to repair your turntable and can be contacted on (0767) 318437.*

## BAD VIBRATIONS

Congratulations on your survey of stands and supports. An objective survey was much needed. I've been experimenting with suppressing vibration over the last couple of years – concentrating mainly on electronics rather than turntables.

First, I would question your statement that very little through-air coupling can occur. Although I've done much not only to isolate my turntable and amplifier but also to damp resonances, I found that merely standing a medite board between the loudspeakers and components made a noticeable improvement. There may be little direct air coupling, but there is certainly enough to excite any resonances that exist – and there are certainly plenty of those. Secondly, I believe that reflections or standing waves between the support and the base of the equipment are important. I found I could change the sonic brightness of a Luxman *Brid* amplifier by sliding different types of carpet between its feets and the slate shelf supporting it. A ribbed rubber mat seemed to give the most neutral results.

Your comments on the RATA *Amplat* are relevant here – I found its Torlyte predecessor gave a 'quacky' sound to anything placed on it. At first hearing, this sounds brilliant and emphasises the character of woodwind instruments; but in the long run the effect is not easy to live with, string tone in particular becoming unpleasant. I'm sure this is due to reflections off the resonant surface of the board. Conversely the lack of a board under the turntable on a RATA stand gives a feeling of natural spaciousness.

I suspect the character of Torlyte has even more to do with the measurement of the Audioquest sorbothane feet than you suggest, though of course I agree with you about the acoustic

coupling of parallel surfaces. I find sorbothane very useful (I use hemispheres from the Tweak shop in California – like those on the Mission *Isoplat* but softer), but used alone they have a bad effect on bass solidity and focus. However, Goldmund pioneered a way of using them that gives the best of both worlds – they combine two or more sorbothane feet with one *Tenderfoot* cone. I've found the best position for the *Tenderfoot* is near the armbase of a turntable or under the D/A chip on a CD player. This particular component seems to be particularly sensitive to vibration – damping it with layers of sorbothane or *dedshete* brings considerable sonic improvements.

I'm becoming more and more convinced that acoustic feedback is a major reason why amplifiers sound different. The fact that putting a couple of flux dumper bricks on top of almost any piece of electronic equipment makes a change for the better gives some indication of its importance. I wonder if the characteristics of Meitner amps, which reviewers find somewhat unusual, are due to their wooden cases?

One reason for the good results from Deltac and Townshend bases on electronics is that their mass provides a sink for air-induced vibrations. It's an approach I've used successfully, but arranging the details of damping and supporting the mass is quite tricky; total success in removing all the resonances still escapes me.

So should reviewers put amplifiers under test in a soundproof cubicle, away from the speakers, or could a test be devised to identify their susceptibility to feedback? Would it be possible to measure the effects of a square wave directed from a Quad *ESL63* onto an amplifier, to establish what ringing it excites electronically rather than mechanically?

This must sound like opening a very messy can of worms – but it might persuade manufacturers to do something about the problem.

DAVID FOXON,  
MARSTON, OXFORD.

## THE CORRECT RESPONSE

I was very pleased to have come across your comprehensive guide to cassette decks (Issue no 52) in which you appeared to stress the importance of good record/playback head alignment. Apparently good azimuth alignment can only be achieved with IEC test tapes. I would be grateful if you could tell me how much these cost and where I can get hold of one.  
A. F. NISBETT,  
BIRMINGHAM.

*It seems you may have misread Alvin's piece on cassette decks as the IEC (International Electrotechnical Commission) reference is a BASF Calibration tape (ferric, 120µS), which represents a replay response standard all cassette decks theoretically adopt. An alignment cassette is commercially available from TASAC but it retails for £34.50 which is more than it would cost to get the job done by a dealer. However, this tape does contain tones for testing speed accuracy, frequency response, speaker coloration and phase correctness – if you want to go that far.*

*One dealer suggested that doing it by ear was as good a way as any, and this is probably true, though there remain pitfalls nonetheless. The technique is to adjust for maximum high frequency output – incorrect azimuth will lead to the left and right channels becoming slightly out of phase which is most noticeable as HF cancellation and loss. The difficult question is in choosing the cassette with which to do the job. One can either align to a prerecorded cassette, which ought(!) to be correct, but those with large collections of self-recorded tapes might do better to align to one of those.*

## FIGURE IT OUT

In the 'Test results' for the Nakamichi CR-2E (April issue *Cassette Decks*), the weighted wow figure is quoted as being 0.984 per cent. I am sure this is wrong as it's higher than any of the other weighted wow figures in the review.

I'm considering buying a cassette deck and the CR-2E is on my shortlist, alongside some of the Denons which seem to have more facilities but not the reputation of the Nakamichis. The CR-3E would be nice but it's out of my price range.  
MICHAEL LOCKLEY,  
LEEDS.

*Well spotted, the weighted wow figure for the CR-2E was indeed incorrect. The correct figure is 0.098 per cent which is an order of magnitude out from our published figure.*

## HOLLOW HORNS

I have a pair of Lowther Acousta (horn loaded) loudspeakers installed about nine feet apart at each corner of my room, which are driven by a NAD 3020E amplifier. The tonal balance seems to be too 'cold', even 'hollow' and 'clinical', which I don't particularly like. Turning up the bass on the amp helps somewhat but is still unsatisfactory. Turning up the bass too far gives an unnatural boom. I use good quality headphones quite often and they give a much superior quality. Is there anything I can do to improve matters – would a graphic equaliser produce a worthwhile improvement? I'm rather reluctant to throw out the speakers so would be grateful of your suggestions.  
J. E. COLCLOUGH,  
HIGH WYCOMBE, BUCKS.

*We haven't formally tested the Louther Acousta speakers but your description would seem to fit in with our experiences of them. Despite your reservations, replacement would seem to be the most cost efficient way of improving the sound of the system. A graphic equaliser would be able to tailor the tonal balance, but due to the extra barrier in the signal path, fidelity would inevitably be compromised. Our June issue contained over 30 new loudspeaker reviews and could be used as a guideline for selecting a new pair (it can be ordered through our back issues department). That said, horn loudspeakers do seem to have unique dynamic qualities that conventional models seem to lack, so check before you change.*

## POST PURCHASE PARANOIA

On the basis of what I read in various hi-fi magazines (including *Choice*, in which I found the *Directory* most helpful) I selected a budget system comprising of an Ariston Q-deck, NAD 3020E and Celestion DL4 speakers.

When I went to purchase the system the dealer offered me a pair of KEF C40 speakers for £150 (apparently they were from a batch that has been used for testing by the manufacturers, though in perfect condition). In comparison with the DL4s they

sounded much more powerful and had nice bass so I ended up buying them. After setting the system up at home I was still impressed with the bass but rapidly began to feel disappointed with the rest of the sound, especially after reading your comments in the *Directory* (the first thing I did!). I don't know if this prejudiced my opinions but they seemed to sound exactly as you described – lots of power but little detail. I started to miss the clear crisp sound of the DL4s (at moderate levels) and became disillusioned with the C40s, and even started to look up what other speakers I could have got for the money. The Celestion DL6 IIs looked like a better choice.

As I bought the system at a BADA dealers I have the option of changing the speakers for up to two weeks. What should I do?  
DAVID AKWUE,  
THORNTON HEATH, SURREY.

*I'm glad your findings match up with ours but wouldn't really advocate this sort of after-purchase review dependency, especially if it heightens insecurity about the selection. However, if you find the KEFs as disappointing as you say, your two week sojourn is worth taking advantage of. We gave the DL4 a Best Buy rating in its original form but have not tested it since the upgrade and we also reviewed the DL6 II in last month's Loudspeaker test but it failed to achieve Recommendation. At around £150 we would recommend the JPW AP2s and the new £130 Infinity RS2000s, and Heybrook's classic HB1s are also worth a listen.*

## HAVE YOU HEARD LYNETTE?

I recently purchased a Linn LP12/Ittok/Troika and a Naim NAP 90/NAC 62 combination which I'm using with a pair of Lecson Lynette speakers that were given to me. I have been unable to discover anything about them and wondered if you had reviewed them in the past or could give me some idea of their capabilities. Although I am pleased with the sound I'm getting, I am considering buying a pair of KEF 104/2s. In your opinion, would I hear any noticeable improvement?  
BRENDAN KEDIE,  
TUNBRIDGE WELLS, KENT.

*The Lecson Lynettes managed to avoid our attention when they were around but apparently they were designed by Stan*

*Curtis, now of Cambridge Audio, back in 1978. Stan is renowned as a wizard in electronic audio design so the Lynettes could be fairly good speakers. However, their vintage alone probably means that more expensive contemporary loudspeakers represent a sonic improvement. The 104/2s are likely to bring benefits all round, except for the space they occupy, but we'd suggest you take your Lecsons down to the dealers and make a comparison for yourself. Some other speakers worth bearing in mind are the Musical Fidelity MC4s (£499), Spica TC-50s (£595) and Spendor SP1s (£640).*

## TRADING SPECS

Reading your interesting and useful *Cassette Decks* Issue I noticed certain figures which seemed rather strange but were not commented on in the text. On Type I signal/noise the Sony TC-R303 is some 8dB better than the Nakamichi CR-1E, 2E etc. Surely the Nakamichi's should be good in this respect?

Secondly the Sony ES range is meant to be better than their ordinary models but once again Type I noise figures for the TC-R303 were 4dB better than the TC-R503ES. Is this just chance?  
D. W. SOUCH,  
ST. ALBANS, HERTS.



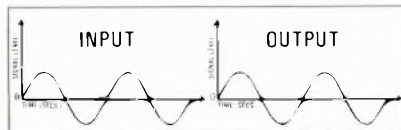
*The Nakamichi CR-2E – there's more to music than specs.*

*It's true that the Sony TC-R303 has better signal/noise figures than the other decks you mention but that's about the only area in which it does compete. The Nakamichis trade off a slightly worse noise figure against a far superior bandwidth, i.e. on Type I the CR-1E gives you an extra 7kHz of headroom above the Sony's 10kHz limit. The same can be said of the ES machines, which also offer lower distortion on all tape types. What is, of course, far more important is sound quality which is not so easily tagged to certain elements of lab performance. The Nakamichi reputation has been built on the fact that they tend to concentrate on sound quality and engineering integrity rather than the latest noise reduction system or whatever.*



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## PERSPECTIVES

*Amplifiers sound different, we know, but why they sound different is not so clear cut. As Richard Black explains, a successful design is one where the designer's recipe of ingredients produces a palatable result. Trouble is, we don't all have the same taste . . .*



# THE *Right* *Ingredients?*

**O**ver the last ten years, one of the strongest contenders for the title 'Most hotly debated subject in audio' has been amplifier sound; its existence or otherwise, its origins and its nature.

The reasons for this debate are mostly obvious, relating to the much-vaunted 'perfection' of electronics as an art and the notable absence from amplifiers of such unknown quantities as moving parts. "This amplifier produces less than a one-hundredth of a per cent harmonic distortion," cry the hardened objectivists, "how can you possibly hear that small an imperfection?"

But amplifiers do sound different, a fact which is sufficiently widely accepted that we no longer feel the need to cite various blind listening tests to back it up. The famous dictum that 'all well-designed amplifiers sound the same' may be true, but it's a brave man who will point with certainty to any two amplifiers and say that they are well designed – or well *enough*

designed – where enough means that all their various distortion artefacts are always inaudible. If we only knew exactly what distortions we were hearing, we would know the length of that particular piece of string.

### POTTED HISTORY

The history of amplifier sound goes back a long way, certainly further than one would gather from a perusal of hi-fi magazines from around ten years ago, when the subject was treated as a novelty. My personal theory is that the whole subject of hi-fi technology was discovered between 1924 and 1928, since every time I open a technical journal from that period I come across some modern 'invention' described in detail.

In the case of amplifier sound, the invention that really set the ball rolling was that of negative feedback, in 1924, by Harold Black (no relation!). This opened the way for low distortion amplifiers, origi-

nally intended for telegraph use but soon applied to sound reproduction. Public address loudspeakers of the period were capable of astounding performance, and there can be no doubt that amplifier improvements were audible. Amplifiers for cinema and public address use were built with distortion below one per cent, and some of these sound a lot better than might be expected. 78rpm records also bear witness to the existence of quality amplifiers from 1930 or earlier.

Improvements in electronic circuit techniques in the 1930s and '40s helped amplifier design advance, and acoustical work done by Fletcher and Munson, and by Olson, laid foundations for specifying audio amplifiers properly. Perhaps the first amplifiers that can still be called 'high fidelity' today were built by McIntosh in the late 1940s. Relying on their superbly ingenious transformer designs, these amplifiers achieved a specification and sound quality that continues to set an example.

The 1950s brought a much wider awareness of high fidelity thanks to the work in this country of Leak, Quad and Radford, and few at that time would argue about the superiority of any of those designs to cheap radiogram amplifiers. In the '60s, as transistors became popular after Jack Dinsdale's pioneering transformerless design, the growth of 'specmanship' led some manufacturers to produce worse-sounding amplifiers than before. But quality amplifiers continued to sell and improve. In the '70s, as the inadequacy of simple harmonic distortion measurements became clear, some designers started to investigate more subtle effects, and the fruits of this work are the foundation of today's science of amplifier sound. David Hafler, Mark Levin-



*Quad II valve power amps – they showed radiogram amplifiers a thing or two.*

son, Matti Ojala and Tim de Paravicini are just some of the foremost designers of that period still active. And many designers since have produced important new products, bringing the price of quality down significantly.

Having arrived in the eighties, the age of the single-chip computer and other science-fiction-come-true creations, the perfect amplifier has still not been designed. Instead, we are faced with a plethora of designs and design philosophies more bewildering than ever. Valves, transistors, MOSFETS, 'super-feedforward', low feedback, 'current dumping'; all buzzwords, the significance of which is fully understood by fewer people than like to say so. Let us examine some of these recipes.

## TESTING THE WATER

The question of type of active device used in an amplifier is a particularly emotive one. (An 'active device' is a component that has gain. Hence transistors, valves, etc. are active, but resistors, capacitors and diodes are passive.) Valves are supposed to sound 'sweet' and 'warm', whereas power amplifiers using transistors have lots of 'guts' and 'punch', and MOSFETS (Metal Oxide Semiconductor Field Effect Transistors, as distinct from ordinary bipolar transistors) can sound 'hard' and 'clinical'. In more technical terms, we are told that MOSFETS are faster than transistors and more linear in their characteristics. Valve amplifiers, the transistor advocates tell us, sound only as good as their output transformer which limits their quality badly. Valve enthusiasts will assert that transistors aren't fast enough to sound good. And so on.

In fact, all these statements are at best half-truths. The best designs in any field are the ones that match the right methods to the right materials; for example, in building a house you would not join the bricks with *Evo-stik*, or the timbers with mortar, although each adhesive is very good in its proper application. And it seems reasonable that perhaps not all active devices like to be used in the same way in amplifiers. In other words, if an amplifier is built with the 'best' available transistors in a circuit intended for valves, it won't work properly. So one must go into more detail to find out what is really going on. We will do this shortly.

As for the other buzzwords, they too are only part of the story. Take 'low Total Harmonic Distortion (THD) for example. This means that when the amplifier is fed with an input that consists of one frequency only, its output contains next to nothing but the same frequency, at a higher level but with negligible additions due to the amplifier. This is very good. But what happens when the amplifier is fed with a complex tone consisting of many frequencies? Very simple theory says that the output will still be pure and uncorrupted. More



*Foremost designer Tim de Paravicini is still active producing his own E.A.R. amplifiers.*

complex theory says that it ain't necessarily so. Practice supports the more complex theory, indicating that the simple theory is *too* simple – the condition may be necessary but it is not sufficient.

'Low feedback' is recommended by some manufacturers and experts. Others say that this increases distortion. 'Feedback' means that some of the output signal is subtracted from the input signal in an amplifier, so that the difference between them, consisting of distortion, can be partially cancelled. So higher feedback (more of the output signal subtracted, crudely put) should indeed reduce distortion. The trouble is that it takes some time for a signal to travel through an amplifier, and that delay, small though it is (around a millionth of a second), can cause unfortunate things to happen in a circuit with feedback. So unless feedback is used *very* carefully it may be a case of pushing down distortion in one place, only to have it pop up somewhere else – and, in terms of audibility, the somewhere else may be worse than the original place.

Another favourite selling point is the 'class' of an amplifier. 'Class A' sounds as if it should be better than 'Class B', and is often claimed to be. These terms mean that the pair of active devices almost universally found in the output of power amplifiers (valve, transistor or whatever) either both pass current all the time (Class A) or half the time each (Class B) or something in between (Class AB). Class B is fine if the devices can be made to turn on and off fast enough, but most amplifiers use a Class AB compromise to mask the fact that 'fast enough' really needs to be pretty fast. Class A reduces crossover distortion which occurs with Class B, but it is not the only way to do so, and the price paid is high power consumption under all conditions and a lot of heat generated. Class D amplifiers are Pulse Width Modulation types, which switch fast current pulses to the output, while designs such as Class AA and Class G, etc are mostly prop-

rietary variations on Class AB.

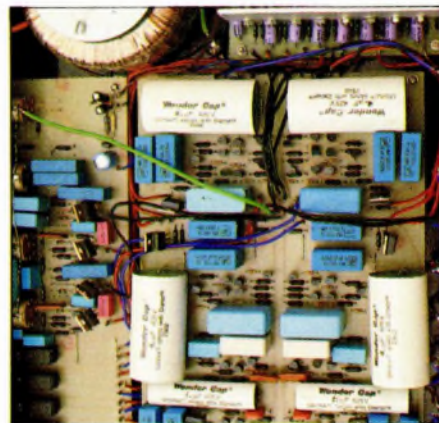
A survey of today's highly regarded amplifiers reveals examples of almost every design approach imaginable. Musical Fidelity use MOSFETS in their big power amps. Krell use bi-polar transistors; both use Class A and 'battleship' construction, DNM use MOSFETS and 'small is beautiful' construction. Esoteric Audio Research use valves and transformers, New York Audio Labs use valves and no transformers, Berning use valves in switching-type circuits, Deltec use custom hybrid microcircuits. And so on.

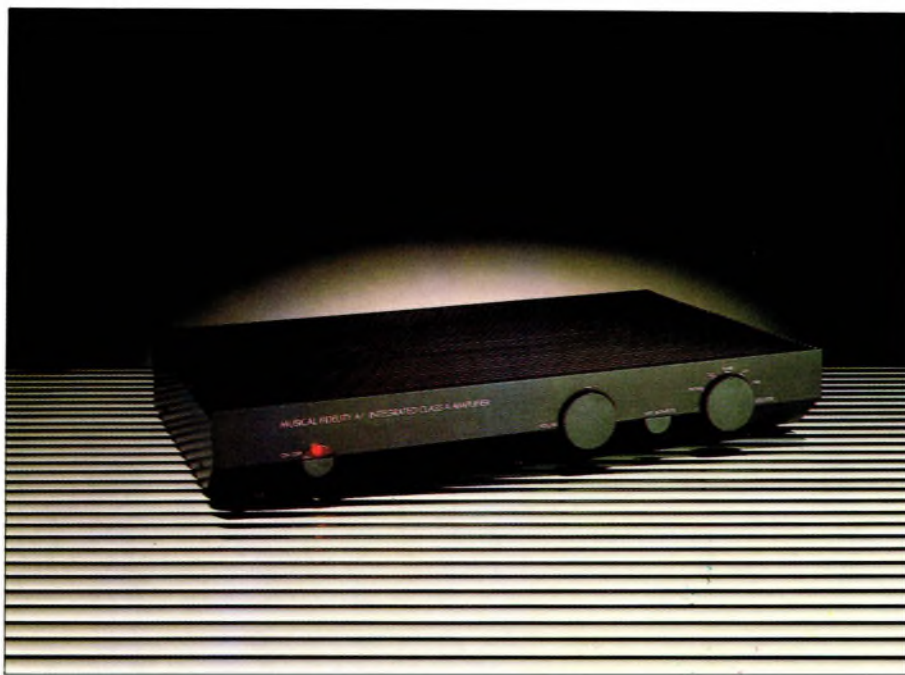
## SERIOUS STUFF

Having disposed of the 'marketing level' descriptions of amplifiers, we come to the 'circuit level' version. At this point it is helpful to list some desirable properties of amplifiers.

Absolutely in general, an amplifier should be accurate; that is, it should introduce as little distortion into the signal as possible. 'Distortion' in this case means anything at all which is not a perfect image

*Choice of components is important. Even the humble resistor can influence sound quality.*





*Musical Fidelity's A1 is heavily biased towards Class A. The price paid is a lot of heat generated.*

of the input. This breaks down into the following:

*Harmonic Distortion*, or HD, (not Total Harmonic Distortion, which according to the IHF definition means *all* distortion of any nature), measured using sinewave (single frequency) inputs. This distortion consists of multiples of the input frequency, often twice or three times the frequency. Roughly speaking, 2nd harmonic (twice the frequency) distortion is audible at three per cent level, 3rd harmonic at one per cent, 4th at 0.3 per cent and so on. In practice, 0.1 per cent HD may be adequate as 5th and higher harmonics are not often present.

*Bandwidth limiting* – a perfect amplifier amplifies all frequencies, but a real one must stop somewhere.

*Noise*, consisting of background hiss. This should be all but inaudible in the absence of an input signal, for any amplifier.

*InterModulation Distortion (IMD)*, which occurs with multiple frequency inputs as sum and difference frequencies.

*Current limiting* in power amplifiers, when they run out of 'oomph'.

*Phase distortion*, when some frequencies get held up by the amplifier more than others, so that complex signals don't come out of the amplifier all at once.

*Clipping*, when the output can't go up and down far enough.

*Slew rate distortion* (transient distortion), when the amplifier output can't get the output up and down fast enough to match the input.

*Various other* things such as modulation noise, power supply modulation, etc, not to mention the distortions for which there are as yet no names!

Of the distortions described above, some should simply not happen. Clipping, for example, only occurs when the amplifier is driven too hard (if your power amp clips a lot it isn't powerful enough for you, simple as that). But some forms of distortion,

including HD, can only be reduced rather than removed. And noise is inherent in everything, but fortunately is often effectively negligible. For example, the signal-to-noise ratio of a 100watt loudspeaker is 174dB; this amount of noise is utterly inaudible under all conditions and can be completely ignored. Noise only becomes a serious problem in low-level stages such as disc (phono) inputs.

HD and phase distortion are at least easily measured, but their precise audibility is open to question and there is a lot more to phase, including absolute phase (does it suck or blow?), than is often assumed. The really nasty distortions are those that depend on the signal, principally the various forms of modulation distortion. These are difficult to measure for a start, and they can be audible in very small amounts, so they are a bugbear to designers, reviewers and purchasers alike. These are the factors that sort the sheep from the goats in amplifier design, but since they are frequently rather subtle and appear in different ways to different people, they also account to a large extent for the proliferation and success of different sounding amplifiers.

What causes these distortions? In the main, limitations in the performance of active and passive devices in amplifier circuits. All devices have limitations; good designs acknowledge these and work round them. The transistor amplifies currents, such that a small current fed into its 'base' causes a large current in the 'collector'. If the one were always in a constant ratio to the other, the device would be perfect. Since this is not so, distortion is generated by a transistor in any real circuit. The designer's job is to reduce this distortion to an 'acceptable' level. MOSFETS and valves pass current dependent on voltage applied to them, but again the ratio of current to voltage is not constant. In all these devices the amplification ratio depends on

current flowing, voltage applied, rate of change of current and voltage (frequency), temperature, even nearby objects.

Since all these things interact, it is not possible simply to optimise them one after another. Feedback can reduce nonlinearities, but as mentioned earlier it is upset by things taking a finite time to happen. Speeding up amplifiers is an obvious answer, but it is not always easy to do this without sacrificing some other parameter. The designer must perform a juggling act, trying to obtain the best mix of speed, linearity, noise performance, and so on.

## RIGHT UP TO THE NECK

Now the really tricky bit: what does all this lot actually sound like? Some distortions are more easily described than others. Clipping gives a 'crunching' noise and is very obvious in most amplifiers. Harmonic distortion in large amounts sounds rough and grainy. But because of the strange way in which the ear decodes sound, effects at one end of the spectrum may appear to be at the other end. For example, many early MOSFET power amplifiers have slack bass caused by the circuit not being fast enough, ie slew distortion. I have found this on several amplifiers, where improvements in the high frequency performance led to audible changes in the bass only. Small amounts of harmonic and modulation distortion tend to sound like slight veiling and loss of clarity at high frequencies (when people talk about 'removing veils from the sound' often what they are hearing is reducing modulation distortion). Phase distortion at low frequencies is often shown up by bass overhang (it doesn't cause it directly, but they can both be due to instability). Compression of dynamics is a common symptom of high feedback round a slow, distorting circuit (this design philosophy, fortunately now out of favour, gives good test-bench specifications but rotten sound).

So we start to see some reasons for the existence of stereotypes such as 'valve sound'. The classic valve sound is 'warm' and 'sweet'; translation, the classic valve amp (typified by Leak and Quad II designs) has low frequency instability due to feedback round the output transformer, high frequency limitations due to the low transformer self-resonance, and highish levels of modulation distortions. Today's better valve amps have none of these drawbacks. Class B transistor amplifiers sound 'compressed' and 'grainy'; translation, some (early) such designs use slow output devices (and it is worth noting that standard power transistors are about one tenth the speed of power MOSFETS, which are still slower than valves, although fast transistors have been available for some years

now) and lots of feedback to cure the resulting crossover distortion, resulting in very poor transient performance. Again, good transistor amplifiers avoid this problem. And so on. Space does not permit a detailed analysis even of common amplifier faults; I cite these examples to illustrate the fact that not only do amplifiers have sonic characteristics, but these characteristics can be sensibly explained in scientific terms.

In addition to the relatively well known forms of distortion, there are some rather subtle ones which often go unnoticed on the test bench but make themselves heard as very slight colorations, not always objectionable but inaccurate nonetheless. A topical example involves capacitors.

The British hi-fi scene has in the last four or five years noticed that different types of capacitor sound different. Yet apart from a few attempts, of varying success, to measure capacitors to audio standards most capacitor selection has been done by ear, empirically. In fact, capacitor sound quality correlates fairly well with some well-known (to capacitor manufacturers anyway) properties of capacitors, but the effects of the properties on audio circuits are far from obvious.

Now some people have found that putting small capacitors in parallel with larger ones makes an improvement, and in extreme cases as many as half a dozen capacitors will be found. Others have found that this makes a difference for the worse. I have tested some such combinations, and it seems that the net result is not a better capacitor than the original, but one which is in general no better or worse but which resonates at a particular frequency, often not far above the audio band. This resonance is excited by transients and high frequency information and intermodulates with the signal to produce distortions which, although only present in tiny amounts, are audible as an apparent high-frequency 'sweetness'. This is in fact a slight blurring of high frequency information, but it can sometimes sound like an improvement as it masks rough edges caused by other design imperfections. The effect has been known for some time, and designers Matti Ojala and Tim de Paravicini (them again) both found it and also the cure (adding a resistor).

Even the humble resistor can influence sound quality; good resistors (metal film or foil) sound better than cheap carbon ones, because the metal resistors introduce less modulation noise than the carbon. Modulation noise (which comes and goes with the signal) is far more distressing than constant background noise to most people, a fact which also accounts for the strange side effects of the recently-launched "NoNOISE" remastering system, and of DNM disc cutting. The brain is excellent at filtering out steady-state 'garbage' signals, but cannot do anything about rubbish that comes and goes.

## CONCLUDING

If you have read this far, you will have noticed there is clearly much more to designing audio amplifiers than might at first meet the eye. But this is all a bit abstruse; how is it related to the process of choosing an amplifier for your own hi-fi system? The important point is that, as you have doubtless realised by now, any amplifier design is a compromise. Cost is, of course, an important factor in the compromise, but by no means the only one. And it is up to you to decide on the order of preference of compromise.

For example, if you want an amplifier that has good bass performance and goes loud, but you aren't worried by a bit of top end spit and don't want to pay the earth, Brand A (which has good fast circuitry and plenty of power but suffers from some high frequency distortion) will be your choice. But your friend who likes to hear middle and high frequencies as clean as a whistle and is prepared to sacrifice some bass tightness will buy Brand B (which has low distortion but is a bit slow) for the same money. And yet another friend may buy Brand C simply because it fits in with his or her decor, or has lots of inputs for connecting up two tape machines and a hi-fi VCR.

In most circumstances, then, you will find that at almost any price range there are amplifiers offering clarity, or punch, or

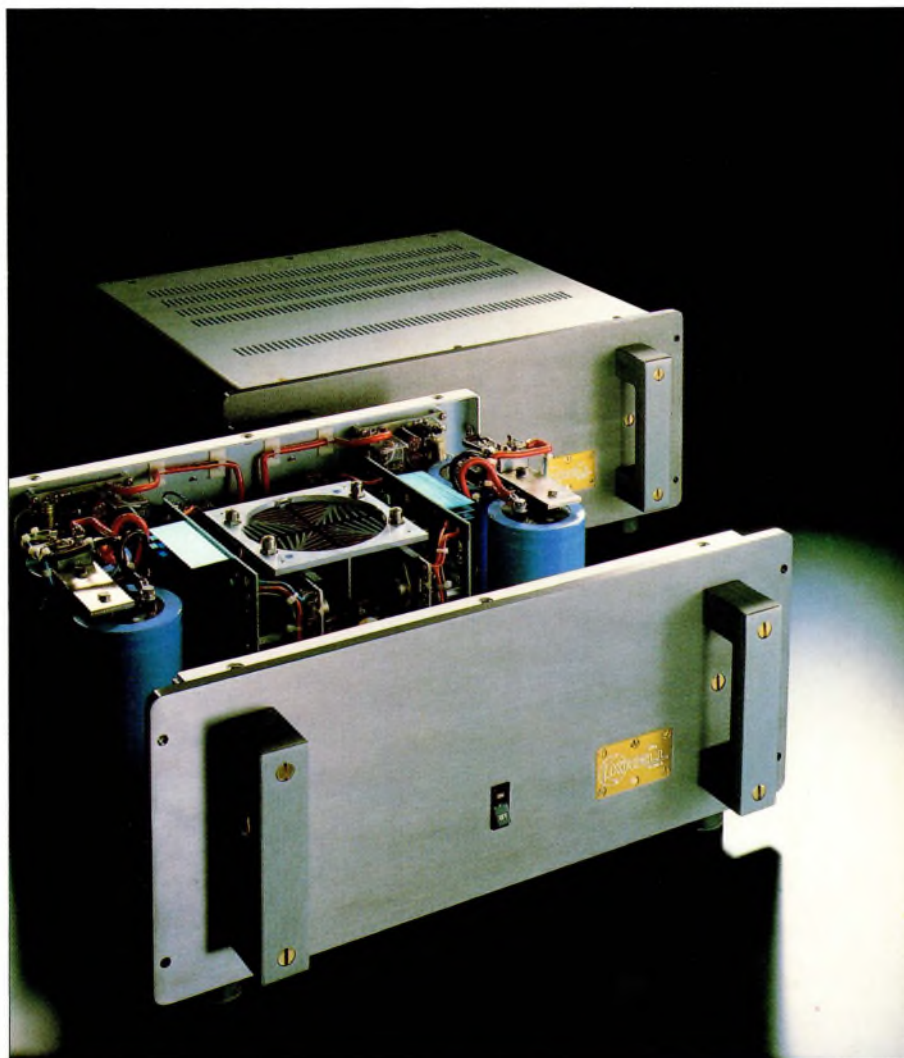
facilities, or looks, or power – but (almost) never all at once.

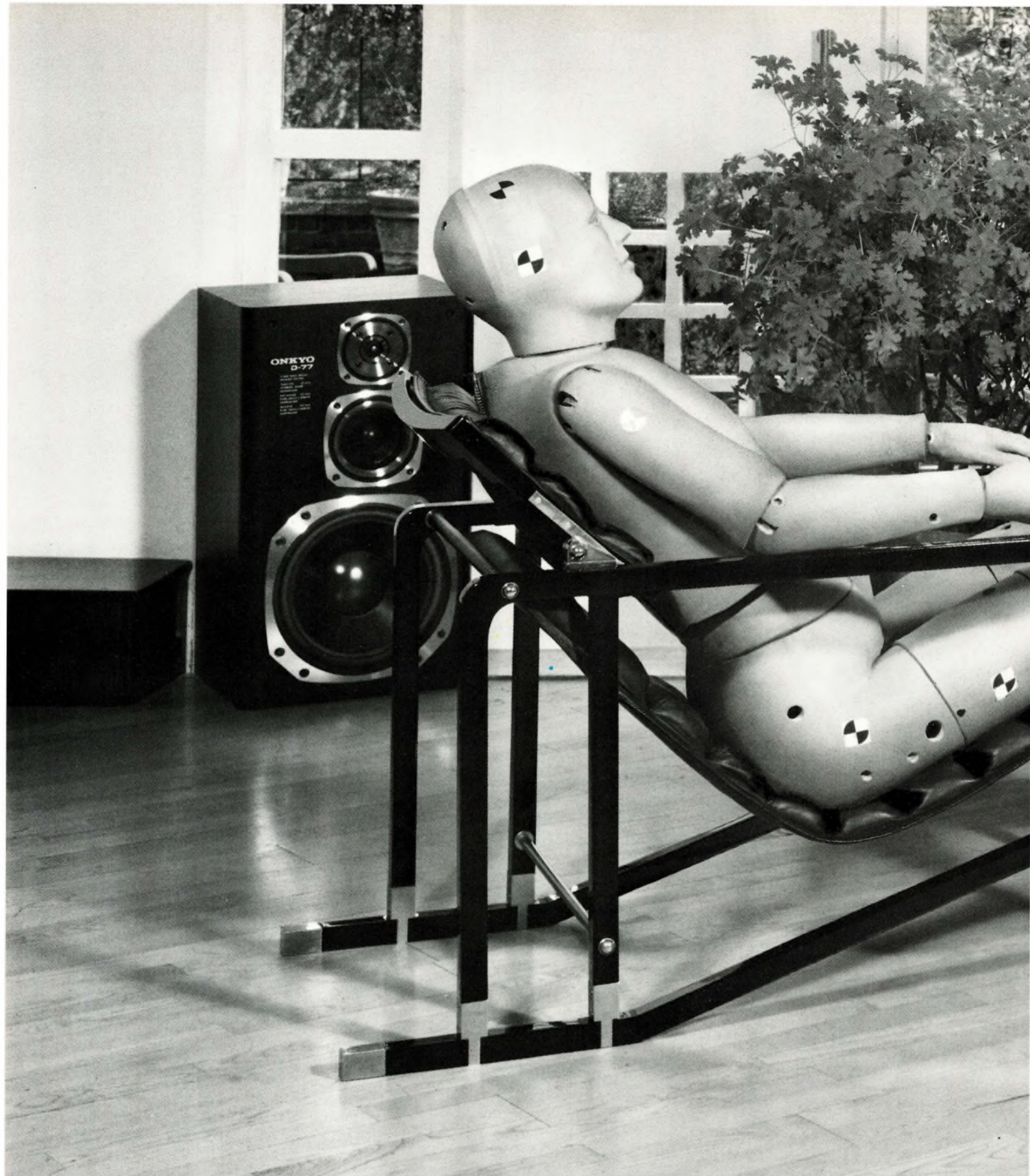
Only at the £1,000-plus end of the market do amplifiers start offering at least a bit of everything. And even then many are flawed, often grossly, in one way or another. Not everyone, many designers included, will always care for the most accurate products in any case, and it is worth remembering that the frequently-heard comments about 'system matching' are well justified when two system components have complementary flaws leading to a balanced end result.

If you've been hoping for a conclusion that tells you such-and-such a manufacturer or reviewer was right all along, and every else was just plain wrong, bad luck! On the contrary, most of them are part right, part wrong – some righter than others, to be sure, hence the relative success and longevity of some designs.

Hence my real conclusion, for the originality of which I claim no credit at all. Listen carefully and open-mindedly, and don't be misled by waffle or someone else's taste if you don't agree with it. The question to ask is, "Does it sound like the live event?" If the answer is "Yes", you can't be far wrong.

*Krell power amplifiers from the US – bi-polar transistors, Class A and 'battleship' construction.*





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SEPTEMBER ISSUE ON SALE AUGUST 12th

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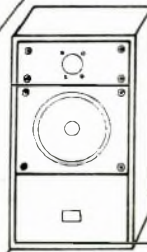


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# MARKET RESPONSE

*In our exclusive dealer survey this month Dan Houston asks the retailers about the reliability and popularity of one-name systems.*

This month's *Market Response* feature is compiled from dealers' comments on, and experience with, one-name systems. For the purposes of this article a one-name system is made up of different width components by the same manufacturer. In the course of the survey it became apparent that while customers may buy most of their system by one manufacturer, they often buy loudspeakers from a specialist (usually British) company, and may also use a different source component such as turntable. Bearing this in mind we have not made up an exact list of best selling combinations but have concentrated more upon the brands which seem to be leading the field.

Market response is incorporated in *Choice* to give readers a distillation of dealers' views; the approach is random across the UK and Ireland, to give as representative a view as possible although if a dealer wants to be regularly consulted then we do so. The subject complements the main review topic in the magazine but concentrates on different criteria such as reliability. Our reviewing methods scrutinise a given piece of equipment while Market Response looks at what happens when that equipment reaches the marketplace. We'll be looking at the sort of people who buy one-name systems as well as compiling a reliability chart and finding out what the 34 dealers we spoke to think about sound quality.

Our dealers rely on sales of one-name systems for between five and 70 per cent of their income, so we have a wide representation of shop types. The average figure worked out at just over 23 per cent. A couple of dealers (RPM and Jeffries) didn't stock any one-name systems arguing that they were no good because the manufacturer was spreading his engineering skills too much, thereby dissipating his genius and concentration. Karen Hole, of RPM told us: "We prefer to cherry-pick the best from each manufacturer. We would say to a customer, let me (who has more

experience) rather than you, choose compatible components."

The one-name system falls somewhere between the midi and what cognizant folk call real hi-fi. Real hi-fi, it must be said, like real fashion, is a mix and match business, followed by dedicated people who maintain a kind of hip safety by being in comparatively small numbers.

The appeal of the one-name system is that it offers a uniform style, whereas the tweaked and diverse set-ups of the buffs offer anti-style and the cachet of multiplicity. Of course, there are variations on the theme and many manufacturers comply in what is basically a one-name demand by supplying everything black and of the same width. This allows people to straddle the gap between those who buy a midi-system and the lovers of esoterica. If one accepts these two camps as the poles then one-name system buyers are more midi-polarised, while those who buy the 43-cm-wide packs from different brands are emulating the ethos of the esoteric camp. Of course, as the kindly plutarch Julian Richer pointed out, most of the mass-market Japanese brands are sourced from about three factories in the Far East anyway, making them all fairly comparable, soundwise at least.

The huge Japanese dominance of the one-name system market gave rise to dealers' lament that there was no complete British system; we don't make a cassette deck. A couple of dealers even said they were losing sales on British systems because they couldn't offer a cassette deck to match the other components. It has been said that British audio manufacturing is like the pimple on the Sumo wrestler's back, but that remark is not surprising when one considers that much of the British stuff is aimed at the trendy camp.

The company several dealers would like to see making a cassette deck is A&R Cambridge, who nearly offer a whole system with their Delta series of CD player, tuner and amplifier. One dealer mentioned that when customers bought a system the

cassette deck was one of the pieces they most wanted; if price came into it they would lose a CD player or tuner before relinquishing the tape option. One only has to look at software sales (£100m per year) to see that manufacturing a cassette deck is a viable option he told us.

When the comment was put to John Dawson, A&R's managing director, he said: "It would be nice wouldn't it?" However, introducing something like a cassette deck to the market, a cassette deck made in England, is not as easy as falling off a log and presumably mechanical components such as a transport mechanism would have to be imported rather than re-invented. Mr. Dawson wouldn't be drawn to public comment but offered a hopeful titbit with: "the subject is under scrutiny."

## RELIABILITY

Where reliability is concerned things are pretty good across the hi-fi spectrum at present. One dealer told us that from January to the end of May he'd only returned three items to manufacturers. The average return rates are more or less what we expected in the light of recent surveys, with many dealers declining to mention percentages feeling them insignificant. Just over a third gave us figures ranging from ten per cent with CD players to one or two per cent for other equipment. We calculated a mean average of 3.3 per cent of goods arriving faulty from the manufacturer.

CD players are still in the teething stage and dealers felt were not as reliable as, say, a turntable or even a cassette deck, but on the whole companies are getting better at producing reliable goods. Unreliable brands are often difficult to pinpoint because the more one sells of a product the more likely one is to find problems. And many dealers told us that if a product was unreliable then they would not stock it.

From comments on reliable

and unreliable products we have calculated the best and worst, the most reliable brands quoted as being Technics and Yamaha followed by Harman Kardon and Quad. Other notables were Musical Fidelity, A&R Cambridge, NAD and Nakamichi. Where unreliability is concerned only two companies received flak. Denon came out worst by one point to Philips. Most of the problems with both firms were with CD players although one dealer mentioned cheaper Denon cassette decks as giving problems. Various reasons were proffered and one retailer felt that increased demand had led to Denon over-reaching its production capability making quality control very difficult; Denon have done particularly well in reliability in past surveys. There were no particular problems but bad tracking on CD players and poor tape head alignment was mentioned.

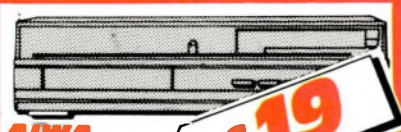
Hayden Laboratories, who import the Denon range, agreed there had been a couple of batch problems, both with CD players and cassette decks. With the CD players tracking problems had arisen from faulty polishing on the bars which transported the laser mechanism, according to Dave Allen from Hayden. However Denon have just issued two-year guarantees on their products which avouches their faith in reliability.

## CD NEEDED

Dealers were also asked whether CD based one-name systems were more popular than other sources. Sixteen told us they were, eight said analogue was still the prime source and three told us the situation was equal, while one cited cassette tape. Of course, many people would continue using their existing record deck with a new CD-based system or might buy a new record deck from a specialist company like Rega. Recent figures estimate CD players selling four times as many units as record decks with around 400,000 units per annum. The disparity between this and our figures -

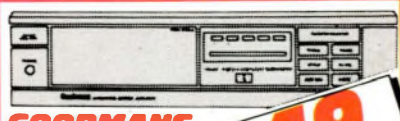
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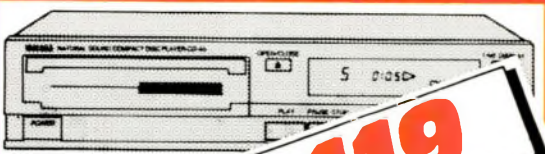


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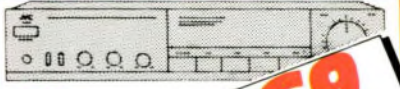
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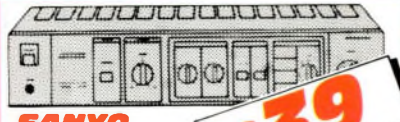
**YAMAHA CD-X5 C Disc**  
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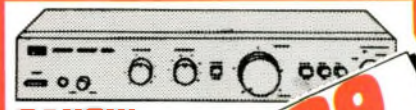
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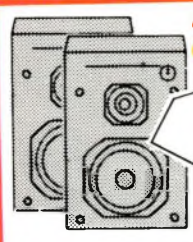
**SANYO JA220 Amplifier**  
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which suggest only twice as many CD players are bought – is partly borne out by some dealers' comments that customers were returning to buy their CD player at a later date. Several also mentioned that customers did not always buy the same brand CD player as the rest of their system.

### TROUBLE AND STRIFE

"We've sometimes gone round to the house with some Magneplanar speakers and she'll open the door and say: 'that's ugly! I'm not having that in my house, take it away'." This was the unfortunate position a dealer related when we asked about the kind of influences upon people to buy one-name systems. Just over half the dealers said that a married customer was likely to be influenced by his wife to buy a one-name system. A further eight dealers said one-name systems were chosen because of style and many commented that the system was bought on looks rather than sound quality. In fact, 19 dealers felt better sound could be achieved from separates by different manufacturers at the same price levels. Ten said the sound of one-name systems was comparable but some commented it was only the particular systems they offered which were as good, and more said the sound was only as good below the £600 price bracket. One dealer said the sound was comparable among more expensive systems such as Mission.

It was almost impossible to get an age group for one-name system buyers from dealers; we heard all age groups from 'young couples' upwards. One dealer gave us the aphorism: "single guys and single girls seem to buy separates but when they marry they buy one-name." We also heard the story of the one-name system being a compromise between the distaff side of the household's wish for a midi-stack to go between the book shelves and the male's chrysalid desire to flaunt ten-foot high speakers and join the cognoscenti.

A couple of dealers commented that one-name systems were bought because people felt "scared to mix and match separates". "They think they're going into a minefield and some are afraid the dealer might offload old stock onto them." This

degree of bafflement at the huge and bewildering choice with different brands was even brought up by Lawrence Merritt – our new advertising executive – who said he would probably buy one-name because it represented an easier option to separates. And he's even got access to all the back issues and advice from our hugely talented editorial team!

### EASY TWEAKS

The easiest tweaks one can make to improve hi-fi equipment are getting loudspeaker stands, cable and interconnects to go between the sources and amplifier. To everyone in-the-know this is extremely old hat but it seems more consumers are becoming aware of the advantages in sound quality available for comparatively little money. Over two thirds of the dealers asked said that customers recognised and bought stands and cables for their sonic merits. "Three years ago it was difficult to sell stands but now it is easy," was how In Hi-Fi put it. Retailers felt it was very simple to prove those merits and some said that even if a customer didn't reach for his chequebook immediately, the seeds were sown and he often came back and bought later. Dealers also said they were now selling a 79 strand cable (most popular: QED) with a system anyway, adding the cost onto the bill automatically. It was pointed out that if £500 was spent on a system then £50 for a pair of stands wasn't upsetting to customers. Interconnect cable isn't as widespread as stands or speaker cable, yet. One dealer said his customers were getting into interconnect at around the £800 per system mark, but again many said the advantages of a good interconnect could easily be demonstrated and could be regarded as an immediate upgrade.

### AFORE YE

The famous line "I'll be in Scotland afore ye" was surely never uttered by a BBC *Radio Four* FM engineer. Hibernia does not get the intellectual programme in stereo in spite of its huge 'serious listening' audience. It is something the Scots regret and none more so than tuner salesmen. After all, while a Scot can get away with a tranny-under-the-bed why bother investing all that sterling in a

tuner if you can't get stereo anyway!? Some Scots feel that the BBC have left them out on purpose – mocking their intelligence and even trying to pollute it with *Radio One* garbage while what they really want is clarity over the air waves to ingest the politics of the day. Happily this is something that is going to change and *FM on Four* comes to Scotland in September, according to the BBC, with the expected boost to tuner sales that has some of the dealers rubbing their hands in glee.

With more use being made of VHF by the broadcasting stations tuners will become a more important part of the system. The Audio Centre, in N Ireland, told us there had been a large increase in the sales of receivers (tuner amps) with the £179 Sansui *SX 500* selling well. Ireland may be a special case because there are some 20 pirate stations all operating legally if not with impunity. These all use FM and are apparently popular through the age and social strata.

### THE BEST SELLERS

To compile our best sellers list we asked dealers for their most popular brands in three price brackets. The price brackets are for systems although we did not specify that there had to be a tuner, amplifier, cassette deck, record player and speakers in a system – there can be any breakdown of components. The guide is therefore fairly rough. The results are calculated on a points basis: five for the best seller, four for the second and three for the third, and then added up.

#### Under £600

|             |    |
|-------------|----|
| 1) Denon    | 50 |
| 2) Yamaha   | 48 |
| 3) Marantz  | 44 |
| 4) NAD      | 38 |
| 5) Rotel    | 31 |
| 6) Technics | 31 |

#### £600-£1,200

|                  |    |
|------------------|----|
| 1) Marantz       | 34 |
| 2) Denon         | 30 |
| 3) A&R Cambridge | 25 |
| 4) Technics      | 24 |
| 5) Yamaha        | 23 |

The slightly lower scores are because many dealers told us customers were mixing equipment by different manufacturers at this level. Also A&R scored five points from all the dealers who mentioned them, meaning that if you walk into a shop selling A&R products you

are more likely to buy them than any other brand.

#### Above £1,200

|                     |    |
|---------------------|----|
| 1) Linn             | 29 |
| 2) Meridian         | 28 |
| 3) Musical Fidelity | 19 |
| 4) Quad             | 19 |
| 5) Mission          | 17 |

The results of this survey are only as representative as the comments from 34 dealers around the UK can be; we do not pretend this is a completely accurate picture. The survey relies on its random polling approach to be representative and should be seen as a pool, perhaps, of dealers' advice and comments.

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

Acoustic Arts, Watford.  
 Active Audio, Derby.  
 Aerco Ltd, Woking, Surrey.  
 Analog Audio, North Finchley, London.  
 Andrew Thomson Hi-Fi, Kirkcaldy, Fife.  
 Aston Audio, Alderley Edge, Cheshire.  
 Audio Excellence, Cardiff, Wales.  
 Audio T, London NW6.  
 Bowers and Wilkins Ltd, Worthing, Sussex.  
 Billy Vee Sound Systems, Lewisham, London.  
 Brentwood Music and Hi-Fi Centre, Essex.  
 Bridge Hi-Fi, Walsall, W. Midlands.  
 Chew and Osborne, Saffron Walden and Epping, Essex.  
 Covent Garden Records, Charing Cross Road, London.  
 Doug Brady Hi-Fi, London WC2.  
 Eastwoods, Leicester.  
 Grahams Hi-Fi, North London.  
 Hi-Fi Experience, Tottenham Court Road, London.  
 Holborn Hi-Fi, Aberdeen, Angus.  
 Horns Ltd, Summertown, Oxford.  
 Image Hi-Fi Ltd, Headingley, Leeds.  
 In Hi-Fi, Edinburgh.  
 Jeffries Hi-Fi, Eastbourne, E. Sussex.  
 JRC, Torquay, Devon.  
 Kensington Hi-Fi, High St. Kensington, London.  
 Lafayette, Dublin, S. Ireland.  
 Merrow Sound, Guildford, Surrey.  
 Paul Green Hi-Fi, Bath, Avon.  
 Richer Sounds Group, 13 shops around UK.  
 RPM, Clapham, London.  
 Standens of Tonbridge Ltd, Kent.  
 The Audio Centre, Portadown, N. Ireland.  
 The Audio File, Bishops Stortford, Herts.  
 The Cornflake Shop, Windmill Street, London W1.

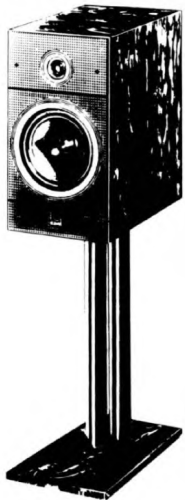
**NB Any dealer who feels aggrieved that he is not on this list, and would like to be consulted in future, either regularly or intermittently, please write to us at 14 Rathbone Place, London W1P 1DE, or telephone 01 631 1433.**

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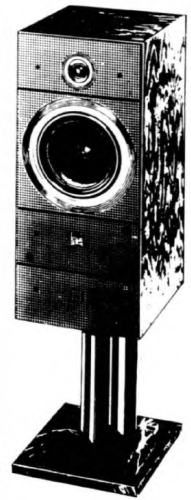
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**ABERDEEN** Bruce Millers, **ABINGDON** Haken & Bell, **ALTON** Balfour News, **AMERSHAM** Video Franchise, **BANBURY** Ritz Video, **BASILDON** Parrot Records, **BASINGSTOKE** Audio Videotronics Ltd., **BATH** Bath Compact Disc, **BATLEY** J & H Videos Ltd., **BEACONSFIELD** Atlantis Records, **BECCLES** Morlings Ltd., **BECKENHAM** KMK Records, **BELFAST** Gilmores Electrical, **BERKHAMSTED** ALTO Ltd., **BEXHILL-ON-SEA** Wilsons Stereo Library, **BEXLEYHEATH** TW Records, **BIDEFORD** Bradrick Rentals, **BIRMINGHAM** Easy Listening, **BIRMINGHAM** Peters Booksellers, **BIRMINGHAM** Reddings Rare Records, **BLACKBURN** Reidy's Home of Music, **BLACKPOOL** Alan Heywood Video, **BISHOP'S STORTFORD** Discus Music, **BLANDFORD**, **DORSET** Music Forum Ltd., **BOURNEMOUTH** Music World, **BOURNEMOUTH** Flicks Compact Disc Centre, **BOURNEMOUTH** Movement Audio, **BRAINTREE** Braitree Video, **BRENTWOOD** Brentwood Music Centre, **BRENTWOOD** Kelly's Radio, **BRIDGE OF ALLAN** Graham Robertson, **BRIDGEND** Roxene Records, **BRIDGEND** Tremauns Video, **BRIDGEWATER** Paul Roberts Hifi Ltd., **BRIDGEWATER** Dynamic Discs, **BRIDLINGTON** Quay Television, **BRIDPORT** Bridport Record Centre, **BRIGHTON** Sounds, **BRIGHTON** Rounders Records, **BRISTOL** Paul Roberts Hifi, **BRIXHAM** A J Pope & Sons, **BROMLEY** John Payne Records, **BROMSGROVE** Virgin Records, **BURY** Vibes Records & Tapes, **BURGESS HILL** Rounders Records, **CAMBRIDGE** Andrew McCulloch Electrical, **CARDIFF** Sound Options, **CARDIGAN** Video Venture, **CARTERTON**, **OXON** Ginger Records Video, **CHANDLERS FORD** Hampshire Audio, **CHANDLERS FORD** TV Audio Sales and Services, **CHATHAM** Kent Compact Discs, **CHELMSFORD** Kimberley Hifi Centre, **CHELMSFORD** Laser Discount, **CHELMSFORD** James Dace & Sons, **CHELTENHAM** Absolute Sound & Video, **CHELTENHAM** Good Music, **CHESHAM** RTS Video, **CHESTER** Chester Compact Disc Centre, **CHESTERFIELD** Hudsons, **CHINGFORD** Turntable Records, **CLEETHORPES** Taylor's Avenue Service Station, **CLEVEDON** Worlewind Records, **CLITHEROE** Hi Tech Audio, **CLYDEBANK** West End Records, **COVENTRY** Kimberley Hifi, **COVENTRY** Coventry Disc Centre, **CRAWLEY** Capital Cameras, **CROWBOROUGH** Harveys, **CROWBOROUGH** Revolver Records, **CROYDON** The Record Centre, **DARTFORD** Challenger & Hicks, **DEAL** Bizarre Music, **DERBY** Siren Records, **DERBY** Spot on Sounds, **DEREHAM** Blainemole, **DEVONPORT** B & W Computer Services, **DONCASTER** Foxes Music Centre, **DORKING** Datasound, **DOUGLAS**, I.O.M. Shocks, **DOVER** Humming Bird Records, **DOWNHAM MARKET** Lewks, **EASTLEIGH** Pinpoint Music, **EASTLEIGH** Television Audio Sales, **EASTBOURNE** Max Records, **EASTBOURNE** Seafords Music, **EDGWARE** Loppylugs, **EDINBURGH** Pattersons Sound & Vision, **EGHAM** Square Eyes Video, **ELGIN** Rockbox Records, **ENFIELD** Harum Records, **EPPING** Chew & Osbourne, **EPPING** Trumps Records, **ESHER** P&L Video, **EVESHAM** RVS, **FARNBOROUGH** S & N Compact Disc Centre, **FARNHAM** Venus Records, **FLEET** Mark One Records, **GERRARDS CROSS** The Video Factor, **GLASGOW** CasaCassettes Ltd., **GLASGOW** Echo, **GODALMING** Record Corner, **GRANTHAM** The Music Box, **GOSPORT** Individual Video, **GRAVESEND** D J Patchett Ltd., **GREAT YARMOUTH** Prism Leisure, **GUILDFORD** Sound Barrier, **HALTWHISTLE** Barry Cogan Ltd., **HARROW** Variety Video, **HAYWARDS HEATH** Mastersound, **HAYES**, **KENT** John Payne Records, **HEADINGTON** Absolute Sound and Video, **HERNE BAY** Gatefield Sounds, **HERNE BAY** Gower & Jones, **HORLEY** Television and Radio Services, **HORNCHURCH** Grapevine, **HORSHAM** Latimers Fine Music, **HORSHAM** Mellow Sound & Vision, **HOUGHT LEA SPRING** Gordons Ltd., **HOUNSLOW** Musical Images, **HOVE** Fine Records, **HULL** Sydney Scarborough, **HYDE**, **CHESHIRE** Hyde Music Centre, **ILFORD** Ley Street Video Club, **ILKLEY** SwallowMusic, **IPSWICH** Rex Records, **JERSEY**, C.I. The Disc Centre, **JOHNSTON** Stereo One, **KIDDERMINSTER** Sounds Around, **KILMARNOCK** Laser Audio, **KINGSTON-UPON-THAMES** CeeDee Vids, **LARKFIELD** Selectavideo, **LAUNCESTON** Status One, **LEAMINGTON SPA** Discovery Records, **LEAMINGTON SPA** The Tape and Disc Centre, **LEEDS** Audio Projects, **LEICESTER** Ainleys Records and Tapes, **LEICESTER** Kimberley Hifi, **LEICESTER** Leicester Hifi, **LEIGH-ON-SEA** Kelly's Radio, **LERWICK** Tom Worthington, **LINCOLN** PACD, CD Centre, **LIVERPOOL** Beaver Radio, **LIVERPOOL** Circles Records, **LLANDUDNO** Kavern Records, **LONDON W.1** Alto Ltd., **LONDON W.1** Atmosphere Music 6-10 Lexington St., **LONDON W.1** Playback Studio, **LONDON W.C.1** Templar Records, 86 High Holborn, **LONDON W.C.2** Covent Garden Records, 84 Charing Cross Rd., **LONDON W.C.2** Templar Records, 9a Irving Street, **LONDON W.C.2** Temple Bar Bookshop, **LONDON W.C.2** Winart Publications, **LONDON W.6** Spin-Offs, 96 Fulham Palace Road, **LONDON S.W.1** Alto Ltd., **LONDON S.W.10** Photosonic, 321 Fulham Road, **LONDON S.W.10** Rave-On Records, 218 Fulham Road, **LONDON S.E.17** A One Stores, 281 Walworth Road, **LONDON S.E.27** Stringray Records, 386 Norwood Road, **LONDON E.4** Turntable Records, **LONDON E.9** Hardware House, **LONDON E.C.4** Alto Ltd., **LONDON N.7** Sounds to Go, 130 Holloway Road, **LONDON N.20** Harum Records, Oakley Road, **LONDON N.W.10** Harum Records, **LONDON N.W.11** Lightening CD Centre, 90 Golders Green, **LONDON N.W.19** Harum Records, **LOUGHTON** Trumps Records, **LOUTH** Louth Video Centre, **LOWER STONDON** Star Video, **LYMINGTON** Disc & Tape Centre, **MACCLESFIELD** Ingredients, **MACCLESFIELD** Numerique, **MAIDSTONE** Alto Ltd., **MAIDENHEAD** Cee Dee Music, **MAIDENHEAD** Opus One Records, **MANCHESTER** Central Records, **MANSFIELD** Cassells Video, **MARGATE** Thornton Bobby Cliftonville, **MATLOCK** Hudsons, **MELKSHAM** P & R Sounds, **MIDDLESBOROUGH** Playback, **MONMOUTH** John Denton, **MORLEY** Morley Video Library, **NEW ASH GREEN** Kara's, **NEWMARKET** Harpers Music, **NEWCASTLE-UPON-TYNE** Alyntronic, **NEWCASTLE-UPON-TYNE** J G Windows, **NEWPORT**, **GWENT** Newport Disc Vision, **NEWPORT**, **GWENT** Roxene Enterprises, **NEWPORT (IOW)** W Teague & Co. Ltd., **NEWQUAY** Newquay Home Video, **NEWQUAY** Upton Disc and Record Centre, **NORTHALLERTON** Apple One, **NORTHAMPTON** Ritz Video, **NORTHAMPTON** Spin a Disc, **NORWICH** Prelude Records, **NORWICH** Sendasound, **NORWICH** See These CD, **NORWICH** Compact Disc Centre, **NORWICH** Scarfe Audio Visual, **NOTTINGHAM** A J Beckett, **OXFORD** Blackwells Music Shop, **OXFORD** Russell Acott Ltd., **PARKSTONE** Carnival Records, **PARKSTONE** Compact Sounds, **PINNER** Tempo Compact Disc, **POOLE** Movement Audio, **PORTSMOUTH** Domino Records, **PORTSMOUTH** Ross Records, **PRESTON** Norman Audio Ltd., **RADETT** Diamond Audio Visual, **READING** Jumbo Home Entertainments, **READING** Reading Hifi Centre, **REDHILL** Trufi Sound & Vision, **REDRUTH** John Oliver, **RENFREWSHIRE** Stereo One, **RICHMOND-UPON-THAMES** Earthshaker, **RICKMANSWORTH** Hifi Video Life, **RIPLEY** A Fowler, **ROCHDALE** J Koczur, **ROMFORD** Downtown Records, **ROSS-ON-WYE** Ross Records, **RUISLIP** Lightening Records, **RUGBY** Sounds Expensive Hifi, **SAFFRON WALDEN** Chew & Osborne, **SALISBURY** Domino Records, **SALISBURY** Suttons Music Centre, **SCARBOROUGH** Bernard Dean, **SHREWSBURY** Durrant Records, **SIDCUP** Leakes, **SITTINGBOURNE** Metro Music, **SKIPTON** John Phillip of Skipton, **SLOUGH** Slough Record Centre, **SOLIHULL** Alternative Audio, **SOLIHULL** Peters Bookshop, **SOUTHAMPTON** Hampshire Audio, **SOUTHAMPTON** Individual Video, **SOUTHAMPTON** Sonic Television, **ST. IVES** TV and Hifi Centre, **STAINES** Video Club, **STOCKPORT** Record Cellar, **STOCKTON-ON-TEES** Stockton Software, **STORNAWAY** Engeebret Ltd., **STORRINGTON** Discus Records, **STOWMARKET** Stannards (Stowmarket), **SUDBURY** Promenade Music, **TAUNTON** Paul Roberts Hifi, **HATCHAM** Bogarts, **THAME** Thame Video Club, **THETFORD** Felix Records, **TOLWORTH** Compact Disc Unlimited, **TWICKENHAM** Earthshaker, **ULVERSTON** The Music Centre, **WAKEFIELD** E G S Records, **WALLINGFORD** Astley Audio, **WALSALL** Sundown Records, **WALTHAM CROSS** Trumps Records, **WARWICK** Bonel & Curtis Audio, **WATERLOOVILLE** Focus Sound, **WATFORD** Hifi City, **WELWYN** Knight View TV Services, **WEST WICKHAM** Showells Records & Tapes, **WEST WICKHAM** Stirling Sound, **WESTON-SUPER-MARE** Paul Roberts Hifi, **WHITEHAVEN** Flix Video Centre, **WICKFORD** Adrians Records, **WILMSLOW** Rare Records, **WILMORNE** Square Records, **WINCHESTER** Whitwams Music Ltd., **WINDERMERE** The Record Shop, **Bowness** on Windermere, **WIRRAL** Belmont Video Centre, **WITHAM** Music Craft, **WITHAM**, Witham CD Centre, **WOKINGHAM** Mark One Records, **WOODFORD GREEN** Broadway Music and Vision, **WORTHING** Michaels Classical Record Shop, **WORTHING** Worthing Computer Centre, **WREXHAM** Wrexham Video, **WORCESTER** Laser Sound CD Centre, **YORK** Banks & Son (Music) Ltd., **YORK** Track Records, **YORK** Virgin Records.

# Doug Brady Hi-Fi

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# CHOOSING AND USING . . . ONE-NAME SYSTEMS

*One-brand separates systems sit somewhat uneasily between midi systems and genuine separate components.*

Traditionally, consumers fearful of the superficial complexity of a separates hi-fi system have turned to the ubiquitous rack and (more recently) midi systems for mental relief. Any worries concerning the likelihood of component incompatibility are presumed banished with the purchase of the friendly stack.

Nevertheless, the concept that one manufacturer's amplifier will not work with another's loudspeakers or CD player is largely a red herring. The relative output levels and input sensitivities of today's hi-fi components have long adopted certain acknowledged (if mostly unwritten) standards.

For example, it would be perfectly safe and feasible to mix'n'match any of the myriad components featured in this system test. Any problems that have arisen in the past have generally been due to the use of both very old and very new pieces of equipment, one example being the high peak output level of a CD player exceeding the input overload margins of a pre-CD amplifier. But even this need not be disastrous, for a simple attenuator (such as those marketed by QED) placed between CD and amplifier will reduce the output of the offending player and bring it in line with other auxiliary sources such as radio tuners and tape decks.

Accepting the occasional oddity with valve equipment and the old DIN standard, any thoughts about component incompatibility are largely groundless, and certainly do not constitute a valid reason for opting automatically for a midi system. Furthermore, it is generally acknowledged that midi systems do not provide the most cost-effective means of achieving a good sound.

On a superficial level, midi systems score by dint of the vast array of features and facilities that accompany the CD player, tape deck (usually double), record player, tuner, amplifier and loudspeakers. That said, many of these features are either

quite bewildering or soon found to be unnecessary after the initial honeymoon period is over.

The main attraction of a midi over a higher quality separates system therefore lies mainly in the twiddly bits, and in the assured visual continuity. Aesthetic co-ordination between separates has improved in these days of almost universal black, but the layout of facilities and the size of the units themselves will not necessarily remain consistent from one manufacturer to another.

This *Choice* test represents a genuine attempt to marry the visual continuity guaranteed by a one-brand system with the struggles of the potential audiophile to maximise sound quality for the money. In many respects such combinations recall the once-popular rack system, but the similarities are superficial and 'tower' furniture is rarely supplied. A number of these systems are somewhat contrived, and may not even be sold as complete packages in the usual retail outlets.

Nevertheless, a consumer who already owns a particular make of amplifier and CD player, for instance, is very likely to be influenced by brand loyalty when it comes to a secondary purchase of tuner or cassette deck. In one way or another, the concept of a one-name separates system remains a popular one.

As far as our test was concerned, the brief was simple: each manufacturer was to supply a sensible combination of units from their range. Naturally, not all companies cater for the same price points; not all are responsible for each and every type of component. Ultimately it depends on the particular expertise, or size, of the manufacturer in question. Therefore, instead of attempting to put a price restriction on the systems, we are able to examine the capabilities of certain product ranges from one end of the spectrum to the other.

Some of the systems may lack loudspeakers or cassette decks, for example, though the almost universal presence of a CD player

as prime source lends something of a theme to the test. In fact only AR was unable to supply a matching CD player, because the longstanding *CD-04* unit is currently being revamped. Fortunately, AR also manufacture a rather nice record deck, making the system an ambassador for those enthusiasts committed to analogue reproduction.

The philosophies behind each of the systems are as diverse as the price range they cover. Many are very straightforward 'audiophile' designs with the absolute minimum of spurious facilities. Others attempt to achieve a high level of user convenience without incurring too much of a penalty in the sound quality stakes.

Inevitably, however, that irrefutable law of physics rears its head; that is, there is no such thing as a free lunch. Applied to hi-fi this means that for a given production cost any increase in the number of facilities must eat into the cash allotted to the critical audio circuitry. Just how each manufacturer has coped with this juggling act is reflected in the outcome of both the technical and subjective (listening) tests.

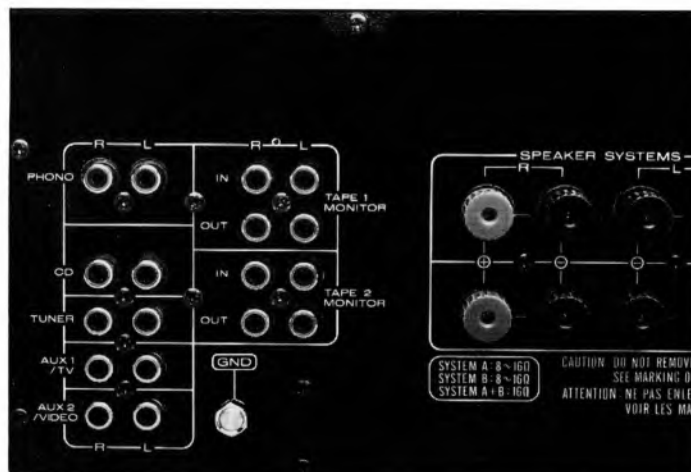
Of course, CD players represent one of the very few examples where features and sound quality do not necessarily clash – the fancy search, skip and memory facilities having more to

do with data acquisition than corrupting the audio stream itself. As such the CD players were accorded extra significance in our tests; the fact that so many were based around the popular Philips 16-bit 4x oversampling chipset simply made any comparisons all the more interesting.

Viewed as the heart of any system, the integrated amplifiers were also thoroughly examined and their subjective tonal 'flavour' compared against those of the accompanying separates. Whether the respective packages proved palatable or not was discussed in the text, but even those consumers who already own part of a system will be able to gauge the feasibility of completing it with other components of the same manufacture.

Nevertheless it proved most interesting to see just how far the one-brand system has evolved, especially with respect to its competition with true separates systems composed of selected audio components. Ultimately, one question has to be answered: are one-name systems still something of a false economy, or is there also sonic justification for such brand loyalty?

*Input sensitivities and output levels of today's hi-fi components have adopted acknowledged standards, so mixing'n'matching presents few problems.*



# ACOUSTIC RESEARCH

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Having been established primarily as a leading loudspeaker manufacturer over umpteen years, Acoustic Research moved into electronics components about 20 months ago with a variety of integrated and pre/power amplifiers, a tuner, CD player and two receivers!

All these products adopt a novel company style that includes a tilted matt plastic fascia, lending either a stepped look to components stacked atop one another or allowing the whole stack to slant backwards with the faceplates flush.

The *T-04* tuner is able to receive messages from AR's comprehensive remote handset, hard-wire linkages ensuring that the remaining components do not lose out, though for some reason or another the *T-04* was not supplied for review.

Neither was the *CD-04* for that matter, our test deadlines just pre-empting the launch of AR's new *CD-06* player. Unlike most of the other separates which are US designed and Far Eastern built, the *CD-06* is apparently designed by a British team, and is based on the now well-established 16-bit 4x oversampling chipset from Philips. Naturally, the analogue stages have come in for some concerted revision, and in this latest component the rather bland fascia is now fashioned from an alloy extrusion.

Despite all these disappointments AR did manage to provide the latest revised sample of the popular *EB101* record deck, a classic design that has been regularly updated over the years.

The real surprise came in the form of some new loudspeakers, built by a company called Rowen Research in Switzerland. Currently

distributed in the UK by AR, this new product range consists of three rather unusual, tall loudspeakers, all based on modified AR drive units of course!

## EB101 TURNTABLE (Revised)

While the electronics venture may be a comparatively new direction for this company, historical links with suspended-subchassis turntable design extends back over 20 years. In many respects the *EB101* is a modern day version of those early turntables, using improved materials and engineering know-how to achieve the same results.

A lightweight, T-shaped subchassis fashioned from steel sits on three conical springs which can only be adjusted by removing the base of the turntable. AR has shied away from using foam dampers within the conical springs in the interests of performance, though a degree of control is exercised via some felt strips that locate against the central suspension supports. This sort of technique represents a compromise between improved lateral stability and a partly short-circuited suspension.

The main bearing is composed of a polished and hardened steel ball running on a tungsten carbide thrust pad, the main shaft held in contact with lead-bronze sleeves and charged with oil to reduce friction and bearing noise. The high calibre of this bearing was revealed on measurement in the B-wtd, rumble figure of  $-78\text{dB}$ . The unweighted figure ( $-53\text{dB}$ ) was unfortunately compromised by an extended electrical spectrum (hum), a strong 100Hz component dominating all the mains-related harmonics.

This latest version of the *EB101* has a new 12-pole synchronous motor linked to a double pulley that provides both  $33\frac{1}{3}$  and 45rpm speeds. A flat rubber belt drives a lower sub-platter while the record is supported on a new die-cast zinc alloy main top platter. This new 1.8kg platter lacks the interference fit of the original design and now incorporates a black, textured edge and a roughened top surface. An ordinary resistive felt mat mechanically couples the disc vinyl to the dissimilar impedance characteristic of the alloy platter. An impulse test demonstrated a strong reaction to the initial shock followed by some lower amplitude transmission waves (20Hz) and a degree of positive 'float' that is typical of such a system using a light, felt mat.

Alongside all these detailed modifications, the plinth has also come in for an aesthetic re-think. A single sheet of chipboard has been machined and folded about its edges to improve both the visual continuity of the product as well as increasing the overall rigidity without adding more mass. The black vinyl covering is complemented by a tinted injection-moulded dust cover.

To complete the package, the *EB101* is equipped with its own straight-tubed tonearm and a basic moving magnet cartridge. Sourced from Jelco and permanently fixed to the deck, the arm uses cheap but nonetheless sufficiently competent offset lateral bearings, and has a calibrated counterweight and bias dial. The adjustable headshell appears to be made of alloy, which is good news from the energy transmission point of view, but this does bump up the

effective mass of the whole arm to around 14g (inc. 1.5g of hardware). As a result, lower compliance cartridges should prove the more sensible match. Fortunately, the low cost Glanz *MG-70R* MM supplied seems to fit the bill quite admirably.

## A-06 AMPLIFIER

Do not be fooled by the deceptively lightweight appearance of this integrated amplifier. Beneath the surface, however, the metal chassis, substantial extruded alloy heatsinks and two laminated-core mains transformers provide unexpected weight – so take care when lifting!

The sloped plastic fascia also looks deceptively empty, with a row of input select keys and a large rotary volume control. Nevertheless, the *A-06* caters for both MM and MC vinyl disc inputs, CD, aux and two tape recorders. Pre-out and main-in sockets allow the amplifier to be used as either pre- or power amplifier instead of its usual role. There is even a separately buffered input for the connection of one or two VCRs, although it is impossible to record the audio signal from CD or vinyl disc onto the attached VCR's soundtrack.

Two rotary tone controls (with an accompanying defeat switch) lurk beneath a hinged flap on the left of the fascia, alongside a balance knob, stereo/mono mode switch, tape/VCR select, together with a mute switch that reduces the power output level by 90%. These functions should be more than sufficient for all practical purposes, although the rather tacky-looking and mechanically loose selection keys are hardly likely to inspire confidence in an enthusiast used to chunky and robust knobs and buttons. Fortunately, the loudspeaker terminals at the rear of the amplifier are capable of accepting 4mm plugs. And aficionados of flashing lights have not been forgotten either, as each input selector has its own individual green LED strip.

Internal wiring and constructional standards left some room for improvement. The Sanyo *D1047/B817* output devices, for example, were covered in heatsinking compound. (These are similar to the high current output transistors employed in Rotel amplifiers, by the way.) A discrete long-tailed pair forms the input to the disc stage and RIAA equalisation is effected by frequency dependent feedback around this and a single Signetics *NE5532N* op-amp. The vinyl disc response plot shows a degree of tailoring: there is a 0.7-0.8dB LF hump around 40Hz on both MM and MC inputs; the response then flattens throughout the midband only to rise again by +0.4dB at 7kHz. No doubt this explains the warm, somewhat sluggish character noted during the listening.

Other results were fine, the *A-06* requiring a nominal 2.85mV input (MM) for full output

and benefitting from a substantial +32.8dB headroom (rel. IHF). 81.6W as delivered into 8ohms, a +1.69dB rise into 4ohms being recorded. Stereo separation at an average 66-67dB was reasonably consistent throughout, while THD also settled at a constant 0.012%.

## ROWEN R-3 LOUDSPEAKERS

Least costly of the four new Rowen loudspeakers, the *R-3* is a two-way design with a single 25mm soft dome tweeter married to a pair of 160mm bass/mid units. Viewed in cross-section, the *R-3* cabinet has two parallel side faces of unequal width, joined by two MDF baffles mounted obliquely to one another, the shape and construction providing sufficient bracing. Built as mirror-image pairs the two bass/mid drivers are not mounted together on the same baffle but radiate doublet-style in opposition, one on each of the two angled baffles.

Rowen claim that this technique results in no net acceleration reaching the cabinet, so greatly reducing low frequency panel resonances. The upmarket models in the Rowen range use pairs of bass, mid and treble drivers all working in dual-opposition and so extending this principle across the whole frequency band.

Most of the Rowen drivers are developed from those used by AR in the classic *AR3a* and *LST* designs (the latter already revived in concept under the prestigious and unrelated Cello brand). However, in the basic though still rather costly *R-3*, the bass unit pulp cones are simply doped with a lossy material. (In the bigger systems, the dust cap fitted to the bass units has been greatly modified so as to brace the cone itself and thereby modify the various breakup modes.)

The enclosure is decorated with a very

light wraparound grille cloth (non-detachable), capped at top and bottom with attractive chamfered wooden blocks. Cables must be connected to the underside of the cabinet where Rowen have provided two inset gold-plated binding posts, and the whole structure is lifted off the floor by corner-mounted spikes.

Inside the box a 'low loss' crossover uses heavy gauge multistrand cable from Monitor PC. The air-cored inductors are used in a series configuration with selected bipolar and metallised-film capacitors, crossing over at frequency is a highish 3.4kHz.

I couldn't help being stuck by the physical resemblance of the Rowen range to a series of US loudspeaker designs produced by Allison a few years ago (Roy Allison himself having once been with AR). However, Allison's somewhat similarly opposed drivers were placed primarily in an attempt to produce 'room-matched' loudspeaker systems with smooth LF response, rather than in an attempt to provide mechanical force cancellation. Unlike Allison, Rowen make no mention of the use of room boundaries for manipulation of the low frequency system response.

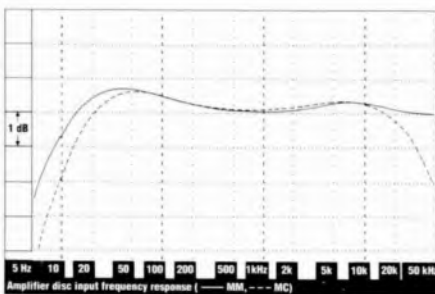
## SOUND QUALITY

Finding exactly where to place these unusual speakers required a degree of experimentation. A near-wall site was finally chosen, ensuring that the axis from the near baffle crossed just in front of the listening position.

Used in this way the *R-3*s possessed a surprisingly clear, transparent and generally open balance. Midband detail was particularly well resolved, though stereo images located towards the periphery of the soundstage often seemed slightly vague. This 'char-







acter' became more obvious at lower frequencies; bass notes seemed to ooze from the cabinets, the sense of rhythm strangely detached from the icy clarity noted throughout the upper registers.

Light orchestral works were reproduced with a refreshing 'airiness' – an out-of-the-box sound that bore some of the favourable hallmarks of open, panel-type loudspeakers. However, with the angled baffle pointing directly towards the listening position, the HF dome on-axis seemed to exaggerate surface noise or tape hiss.

Whereas the clarity and transient speed of these loudspeakers came into its own when reproducing delicate passages full of subtle, timbral detail, the treble unit could sometimes cut the air like a knife. Aggressive or forward sounding recordings then often became too fierce and ultimately fatiguing.

However, to a large extent the laid-back yet still pleasingly articulate presentation of the A-06 amplifier redressed this forward tendency in the loudspeakers, and in this way the system as a whole enjoyed a sedate, relaxing and approachable sort of sound – albeit one that often lacked the get-up-and-go verve available from the speakers when driven by truly wideband amplifier. Nevertheless, the A-06 certainly improved with time, in much the same way as the Mission and Rotel integrated amplifiers in fact. The original softness was gradually traded for sharper stereo focus and top end clarity.

Auditioned separately at first, the EB101 turntable put in a fine performance, but was

obviously hampered by the limited quality MM cartridge. If your budget would stretch to a Goldring 1010 (MM) or even an Audio Technica AT-F3 (MC), the sonic reward should surely justify the upgrade.

In keeping with the overall sound of the system, there was a slight loss in precision and focus at very low frequencies. However, the deck retained a realistic sense of ambient weight when reproducing large orchestral works, for instance. Higher registers were detailed and still relaxed, though a hint of raggedness was occasionally heated courtesy of the arm.

Linked up with the A-06 amplifier, the MM stage sounded slightly sweeter at the top end than the MC stage. Hardly surprising in view of the measurements, vinyl records produced a warm, comfortable and solid sound. Compared to the CD input, this basic MM stage enjoyed a more coherent and solid rendition of bass lines, even if there was a corresponding loss in transparency and detail resolution through the midband. Furthermore, a slight soundstage bunching was noticed with stereo images gathering between the loudspeakers and slightly restricting the lateral spread.

## VERDICT

Despite the imposing carcass area, the Rowen sounds quite unlike a conventional large enclosure design. It does, however, appear to be something of a fickle loudspeaker, and may well prove to be quite room dependent. As in all such cases, a home trial

is worthwhile to avoid making any expensive mistakes. Nevertheless these speakers fared well enough for tentative Recommendation in the context of the AR system.

I was less impressed overall with the A-06 amplifier. This overly complex design seemed to offer good material value, but was ultimately a little too safe and bland to merit sonic recommendation. Fortunately, the excellent performance of the EB101 turntable does much to sweeten a package which is the only system in this test that is unashamedly analogue.

## TEST RESULTS

|   |                           |                |          |
|---|---------------------------|----------------|----------|
| <b>Turntable: Acoustic Research EB101, £230</b> |                           |                |          |
| Type  | Suspended subchassis      |                |          |
| Platter Mass                                    | 1.8kg                     |                |          |
| Absolute Speed                                  | +0.4%                     |                |          |
| Drift (1 hour)                                  | -0.07%                    |                |          |
| Peak wow  | 0.107%                    |                |          |
| Peak flutter                                    | 0.041%                    |                |          |
| Total Rumble (unwtd)                            | -53dB                     |                |          |
| Electrical noise                                | -65dB                     |                |          |
| Rumble (DIN B wtd)                              | -78dB                     |                |          |
| Shock/vibration sensitivity                     | good/good                 |                |          |
| <b>Amplifier: AR A-06, £250</b>                 |                           |                |          |
| Maximum continuous power                        | 8ohms - 81.6W             | 4ohms - 120.4W |          |
| Output Impedance/damping factor                 | 0.053ohm/152              |                |          |
|   | CD/aux                    | MM             | MC       |
| Input sensitivity                               | 216.6mV                   | 2.85mV         | 248µV    |
| Input overload                                  | >7V                       | 219.2mV        | 19.7mV   |
| Stereo sep                                      | -67.8dB                   | -66.7dB        | -67.27dB |
| THD (1kHz)                                      | 0.012%                    | 0.012%         | 0.012%   |
| IMD (19/20kHz)                                  | -81.5dB                   | -80.6dB        | -74.7dB  |
| S/N (A wtd)                                     | -91.2dB                   | -86.7dB        | -75dB    |
| <b>Loudspeakers: Rowen R-3, £750</b>            |                           |                |          |
| Sensitivity (2.83V/1m)                          | 89dB                      |                |          |
| Max. spl  | 104dB                     |                |          |
| Distortion                                      | 100Hz: 0.56%, 1kHz: 0.32% |                |          |

# ARCAM DELTA

A&R CAMBRIDGE LTD., DENNY INDUSTRIAL ESTATE, WATERBEACH, CAMBRIDGE CB5 9PB. TEL: (0223) 861550.



From humble beginnings with the original A60 integrated amplifier, A&R Cambridge (or Arcam which is now the preferred name) has developed into a company with a substantial and varied product range, and is one of very few British companies with what could legitimately be called a 'complete system'. With tuner and CD sources to draw upon, Arcam offers a choice of three amplifiers and no less than three loudspeakers – recently revamped to 'Plus' status with re-worked crossovers and designed to accept a bi-wire cable configuration.

More important, Arcam has responded to the proliferation of digital outputs on today's budget CD players. To make use of this hitherto redundant facility, Arcam has developed a specialised outboard D/A converter known affectionately as the *Black Box*. Designed specifically for the retrieval and processing of a CD digital datastream, this affordable add-on box succeeds in uprating the sonic performance of most budget CD players. A large number of costly machines also benefit from the 'black magic', including Arcam's own *Delta 70!*

## DELTA 70 CD PLAYER

This player represents an attempt to produce a user-friendly machine, readily understandable to experienced enthusiasts and babysitters alike. The matt black fascia is divided into upper and lower halves with all the important transport controls located on the top section. These sit next to a basic 4-element fluorescent display which either indicates the playing time or track/index complement of the disc depending on a

switch setting. Two LEDs tell you what mode the display is in at the time (as if it were not obvious enough already; this is termed user-banalilty).

Secondary controls like track skip, fast music search, pause and the entry key to the 20-track random access memory string along the lower section of the fascia. A large if somewhat awkward volume control adjusts the output of both the variable output socket and headphone socket simultaneously. The disc tray is a trifle ponderous in action, though Arcam are to be congratulated on avoiding Philips' cheaper plastic disc mechanism – here an alloy casting should reduce the effects of vibration on the laser's tracking prowess.

The *Delta 70* is yet another Philips 16-bit 4x oversampling derivative, though with a proprietary post-DAC filtering circuit. The 3D plot is one of many that demonstrate the common Philips heritage, the second-order sampling IMD routes suffering a clear stop-band ripple through the action of the *SAA7220P/A* NMOS linear-phase digital filter. Other oversampling filters have different, but characteristic, IMD patterns that allow much of the circuitry to be identified *without* peering into the box! The staggered routes, 4.1kHz removed from the 44.1kHz and 88.2kHz sampling points, are caused by filter ringing in the transition band. Note the relatively high 2nd and 3rd harmonic distortions which increase with frequency, though no clipping was observed with white noise signals.

## BLACK BOX

External D/A converter units have been available for some time now, but prohibitive cost has rendered them quite unsuitable for mass market players. This is where the unassuming *Black Box (BB)* could make its mark. Connection is very simple and involves running a standard phono lead from the digital output of a CD player to the single input of the *BB*. Once connected, the *BB* accesses the digital data stream from the CD player, subsequent to the pick-up demodulation and serial processing. Arcam has developed a customised processor for the *BB* though, replacing one of Philips' LSIs in the process.

Known fondly as the Black Chip, this device slices the data stream into its consecutive parts (L/R data flag, error, subcode, emphasis, parity bit and 16 sample audio stream). The appropriate data is then fed to the 4x oversampling filter (Philips *SAA7220P/A*) before reconstruction in one of the latest Philips dual-channel DACs, the high specification *TDA1541A*. A three-pole linear phase filter comprises the output, though the -3dB point has been extended from 33kHz to 40kHz in the *BB*. Audiophile grade passive components are used, and analogue and digital sections have their own isolated power supplies.

As far as facilities are concerned, the *BB* may seem a little bland. Nevertheless, an output inversion feature is incorporated so the listener can experiment with absolute phase – some CDs may sound better with absolute phase reversed and vice-versa (and of course multi-track recordings may exhibit mixtures

of phase within the same musical passage, in which case it will be possible to sharpen the stereo focus of some instruments in preference to others!).

Technically, separation and noise figures are excellent but IMD and THD at peak levels rather less so. Viewed in isolation the numerical figures are still quite acceptable (0.022% at 0dB), but the *lower* figure (0.017%), obtained at -10dB, nonetheless indicates the onset of slew-limiting. This is the second *BB* that I have tested, and both have demonstrated this phenomenon.

Linearity was as compromised as ever, recording errors of -8.4dB and -10.4dB at -90dB. To within 0.1dB tolerances, the *TDA1541A*'s reconstruction is only monotonous to about -70dB, the THD at -90dB reaching a (theoretical) maximum of 131% - probably only the drastically reduced output (0.0224mV rel. 0dB) prevents any subjective repercussions. The 3-D plot (not shown) is broadly similar to the *Delta 70* in isolation, though the noise floor characteristics are more consistent and generally better controlled. From the subjective viewpoint this can be very important indeed.

## DELTA 90 AMPLIFIER

Rather utilitarian in appearance, the Arcam *Delta 90* amplifier has a split fascia with all the relevant controls situated on its lower portion. Five identical rotary controls ensure maximum confusion, the volume knob actually being a dual-concentric affair that also provides for channel balance. Bass and treble controls are easily defeated from the main audio circuit by use of the 'Direct' button. This amplifier is equipped with a full quota of inputs including vinyl disc (both MM and MC), CD, tuner and two tape machines. Furthermore, the comprehensive record out facility allows tape recording independent of the source currently being used.

Additional loading modules may be purchased for the MM input, though changing over entails removing the lid (best left to a dealer perhaps). The internal layout is very neat and tidy, the power supply based around a huge toroid and two 10,000 $\mu$ F reservoir capacitors. A single pair of *TO-3* style output devices are used per channel, these being fixed to a small heatsink that protrudes at the rear of the case. A healthy increase from 90.5W/8ohms to 144.4W into 4ohms demonstrates good load tolerance, while the output impedance is a satisfactorily low 0.053ohms.

Vinyl disc equalisation is based around two low noise Signetics *NE5534AN* op-amps (also used in the active tone control circuit), but the response was notably tailored. The moving-coil input was bandlimited from 40Hz to 30kHz (-1dB) while MM showed a slight 'lumpiness' at 60Hz followed by an ultrasonic rise to +1.9dB at 50kHz. Nevertheless, the disc sensitivities were accurate

and the overload margins excellent (up to +33dB on MC). Noise could have been lower on MC.

## DELTA 80 TUNER

Fashioned to complement the other *Delta* components the *80* looks at first sight to be a modern digital synthesiser tuner. In reality, the 4-digit frequency display and presence of 6 preset buttons only serve to confuse the fact that this tuner is actually a traditional analogue design. Once this is appreciated the manual-only tuning knob starts to make a bit more sense, the digital frequency display tracking the movement of the analogue tuning condenser to a resolution of 100kHz (50kHz steps are more common with digital synthesiser tuners). The muting threshold was a little too low at 1.7 $\mu$ V, so the tuner tended to 'thump' as it moved in and out of tune.

Five LEDs across the top of the tuner give some indication of signal strength, while a tri-colour beacon shows green once the station has been correctly tuned. An AFC lock can be used once the desired station has been reached, though this should not be used to receive weak transmissions are closely bordered by stronger stations. If reception is particularly bad, the mono switch can reduce background noise (at the expense of stereo of course).

All three wavebands are tuned, and 12 manually-adjusted wheels on the rear of the case preset favourite stations. The buttons on the front can then call up a total of 6AM and 6FM stations. One particularly daft break with tradition concerns the use of phono sockets on the rear panel for hook up to an AM antenna - most confusing!

## TWO PLUS LOUSPEAKERS

Evolutionary rather than revolutionary describes the nature of the recent improvements made to Arcam's loudspeaker range. The *Two Plus* now includes upgraded internal wiring and a split crossover (second-order, operating at 3kHz), linked to four binding posts on the rear of each cabinet for bi-wiring purposes. High quality network components are used, including metal oxide resistors, low loss inductors and plastic film non-polar capacitors.

The 180mm cobex-coned bass/mid unit has also witnessed some detail changes while the 20mm soft-dome tweeter incorporates a short flare for improved loading and dispersion characteristics. The bass is loaded by a rear-mounted reflex port, and close to rear wall siting is not recommended. In the context of this system the *Two Plus* loudspeakers should be used on rigid stands at least 1m from side and rear walls.

## SOUND QUALITY

Using appropriate siting and stands, this latest version of the Arcam *Two* gave a good account of itself. Erring on the lean side of neutral, the tidy, clean presentation allowed rare insight into many complex recordings. Massed strings were particularly well differentiated, for example - there was little compressive muddling or overhang to suppress the spirit of violins and cellos alike. The extreme top end was sharply detailed without becoming unnecessarily bright, a condition helped by both the Arcam *Delta 90* amplifier and bi-wiring the loudspeakers themselves.

Broad stereo soundstages were easily developed, though a trace of forwardness in



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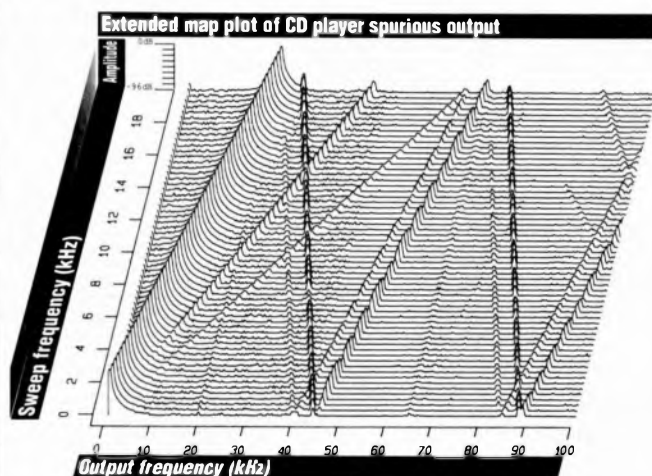
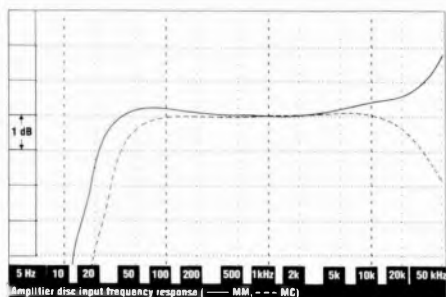
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the upper mid tended to over-project quiet vocals on occasions. A thoroughly coherent sense of rhythm was maintained, despite the modest size of these boxes. Deep bass resolution was obviously restricted but the overall sound of the system nevertheless remained tuneful and quite 'boppy'. More importantly, the low frequency roll-off was free of any nasty discontinuities, and was therefore subjectively pleasing.

The flattening of perspectives heard with earlier tuner samples have been redressed to a degree here, though FM sound quality was still mildly softened compared to the likes of the Sony 700ES, for example. Background noise was very low, the sweet treble balance encouraging long term listening without fatigue.

Similarly, the rather over-rich balance of the first CD players has now been superseded by a leaner and more open sound, though this new found sparkle has not been won at the expense of the older player's beguiling warmth. In many respects the Delta 70 still suffers a uniquely analogue flavour, though it certainly lacks the quiet transparency and fast resolution of the Philips/Marantz players, for example.

If there was ever the feeling of artificiality, connecting up the Black Box turned out to be the audio equivalent of a breath of fresh air. The overall improvement in clarity, transparency, stereo focus and detail resolution was nothing short of remarkable (a feat repeated with many other budget CD-players, I

might add). Lower frequencies retained the weighty punch of the D70, but transients stopped and started that much quicker. 'Silences' were also subjectively quieter, the 'greyness' of the D70 being stripped down to an 'inky black' that proved better at resolving tonal, as well as dynamic contrasts.

The line stage of the Delta 90 amplifier proved both lucid and neutral, while the healthy power output ensured that very high sound pressure levels could be attained with the minimum of strain and compression. In many respects the sheer effortlessness and subjective speed of the Arcam system was quite remarkable – all this and devoid of fatiguing harshness to boot!

Via disc (MC) there was an undeniable loss in drama and vitality, but the important ingredients still remained. Records enjoyed the same coherent solidity heard through the line stage, though the sparkling transparency that was so welcome with the Delta 70/Black Box was faintly muted in the case of vinyl. Stereo images were also slightly more centralised, but there was a general lack of 'boxy' type colorations which allowed the music to breathe in a thoroughly refreshing manner. Above all, the system was inherently musical, without resort to the manipulation of specific distortion mechanisms!

## VERDICT

As a synergic package, the Arcam combination must rank as one of the most successful in this test. Clearly, the sweet-sounding sepa-

rates and more forthright character of the speakers were made for each other! Of the set, both the Black Box and Two Plus loudspeakers represent particularly good value. Best Buy rating is ruled out through the constraints of cost, so confident Recommendation is the only logical conclusion.

## TEST RESULTS

|   |                                  |                           |         |
|---|----------------------------------|---------------------------|---------|
| <b>CD player: Arcam Delta 70/Black Box, £500/£250</b> |                                  |                           |         |
| Frequency Response (–3dB):                            | L: 20.7kHz, R: 20.9kHz           | 1kHz: 0.2dB               |         |
| Channel Balance                                       |                                  | 1kHz: 0.2dB               |         |
| Channel Separation                                    | 1kHz: –91dB, 20kHz: –92.7dB      |                           |         |
| S/N ratio (A-wtd)                                     |                                  | –106.4dB                  |         |
| THD (@ 1kHz), 0dB                                     |                                  | 0.0223%                   |         |
| THD, –10dB  |                                  | 0.0168%                   |         |
| THD, –60dB  |                                  | 1.07%                     |         |
| THD, –90dB  |                                  | 131% (R), 104% (L)        |         |
| IMD (19kHz/20kHz), –10dB                              |                                  | –76.7dB                   |         |
| Stop-band rejection                                   |                                  | –39.9dB                   |         |
| Resolution at –90dB, L/R                              |                                  | –8.4dB/–10.4dB            |         |
| Peak Output Level, L/R                                | 2.291V/2.241V, (1.142V)/(1.116V) |                           |         |
| Amplifier: Arcam Delta 90, £329                       |                                  |                           |         |
| Maximum continuous power                              | 8ohms: 90.5W, 4ohms: 144.4W      |                           |         |
| Output Impedance/damping factor                       |                                  | 0.053ohm/152              |         |
|   | CD/aux                           | MM                        | MC      |
| Input sens  | 431.3mV                          | 2.65mV                    | 127µV   |
| Input overload  | >7V                              | 215.3mV                   | 22.91mV |
| Stereo sep  | 79.06dB                          | 78.55dB                   | 72.6dB  |
| THD (1kHz)  | 0.011%                           | 0.0163%                   | 0.0286% |
| IMD (19/20kHz)  | –81dB                            | –75dB                     | –66.5dB |
| S/N (A wtd)   | –86dB                            | –72dB                     | –63dB   |
| <b>Tuner: Arcam Delta 80, £269</b>                    |                                  |                           |         |
| Sensitivity (@ –50dB S/N)                             |                                  | 3.1µV/25µV                |         |
| Ultimate S/N, mono/stereo                             |                                  | –77dB/–69dB               |         |
| FM distortion (1kHz)                                  |                                  | 0.187%                    |         |
| Output level (100kHz dev.)                            |                                  | 540mV                     |         |
| <b>Loudspeakers: Arcam 2 Plus, £249</b>               |                                  |                           |         |
| Sensitivity (2.83V/1m)                                |                                  | 88dB/W                    |         |
| Max. spl  |                                  | 102dB/A                   |         |
| Distortion  |                                  | 100Hz: 1.75%, 1kHz: 0.84% |         |



Ever since reverting to the parent brand-name Kenwood, Trio has been faced with the problem of re-establishing what many consumers must perceive as an entirely new product line. This daunting task has nevertheless been tackled with aplomb, many of the components featured here reflecting a trend towards 'budget audiophile' designs without sacrificing essential facilities. Many recent Kenwood products also seem to be offering very good value for money, with solid alloy casework and high quality discrete circuitry – to the point where one must wonder whether manufacturing and distribution margins are sufficient to maintain prices in the long term.

Typical of Kenwood's latest stock this system includes the new *KA-660D* integrated amplifier, with equally new *DP-880SG* CD player (one of Kenwood's first to adopt 16-bit 4x oversampling), the *KT-660L* tuner and the *KY-660HX* cassette deck. The tuner includes every conceivable feature, without sacrificing an inch in sound quality – quite a feat at only £130! However, amidst all the revelry Kenwood omitted to send a pair of loudspeakers; was this oversight contrived I wonder...?

### DP-880SG CD PLAYER

Entering the marketplace at a very competitive price point, the *DP-880SG* incorporates both high technology and a myriad facilities. A comprehensive fluorescent display occupies centre stage on the silky black anodised fascia, with most of the standard transport keys situated beneath. This display includes a 20-track music calendar, track and index

notation, plus elapsed time of a single track or the entire disc. A whole bunch of status indicators include a little arrow which points at the time, program, single track or ordinary play modes. On loading, track and time complement are displayed momentarily before reverting to the default *01 01* display mode.

The main transport keys cover fast search, track skip, repeat, play and pause options. A bank of eleven direct track access buttons considerably aid the quick programming of up to 20 separate tracks, while delete key provides the reciprocal function, allowing tracks to be discarded individually. All these functions are duplicated on the *RC-P880SG* remote handset, which also adds index search, +20 to +50 track access and an electronic volume control option to the feature list.

Both analogue and digital phono outputs are fitted, the former either fixed or variable. Interestingly, the volume control is not a stepwise digital type but relies on a motorised potentiometer to reduce the full output of the final analogue stage. This may be accomplished manually with dextrous use of a screwdriver – or more likely by using the up/down keys fitted to the remote control. There are even 5 LEDs fitted to the front of the fascia to give some idea of the volume setting.

Inside the metal carcass is found Sony's proprietary 4x oversampling/data processing chipset, alongside two 16-bit Burr-Brown *PCM56P* DACs for reconstruction without incurring interchannel high frequency phase errors. Kenwood has also tried to reduce jitter and quantisation errors by tightening up

on the quality of the master clock. Post-DAC filtering is undertaken by an active network based around two *JRC4560D* op-amps, but the 3-D plot indicates that this is insufficiently steep to attenuate the 2nd-order 44.1kHz sampling IMD route that is seen (through nonlinearities in the digital domain) below 25kHz. All other sampling routes are suitably suppressed, but a trace of 3rd and 4th-order 3fs IMD is visible, and conventional 2nd and 3rd harmonic distortions emanate from the peak level sweep.

Stereo separation fell markedly from –117.2dB at 1kHz to a still very good –89.6dB at 20kHz, while noise, THD and IMD are all within acceptable limits. Low level resolution approaches 15.7-bits, with excellent symmetry between the two channels. Output level is spot on the CD standard, and 0.05dB channel balance is excellent.

### KA-660D AMPLIFIER

One of two recently launched amplifiers, the *KA-660D* is the more costly by dint of its moving coil vinyl disc input and higher power output. Rated at a conservative 60W, in fact it managed 90.9W into a non-inductive 8ohm load plus a healthy enough 140.7W into 4ohms. Two pairs of loudspeakers may be connected to the double set of chunky 4mm sockets, and switched from the front panel. The silky black fascia is dominated by a huge dual-concentric volume control, flanked by smaller tone controls and rotary source-in/record-out selectors.

Inputs for CD, tuner, aux, 2 tapes and phono are provided, the latter switched between MM and MC cartridges by front

panel pushbutton. The tape monitor control not only allows tape-to-tape dubbing but also provides a direct route for the CD input, bypassing all peripheral circuitry and running this high level signal straight to the power amp section via the volume control. Even without using this 'source direct' option, the tone controls may be removed from the signal path. One minor throwback to the days of feature-laden amplifiers is seen in the insidious useless 'Super Bass' contour, which provides about +3dB extra gain at 100Hz to correct for the ear's insensitivity at low listening levels. My advice is to ignore it.

TH and IM distortions are suitably low on all inputs. Input sensitivities are all par for the course, while the disc stages showed 30dB minimum headroom – a healthy margin. Equalisation is achieved by the usual frequency-dependent feedback topology, in this case based around a National 5218 op-amp. The MM input showed a very (rather too?) extended LF response, the –3dB point registering at just 1.1Hz! There was some rather more obvious tailoring on the moving coil input, where the response reached –1dB by 10.5Hz and –3dB by 6Hz.

## KT-660L TUNER

Of all the components contained within this (loudspeaker-less) system, perhaps the *KT-660L* digital synthesiser tuner best reflects this company's desire to succeed. Although it embodies many of the self-same features the *KT-660L* is not just a full-width version of the popular T-91L midi tuner, but rather incorporates some improvements in the audio circuitry.

A bright, multi-colour alphanumeric display covers most of the left hand side of the fascia. Ten solid preset keys cater for a total of 20 memory blocks, and as an aid to station identification, a four-character alphanumeric name may be entered in to accompany the tuned frequency. (More memory space is occupied this way, so only 12 FM or AM stations may be stored with an accompanying 4-digit banner.) To prevent the fascia from being overwhelmed with alphanumeric keys, the up/down tuning key has a dual role. Once in character mode electronics cycle swiftly through 0-9 and A-Z character sets, each of the four available slots being stored sequentially.

With all favourite radio stations memorised and their identification stored alongside, station hopping can be further facilitated using preset-scan. Each stored station is accessed for 5 seconds – the tuner equivalent of an intro-search facility! Furthermore, the fluorescent panel alongside the frequency display may be converted into a 24-hour timer. This comprehensive timer feature uses both display panels, allowing a maximum of two on and off periods to be memorised for remote recording onto a partnering cassette deck.

Technically, the tuner is not quite as special as the extensive feature list might imply. Sensitivity seems quite low, while alternate selectivity (50dB) and pilot/subcarrier suppression (38dB) could both have been improved.

## KX-660HX CASSETTE DECK

Styled in the same attractive fashion as the cheaper *KX-550HX*, the *660HX* looks quite distinctive in its silky black livery and brightly lit vertical record level meters. Independent record level controls are fitted for each channel, with an over-riding master fader sited alongside. Logic-controlled transport keys not only ensure swift execution of the standard transport functions but add such extras as direct track access, track repeat, intro search and immediate record standby into the bargain.

Tape selection is automatic, the result being indicated on a small status panel, although the distinction between Dolby B and C is less obvious to the casual observer. There is even a decent variable bias control that will cope with some of the more difficult (or over-sensitive) metal formulations that abound – Sony *ES* being a prime example.

Dolby HX Pro is included, but there was nevertheless evidence of premature saturation at the 0VU point (SAT10k = –6dB, Type I) even though this was factory-preset some –3dB below the IEC 0dB level. Capstan wow dominated the low frequency modulation spectrum, while the similarly high peak flutter figure was derived from components at 18, 42 and 210Hz.

## SOUND QUALITY

At the heart of this electronics-only system lies the very capable *KA-660D* integrated

amplifier. Via the line stage and using the matching *DP-880SG* CD player the overall effect was of gentle refinement – a subtle but surefooted sound that relayed bags of musical detail without appearing too brash or forthright.

In many respects the CD player was the smoother of the two, as the amplifier did tend to lose its grip at both frequency extremes when the going got tough. Fortunately this was perceived as a slight smudging effect, avoiding lapsing into an obviously cold or coarse tonal balance.

Viewed in isolation, the CD player puts up a brave fight. While it doesn't quite reach the standards set by such as the Philips *CD473* or Marantz *CD-65DX*, it does offer a thoroughly beguiling character all its own. Perhaps aided by the highly accurate master clock and potentially greater oversampling linearity, this player enjoys fine tactility and seamlessness throughout the frequency range. Midrange detail benefits from a very transparent soundstage, but a loss of low bass affects the way in which spatial or ambient clues are perceived.

While this CD player does not sound cluttered in the way that the amplifier did on occasions, it was just a little 'thin' when reproducing large orchestral works. In contrast, most simple pop recordings required no fleshing-out, and the speed and sharp precision proved ideal for reproducing drums, percussion or electronic synth. tracks.

The *KT-660L* digital tuner possesses something of a similar balance. The hazy top-end found with so many tuners was here replaced by a more specific clarity and sparkle. Broadcasters' voices were generally very clear, expressive and articulate, while only some close-miked females suffered from excessive



# “Very singular behaviour!”

Remarked Sir Arthur, clasping a hand to his injured ear. . .

Call that music he shouted, it's a complete travesty of what the composer was trying to achieve . . .” and then his voice drifted off as he mumbled incoherently to himself . . .

Regaining his composure he apologised to the unfortunate couple who for weeks had endured the appalling sound which he had barely been able to tolerate for less than five minutes. His apologies were accepted but none the less Sir Arthur was perplexed by their reaction to his uncharacteristic outburst. It quickly became apparent that the unfortunate couple had tried in vain to explain to the anonymous (and misguided) retailer responsible for this fiasco that the sound was not to their liking – at all. Sir Arthur had been the first audio consultant to have actually agreed with their view and been sympathetic to their plight.

It wasn't so much that the equipment they had purchased was bad, more that it was not appropriate for their musical tastes and room acoustics.

Sir Arthur having now grasped the situation invited the couple to visit his demonstration studios the following Wednesday evening. Help was at last at hand.

Having weighed up the various factors, not the least of which was cost, our hero assembled a seemingly modest system (when judged by the absence of superfluous knobs, levers and lights) comprising of an ORACLE turntable, AIR TANGENT tonearm & KOETSU RED cartridge which passed a near perfect signal through to the remarkable AUDIO RESEARCH SP9 pre-amp. Via carefully chosen cable, the signal then passed through KRELL amplification (inevitable really) into the SONUS FABER speakers. Naturally Pi stands were in use.

Calm and quietly confident, Sir Arthur waited. The couple arrived early (such was their enthusiasm). Sir Arthur much to his surprise, discovered that within fifteen minutes they were asking when the system could be installed, but he was not complacent and was surprisingly reluctant to accept the order because . . .

Ever cautious and vigilant, Sir Arthur insisted that more and more records be played in a vain effort to tease out any inconsistencies or inadequacies that might detract from 100% customer satisfaction. There were none. Fully confident, only then did he proceed with the sale.

Installation was completed on time and without mishap – as was the norm.

Soon after installation, he received written confirmation from the couple indicating quite clearly that he had succeeded fully in meeting their audio needs. Furthermore, their perception of recorded music in particular and quality of life in general (such was the

importance of music in their lives), had markedly improved. Sir Arthur paused to reflect how best he could meet the needs of another visitor with a completely different criteria . . .

Sir Arthur felt confident that Absolute Sounds equipment (once again) would provide the answer, but was uncertain at that stage whether APOGEE SCINTILLAS or MAGNEPLANAR TYMPANIES would be the chosen speakers. But having both of them on demonstration, he felt confident that the customer would be able to decide. More certain however was that amplification would be KRELL or AUDIO RESEARCH or a combination of the two. Whilst ruminating on the possible course of events that afternoon, Sir Arthur unpacked the KINERGETICS CD player . . .

A thought crossed his mind – would he ever really find out how it was that Absolute Sounds always had so many musically extraordinary items which he could offer to his visitors. And as the MICRO-SEKI CD player's enormous weight caused his back to twinge, he wondered (out loud this time) why their equipment had to be so damn heavy . . .



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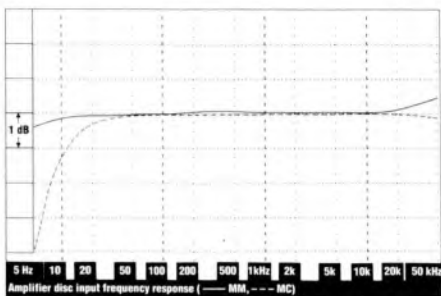
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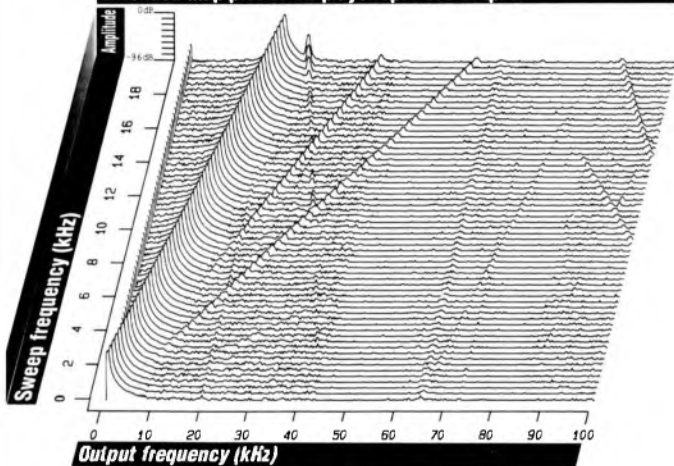
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Extended map plot of CD player spurious output



sibilance. Once more the system delivered a broad and transparent soundstage, punctuated with realistic dynamics and bolstered by an entirely silent background.

A faint metallic coloration was heard, on some occasions and this was subjectively similar to the loss of control on high level passages noted with the amplifier's line stage. AM broadcasts were also fairly free of spurious noises, but a background pilot was always present, and the usual hiss was suppressed by the slightly dim overall balance.

Pre-recorded musicassettes sounded slightly processed and lacking in trio when played through the *KX-660HX*, but recordings made on metal tapes (TDK *MA-X* and Thats *MEX-Pro*) retained much of the life and clarity of the original. However, Type I tapes generally sounded a little soft and fuzzy (fuzzier than normal that is), possibly as a result of scrape flutter components. Nevertheless, this is a respectable performance overall, saved to a large extent by the decent variable bias facility.

Feeding the amplifier a diet of vinyl disc, both MM and MC stages performed commendably well. The tonal balance of the system changed slightly, lower frequencies benefitting from slightly more urgency and weight, whilst much of the top-end sweetness of the line stage was retained. The MC input was weightier still, but there was also an added softness at the highest frequencies which takes the edge off percussive detail and flattens the raw timbral rasp of trumpet

or sax for instance. Considered all-round, the *KA-660D* may not be perfect, but it surely marks an improvement as far as Trio/Kenwood are concerned.

## VERDICT

Except perhaps for the tuner, none of these separates is likely to occupy the top slot in its respective marketplaces. Nevertheless, the amplifier, CD player and tuner are more than merely competent, and each offers an above-average sound quality for this price category. Furthermore, given by the truly excellent standard of build and finish that all have in common, they not only look decidedly upmarket, but are also likely to be inherently reliable in the long term.

The cassette deck certainly offers plenty of facilities, but does not escape criticism quite as unscathed as the tuner – it is good but I am sure it could be better. Ultimately, if Kenwood are currently waging some sort of price war, then the consumer is getting the benefit and that has to be good news. Consequently I feel duty bound to support their action, and a hearty Recommendation is appropriate.

## TEST RESULTS

|                                       |                                 |                        |
|---------------------------------------|---------------------------------|------------------------|
| CD player: Kenwood DP-880SG, £250     |                                 |                        |
| Frequency Response (–3dB)             |                                 | L: 21.7kHz, R: 21.5kHz |
| Channel Balance, 1kHz                 |                                 | 0.05dB                 |
| Channel Separation                    | 1kHz: –117.2dB, 20kHz: –89.63dB | –108.2dB               |
| S/N ratio (A-wtd)                     |                                 | 0.0093%                |
| THD (@ 1kHz), 0dB                     |                                 | 0.0178%                |
| THD, –10dB                            |                                 | 0.951%                 |
| THD, –60dB                            |                                 | 46.3%                  |
| THD, –90dB                            |                                 | –87.4dB                |
| IMD (19kHz/20kHz), –10dB              |                                 | –33.33dB               |
| Stop-band rejection                   |                                 | –2.37dB/–2.43dB        |
| Resolution at –90dB, L/R              |                                 | 2.055V/2.067V          |
| Peak Output Level, L/R                |                                 |                        |
| Amplifier: Kenwood KA-660D, £160      |                                 |                        |
| Maximum continuous power              | 8ohms: 90.9W, 4ohms: 140.7W     |                        |
| Output impedance/damping factor       |                                 | 0.059ohm/135           |
|                                       | CD/aux                          | MM MC                  |
| Input sensitivity                     | 174.4mV                         | 2.91mV 255µV           |
| Input overload                        | >7V                             | 161.8mV 17.3mV         |
| Stereo separation                     | –73.6dB                         | –64.6dB –64.2dB        |
| THD (1kHz)                            | 0.01%                           | 0.01% 0.0108%          |
| IMD (19/20kHz)                        | –87dB                           | –83dB –81dB            |
| S/N (A wtd)                           | –92dB                           | –75dB –69dB            |
| Tuner: Kenwood KT-660L, £130          |                                 |                        |
| Sensitivity (@ –50dB S/M)             |                                 | 3.2µV/52µV             |
| Ultimate S/N, mono/stereo             |                                 | –78dB/–73dB            |
| FM distortion (1kHz)                  |                                 | 0.32%                  |
| Output level (100kHz dev.)            |                                 | 670V                   |
| Cassette Deck: Kenwood KX-660HX, £170 |                                 |                        |
| Replay frequency response, –3dB       |                                 | 20Hz–11.5kHz           |
| Record/replay freq. response          |                                 | 20Hz–16kHz             |
| Peak wow (1–10Hz)                     |                                 | 0.11%                  |
| Peak flutter (10–100Hz)               |                                 | 0.12%                  |
| S/N (A-wtd, Type II)                  |                                 | –53dB                  |
| Distortion (315Hz, Type II)           |                                 | 1.163%                 |



Even though Marantz is now a Philips subsidiary, the only real clue to their close association comes in the parallel ranges of CD players – the 'tweaked' customised audio circuitry of the Marantz examples often lifting them ahead of the pack on sound quality. Their other tuner, amplifiers and cassette machine separates are also built in Japan, though the designs – and eventual sound quality – bear little resemblance to comparable equivalent Philips models. Marantz has long held a fairly strong yet broad market position in hi-fi separates, enhancing its audiophile reputation with the earlier *Esotec* series which included some rather meaty power amps and a novel tuner which incorporated an oscilloscope as a tuning aid.

However, this latest collection of Marantz separates is culled from a more modest product range, including one of the newer CD players to emerge from this prolific stable. Joining this *CD-65DX* are the *PM-45* integrated amplifier, *ST-35* tuner, *SD-35* cassette deck, plus the *LD20DMS* loudspeakers.

### CD-65DX CD PLAYER

Based on the highly successful *CD65* full-width player, this latest *DX* version benefits from the fully floating *CDM2+* die-cast disc servo mechanism, together with independent supply regulation for the servo, digital and audio circuits. Marantz' ceramic-damped electrolytics are used in a power supply which is further decoupled by smaller parallel capacitors to lower the source impedance.

The tastefully crafted black plastic fascia is illuminated by a comprehensive green/blue fluorescent display. During play this

indicates both track and index number, together with the elapsed time or remaining time. Status beacons cater for play, pause, recall and repeat modes, this latter facility operating on normal or pre-programmed sequences.

Up to 20 tracks may be stored in the volatile random access memory, though the *65DX* lacks the useful FTS feature incorporated on the costlier *CD-75DX* model. By way of compensation, however, the *65* allows specific disc positions to be memorised by index number (equivalent to 2 memory blocks) or by time in minutes and seconds (equivalent to 5 memory blocks). All the usual transport keys are located beneath the display while track skip and fast music search facilities are included on the right, above the fixed-output headphone socket. Music search includes two speeds with audible cueing and a final faster rate with a muted output; track skip is changed to index skip by means of an adjacent 'select' key.

A coaxial digital output is provided alongside the usual L and R phono sockets. Marantz supplies a fairly basic IR handset, which only caters for the rudimentary transport facilities; once more, the remote-control 64-step variable output fitted to the upmarket *75DX* is omitted on this model.

Looking inside the case, I find myself in disagreement with Marantz' recent press release concerning the internal components – specifically the claim of improved linearity offered by the dual-channel *TDA1541A* DAC supposedly incorporated. In fact the older *TDA1541* DAC was used in our sample; coupled with the Philips *SAAT220PIA* 4x over-

sampling filter, this resulted in the worst low level linearity error I have ever encountered. Barely scraping in at 15 bits, the left channel was  $-9.93\text{dB}$  while the right possessed a substantial  $-21.24\text{dB}$  error. Fortunately, these nonlinearities are both directed negatively, resulting in an output of just  $0.0018\text{mV}$  relative to the peak  $2.103\text{V}$  output at a nominal  $0\text{dB}$ . It is this much reduced output that makes the low level 306%(!) THD tolerable subjectively.

Back in the real world, the player showed excellent channel separation which only fell to  $-100.4\text{dB}$  at  $20\text{kHz}$ , a result no doubt aided by the two separate *JRC5532DD* op-amps employed in the output filter. Noise and passband IMD were both very low, the 3-D plot demonstrating a typical  $-40.8\text{dB}$  attenuation of stop-band products; 2nd, 3rd and 4th harmonic distortion routes are fairly clear, as are the sum and difference 2nd-order sampling IMD routes that display the filter rippling typical of a Philips-based design. More important, 4th and higher order sampling IMD routes were a well suppressed  $-106\text{dB}$  in the audio range.

### PM-45 AMPLIFIER

Joining Marantz' rather dubiously named *Digital Monitoring* series, the *PM-45* is nevertheless very well built and sensibly designed. The black anodised fascia is complemented with a gold badge near its centre and a plethora of copper-plated screws that hold the steel wrap to the main chassis. A large rotary input selector caters for CD, vinyl disc (MM and MC, distinguished by a separate button), tuner, TV and video. CD

and vinyl direct inputs are provided, the latter routed directly to the volume control and on to the power amp section immediately after RIAA equalisation.

However, the *FM-45* showed a significant 0.6dB lift at 35Hz via the MM vinyl disc stage, and also rose to +2dB at ultrasonic frequencies. This input stage is based around discrete low noise FETs; frequency-dependent feedback around a JRC op-amp effects the necessary equalisation. Both MM and MC inputs have sufficiently high overload margins, but the level of 2nd-order IMD through the MC stage is a slightly high -64dB.

Bass and treble tone controls are provided, a tone defeat switch removing these from the audio path if so desired. Tape monitor, copy and a balance control complete the features list.

Bog standard *C3181/A1264* bipolar transistors in the output stage supply 69.2W into 8ohms and provide a reasonable increase to 102.8W into 4ohms. Output impedance was a little high at 0.107ohm, but then in my opinion few amplifiers enjoy a low enough output impedance.

## ST-35L TUNER

Yet another of the *Digital Monitoring* ilk, the *ST-35L* tuner has recently undergone a substantial £35 price cut in an attempt to improve its competitiveness. That said, I still find the split fascia with its low-slung frequency display rather unweildy aesthetically. Covering three wavebands, stations are selected using 16 preset keys (covering 16FM and 8AM stations).

Automatic or manual tuning is also possible, the muting threshold set at a reasonably sensible 10.5µV. One point of interest concerns the signal strength meters which light at very different - and probably more useful - values than normal, the final beacon illuminating at an unusually high 5.24mV! Despite the MOSFET front-end, sensitivity was a little below par, while the 400kHz alternate channel selectivity measured an excellent 77dB.

## SD-35 CASSETTE DECK

Yet another *Digital Monitoring* series component, the *SD-35* is sturdily built, using a proprietary two-motor transport mechanism. One of the major plus points of this deck is its low(ish) wow and flutter, a minor capstan irregularity giving rise to the bulk of the peak 0.09% wow figure. All the standard transport controls are located in the middle of the plush, black fascia, underneath the display panel which includes a 12-position fluorescent record level meter and status LEDs for tape selection (automatically sensed and set) and Dolby.

Larger keys below either defeat Dolby from the circuit or offer a choice between B and C types. A single record level pot covers master fades, alterations between left and

right channels being achieved using a smaller balance control. A fine bias adjust facility allows a degree of response tailoring on both Type I and Type II tapes, thereby minimising any Dolby tracking errors that might otherwise occur.

## LD20DMS LOUDSPEAKERS

Apparently built in the UK, this stylish-looking loudspeaker is a two-way design with reflex loading to augment the low frequency response. The bass/mid driver uses a mica-loaded polypropylene cone for extra stiffness; the treble unit is a Marantz-special 19mm Mylar dome. The bass characteristics are slightly over-damped, but a bright-sound is avoided by employing a deliberately down-tilted frequency response.

Construction is very good, with a sturdy particle-board cabinet, internal foam filling and a low-loss crossover operating with 3rd and 4th-order rolloff characteristics. Three cable binding posts are fitted to the rear of the cabinet, allowing the option of a bi-ground hook-up technique to be tried.

## SOUND QUALITY

Building on the essential vitality and beguiling basic character of the Philips CD players, the Marantz derivative possesses the same clear-cut articulation and sparkle but with a smoother, sweeter and generally rather more natural top end. Any criticisms seem quite churlish in view of the very reasonable retail price. What this player may lack in build quality it certainly makes up for in terms of sheer musical pleasure. Vocals were reproduced with realistic presence, the solid, tactile central image forming the hub of a deep and broad soundstage. None of this delightful neutrality was lost through the CD-direct

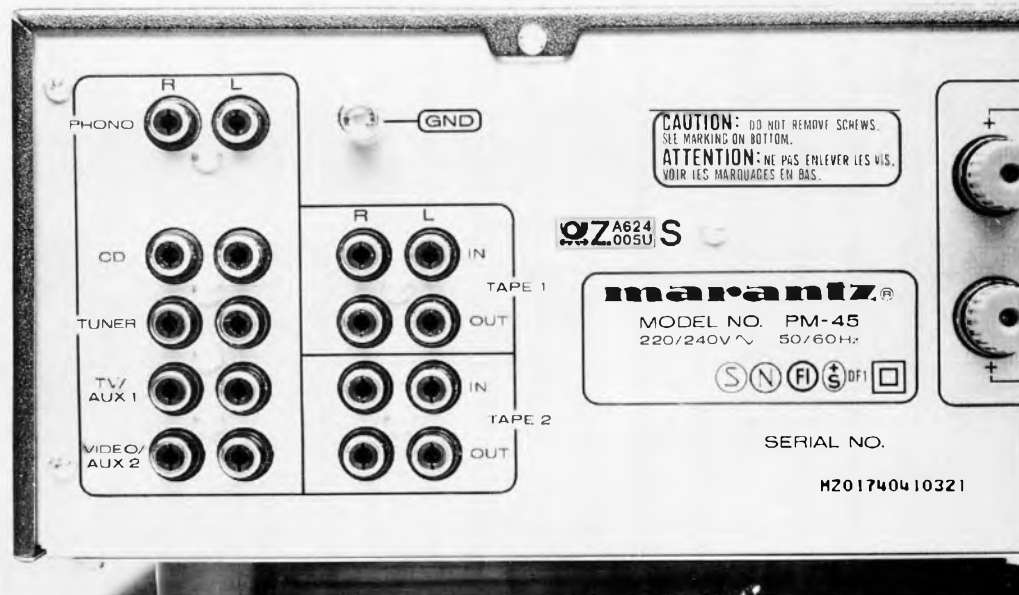
facility of the accompanying *PM-45* amplifier, which in my opinion represents a significant upgrade from its cheaper *PM-35* stablemate.

Faintly on the light and breezy side of neutral, the amplifier nevertheless has an unusually transparent and refreshingly open midband. The resolution of stereo depth has never been a strong point of CD players in general, but the *CD-65DX* is better than most in this respect, and so complements the *FM-45* in reproducing tactile, three-dimensional soundstages.

Although the amplifier possesses a pacy, exciting sound, this is never allowed to get in the way of the music, which comes across with comfortable fluidity, never a sense of forced urgency. Both amplifier and CD player are thoroughly unfatiguing - a boon to long-term listening!

Rather more troublesome, however, was the compressed and universally lacklustre effects of the *LD-20DMS* loudspeakers. Placing these at the end of the system really did put a damper on things as the natural exuberance - the unfettered, spritely sound of CD player and amp - was dulled and muted in one foul (? - Ed.) stroke.

To encourage more open and spacious reproduction and avoid exaggerating any unpleasant boxy colorations, the loudspeakers seemed best in a free-standing position on fairly tall open-frame stands. Lean-sounding cables such as Deltec or DNM solid-core also helped redress some of the thickening and compressive effects noted in the midband. That said, the speaker did seem irritatingly music-dependent, recreating simple well-recorded vocals with quite suprising presence, articulation and projection while casting an aural hue over anything more intense than a duet. Massed choral works, for



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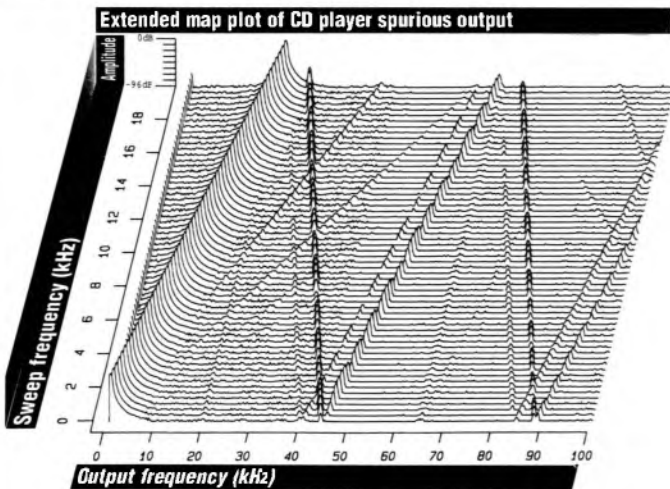
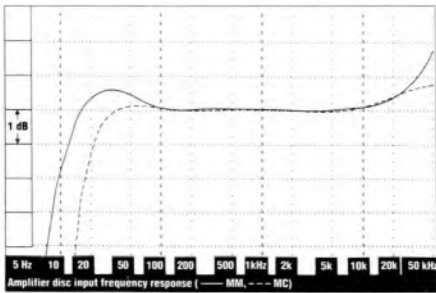
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instance, were muted in scale and grandeur, while string instrument bite and timbral definition was reduced.

Leaving aside the regrettable limitations of the loudspeakers for one moment, the vinyl disc stage of the amplifier appeared to supply much of the expressive openness and clarity heard through the line stage. A slight bass lift was audible, particularly through the MM input, though this rarely led to obtrusive softness other than that penetrated by the loudspeakers themselves – it simply added gravity and substance to the lighter sound heard via CD.

A hint of glassiness was heard in the treble registers, just faintly glossing over subtle timbral detail and adding a sheen to cymbals and the like. Once more, the problems associated with the partnering speakers overrode any slight subjective imbalance of the amp itself!

The remaining, sources were a little mixed, the *SD-35* tape deck clearly outshining the relative performance of the matching *ST-35L* digital tuner. An inkling of forwardness that the latter delivered from strong broadcasts certainly suited the loudspeakers, but this was achieved at the expense of additional coarse 'grittiness' in the treble. At progressively lower frequencies instruments seemed to 'slow down' until a definite ponderous softness was achieved in the deep bass.

However, the accompanying tape deck produced some very faithful recordings on

both TDK *D* and *SA* blank tapes. Most pleasing was the general lack of dullness, recordings maintaining much of the sparkle, life and vitality of the original. Of course the unusually fine transport was a major instrument in this process – critical material (such as harpsichord, flute or piano) enjoyed the kind of unwavering pitch stability traditionally reserved for far costlier tape machines. Rise is slightly high though, especially when using real chrome tapes which have limited overload thresholds, so the application of Dolby B elastoplast proved necessary for much of the time. Nevertheless this is excellent stuff for the price, it has to be said.

## VERDICT

Like many of the other systems included in this issue, the Marantz combo proved something of a mixed bag. The relatively poor showing of the digital tuner (recent price decrease notwithstanding) can be forgiven if you wish to view such a source as secondary to the CD player, for example. However, there is little that can be done to reverse the lazy balance of the speakers.

On a more positive note it is hard to ignore the excellent subjective performance of the *CD-65DX* CD player (which nudges ahead of the Philips *CD473*) and chunky *PM-45* integrated amplifier, both of which offer superb value both in terms of material content and sound quality. These fine separates, together with the *SD-35* cassette deck, tip the scales firmly in Marantz' favour, so the system may

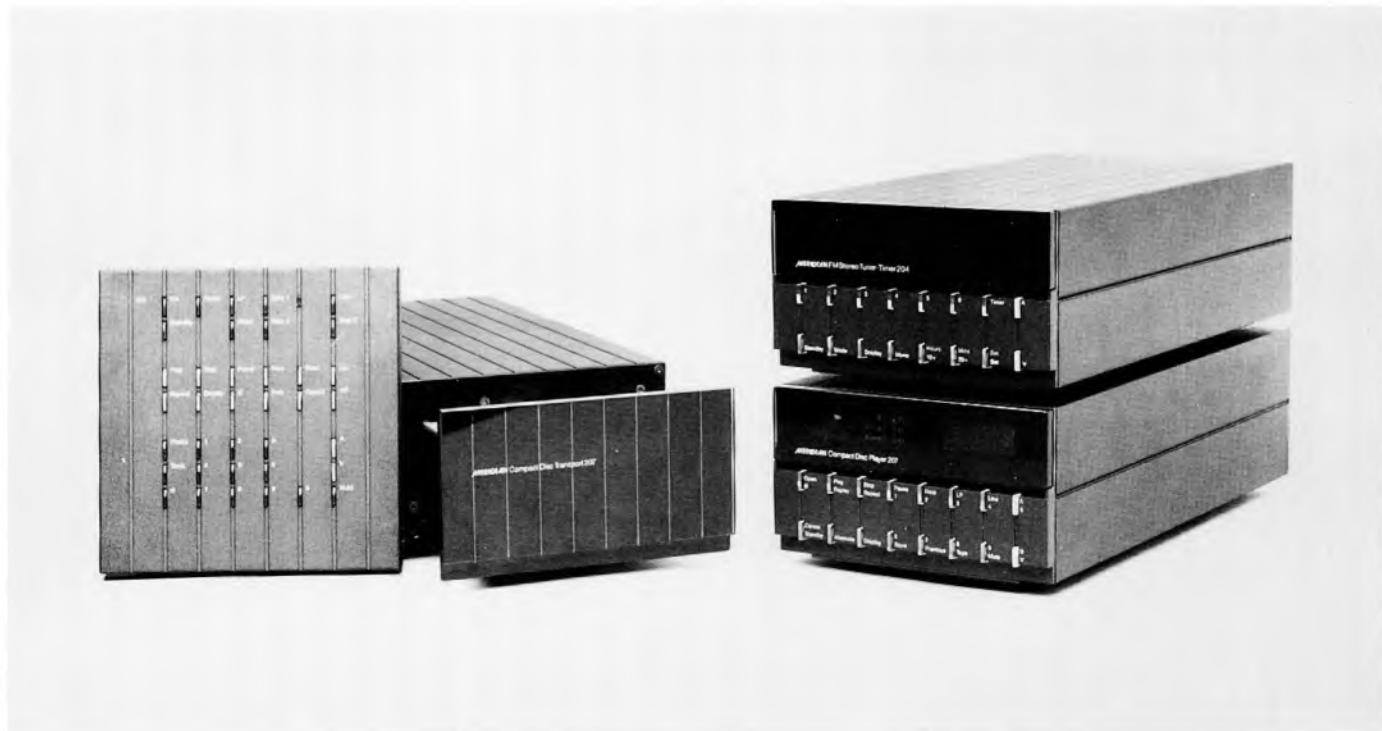
be Recommended – and there's no reason not to try alternative loudspeakers.

## TEST RESULTS

|                                     |                                 |                           |
|-------------------------------------|---------------------------------|---------------------------|
| CD player: Marantz CD-65DX, £250    |                                 |                           |
| Frequency Response (–3dB)           | L: 21.4kHz, R: 21.5kHz          |                           |
| Channel Balance, 1kHz               |                                 | 0.08dB                    |
| Channel Separation                  | 1kHz: –107.7dB, 20kHz: –100.4dB |                           |
| S/N ratio (A-wtd)                   |                                 | –108.4dB                  |
| THD (@ 1kHz), 0dB                   |                                 | 0.0084%                   |
| THD, –10dB                          |                                 | 0.015%                    |
| THD, –60dB                          |                                 | 1.48%                     |
| THD, –90dB                          |                                 | 306% (R)/104% (L)         |
| IMD (19kHz/20kHz), –10dB            |                                 | –84.1dB                   |
| Stop-band rejection                 |                                 | –40.8dB                   |
| Resolution at –90dB, L/R            |                                 | –9.93dB/–21.24dB          |
| Peak Output Level, L/R              |                                 | 2.103V/2.083V             |
| Amplifier: Marantz PM-45, £200      |                                 |                           |
| Maximum continuous power            | 8ohms: 69.2W, 4ohms: 102.8W     |                           |
| Output Impedance/damping factor     |                                 | 0.107ohm/75               |
|                                     | CD/aux                          | MM MC                     |
| Input sensitivity                   | 252.8mV                         | 3.21mV 382µV              |
| Input overload                      | >7V                             | 147.8mV 9.157mV           |
| Stereo separation                   | –80.6dB                         | –79.2dB –75.1dB           |
| THD (1kHz)                          | 0.01%                           | 0.0106% 0.012%            |
| IMD (19/20kHz)                      | –89dB                           | –78dB –64dB               |
| S/N (A-wtd)                         | –94dB                           | –84dB –74dB               |
| Tuner: Marantz ST-35L, £125         |                                 |                           |
| Sensitivity (@ –50dB S/N)           |                                 | 5.1µV/52µV                |
| Ultimate S/N, mono/stereo           |                                 | –75dB/–68.2dB             |
| FM distortion (1kHz)                |                                 | 0.71%                     |
| Output level (100kHz dev.)          |                                 | 1.17V                     |
| Cassette Deck: Marantz SD-35, £160  |                                 |                           |
| Replay frequency response, –3dB     |                                 | 32Hz–16.1kHz              |
| Record/replay freq. response        |                                 | 25Hz–17.2kHz              |
| Peak wow (1–10Hz)                   |                                 | 0.09%                     |
| Peak flutter (10–100Hz)             |                                 | 0.08%                     |
| S/N (A-wtd, Type II)                |                                 | –53dB                     |
| Distortion (315Hz, Type II)         |                                 | 0.85%                     |
| Loudspeakers: Marantz LD200MS, £150 |                                 |                           |
| Sensitivity (2.83/1m)               |                                 | 87dB                      |
| Max spl                             |                                 | 101dB                     |
| Distortion                          |                                 | 100Hz: 0.89%, 1kHz: 1.49% |

# MERIDIAN 200 SERIES

BOOTHROYD STUART, 13 CLIFTON ROAD, HUNTINGDON, CAMBS PE18 7EJ. TEL: (0480) 57339.



Recent recipients of a Design Council Award, Boothroyd Stuart's trademark has long been in innovative design flair, and this is very evident in the latest 200 series Meridian components. The recent injection of cash and backup expertise from no lesser manufacturer than KEF can only help the Boothroyd/Stuart design partnership on to even better things.

Several different components are available in this distinctive, unique and highly attractive modular format, though the system being covered in this review is composed of the 207 integral CD player/pre-amplifier and 204 tuner, the use of active M20 loudspeakers circumventing the need for an accompanying power amplifier. Meridian has also included their very pretty and comprehensive 209 remote control, which operates the complete system. Control sockets fitted to the rear of most Meridian components (including the tuner) allowing full control from either the master pre-amplifier or the CD player (which incorporates some pre-amplifier facilities). Meridian eventually envisages hi-tech 'round the house' control over a hi-fi system with active loudspeakers acting as remote sensors in several different rooms. As it stands presently, the 209 master controller is used simply as a traditional remote handset.

## 207 CD PLAYER/ PREAMPLIFIER AND 209 MASTER CONTROLLER

Taking the concept of hi-fi separates very seriously indeed Meridian's 207 Pro CD

player is actually a two box system. Power supplies and transport are in one case, full signal processing, D/A conversion and additional preamplifier facilities in the second box. Complementary aesthetics combine dark, textured metal cabinets with tinted glass 'pinstripe' fascias. A stiff, 25-way connector acts as umbilical, providing the necessary joint pathway for power supplies and digital data.

Triggered by a command from the 'B' box, the massively built transport assembly moves ponderously from its enclave, driven by a powerful rack-and-pinion arrangement and supported on sorbothane blobs to reduce vibration ingress. In fact, the entire fascia moves out as this is attached to the front of the deep disc tray!

The number of typical CD facilities is not excessive, but includes track skip, replay, pause, index select, absolute phase reversal plus 10-digit direct track access/programming keys. A neat option when programming the 30-track random access memory is the option to program out specific tracks – handy when you want to play most but not all the tracks on a busy disc.

A four-digit display above the two rows of function buttons can indicate total track number, total disc time, absolute time, track time, remaining time and memory content, in addition to the discrete steps of the 64-position electronic volume control. Six compact status LEDs refer to the phase and display condition, repeat mode, equalisation and error correction/concealment.

The transport, or A box, incorporates Meridian's own peripheral circuitry to the

Philips 5708/5709 control chips, upgrading the radial and focus servo mechanisms to name but two. After pickup demodulation and serial processing the datastream is subject to the usual Philips 4x oversampling filter (SAA7220P/A) before reconstruction via the dual-channel IDA1541 DAC.

The DAC feeds a current-mirror that precedes a FET-switched de-emphasis routine and basic (inductive) RF filtering. Signetics NE5532N op-amps are used in the output buffer, the equalisation and output stage being stabilised by an LF353 DC servo. The electronic volume control operates over 64 x 1.25dB increments, using discrete FET switching with a finely trimmed resistive ladder.

The CD player test results show the usual negative resolution error for a Philips oversampling/DAC array, low level linearity measuring about 15.2 bits. Channel balance is excellent but 63-67dB separation across the high frequency range is comparatively weak. The frequency response is slightly tailored, being -0.32dB at 20kHz.

Distortion is acceptable, despite noting the vestiges of compression between 0dB and -10dB. The 3-D plot highlights 2nd through to 5th harmonic distortion, derived mainly from the post-DAC analogue stages, while the efficacy of the proprietary output filtering is demonstrated in the 1-2dB extra suppression of 2nd-order stop-band IMD routes; a similar reduction is seen in the routes offset by 4.1kHz, derived from nonlinearities in the transition band.

The secondary function of the 'B' box is that of a conventional preamplifier, the switching hierarchy being based around

MC14052/MC14053 CMOS devices. Inputs are provided for line and tape, alongside fixed, variable, tape and headphone outputs. The selected input is shown by subtle back-illumination of the appropriate key on the front panel. A further key labelled 'LP' activates the MM/MC vinyl disc stage that may be fitted as an optional (£100) extra; for ordering purposes, this is known as the dual-module. A mute facility is provided but there are no balance or tone controls of any kind.

The RIAA dual module incorporates a 4-pole 2-way switch so that users may select the appropriate gain/loading required for either MM or MC operation. Equalisation uses frequency dependent feedback through a very low noise/ high slew rate *LT1028* op-amp, the entire array stabilised with an *LF353* DC servo. Meridian was one of the first companies to adopt the IEC-recommended bass roll-off, and this is reflected in the obvious tailoring of the vinyl disc curve. The -3dB point is almost exactly 20Hz while the MM stage also shows sensible HF control, with a 0.65dB cut at 20kHz falling to -2.6dB at 50kHz.

However, while the respective input sensitivities are pretty much par for the course, the input overload margins (especially MC) are marginal. As explained in the accompanying *Mission Cyrus* review, an MC overload of 18.4dB (ref. IEC standard 0.5mV) risks problems, not only because of the high peak levels produced as a natural action of transcribing highly modulated grooves, but also because of unpredictable output levels caused by clicks, pops and general ultrasonic garbage. IM distortion was also high via MC.

The dual-board vinyl disc option incorporates two compensation loops that feed the signal input into the equalisation stage itself, and these should be oriented vertically with a 45° twist to minimise hum. Distortion on the crosstalk channel may also be influenced by the position of these looped wires, so care should be taken when pressing down to locate the dual-board onto the *207* mother PCB.

Further inputs become available if the *207* used via its line out sockets are fed into the matching *201* control preamplifier. Even without this full-feature preamplifier unit, the boxes provided for this test may be controlled using the *209* handset - a chunky metal block that looks appropriately smart on a contemporary coffee table. All CD transport and programming facilities are included, together with phase-invert, while a 10-digit keypad and electronic volume control just add to the convenience. Used with the full *201* Meridian preamplifier, the *209* facilitates switching of up to 3 tape recorder, video, tuner, phono, CD and aux inputs.

## 204 TUNER

Maintaining the unique style of these components, the *204* digital synthesiser tuner is

built into the same case as the *207* and *201* preamplifiers. Here the input select and volume keys are replaced by a row of 6 station preset buttons and a timer facility.

A single 75ohm RF input socket at the rear confirms the *204*'s FM-only status, though by virtue of two shift keys the memory store is expanded to cope with no less than 18 favourite station frequencies. Should one of those favourite stations just happen to suffer from excessive noise due to inadequate signal strength, the tuner will also remember instructions to select mono mode in its non-volatile memory.

Small green up/down tuning keys replace the volume controls fitted to the *207*. These also initiate auto-scan tuning, and the frequency is constantly displayed in the usual 50kHz steps. Stations of known transmission frequency may also be keyed-in on a direct basis.

Although only four fluorescent yellow digits are provided on the main display, these may be switched between various functions other than the tuned frequency - including a 0-15 increment signal strength guide, preset number, 'srch', 'step' and of course the 24-hour timer. And it is also possible to turn the display off entirely. Stereo reception, centre tuning and timer operations are denoted by three status LEDs.

Technically this tuner does not set any new records, especially as far as the quite poor 55dB (band noise) stereo S/N ratio is concerned. Full quieting required more than 1.2mV of RF aerial signal - a condition not met in all local reception conditions. Better than 52dB pilot tone and subcarrier rejection is about average, though second-order intermodulation products resulting from earlier interaction between the audio signal and

19kHz pilot tone produced in-band residuals at only -35dB. HF noise floor modulation was also apparent, and this tends to have subjective correlation in treble blurring and coarseness.

## M20 (ACTIVE) LOUDSPEAKERS

Descendant of the famous *M2* loudspeakers, the *M20* uses a similar driver complement in a slim, front-ported cabinet. A pair of KEF *B110* long-throw drive units are mounted above and below a *T33* soft-dome treble, crossing over at 2.2kHz using an active crossover with 4th-order Linkwitz characteristics. Reflex loading introduces a 4th-order LF roll-off but an auxiliary active filter element increases this to a sharp 6th-order attenuation. Some HF response tailoring is available on coloured DIL switches located on the rear of these heavy boxes, various permutations of these switches introducing different RC networks at the input to the speaker. For the purposes of this test the *M20*s were used in their nominal 'flat' response condition.

Preceding the two power amplifiers per loudspeaker, the active crossover is built around four *NE5532*s. The power amps themselves (one for treble, one for the paralleled bass drivers) use Motorola devices bolted to a small heatsink. A Holden and Fisher toroid with 2 x 6800µF reservoir capacitors form the main power supply for each enclosure.

For additional flexibility the speakers may switch themselves on and off in a 'music sense' mode; either way it is probably best to keep them permanently powered up. Supplied bolt-on tubular steel frames support the speakers, and these being filled with loose polystyrene beads to prevent any ringing. The three rubber feet should surely be replaced by proper carpet-piercing spikes.

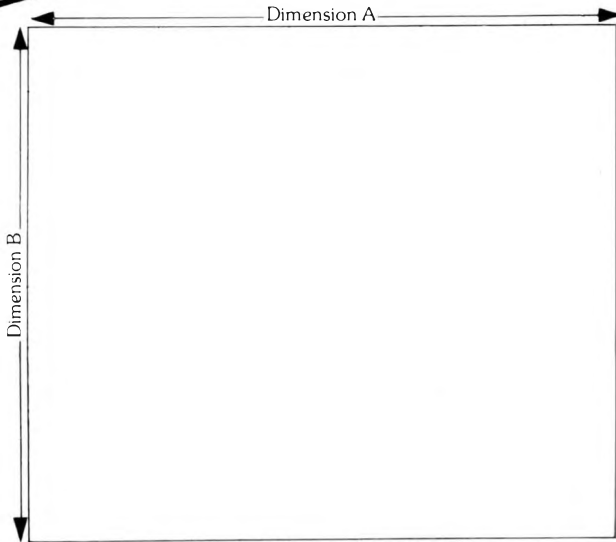


# **kj** SYSTEM DESIGN BRIEF

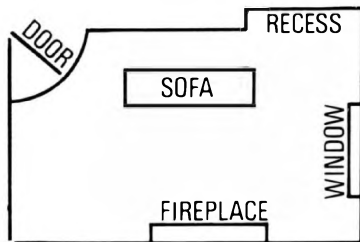
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Please draw the shape of your living room.



(Diagram of example room layout)



### MEASUREMENTS

Dimension A: .....

Dimension B: .....

Ceiling Height: .....

Is the room wall to wall carpeted? YES  NO

Please indicate on the plan where you would normally sit when listening. Also indicate positioning of doors, windows, major items of furniture and any unusual aspects of the room (i.e. odd recesses or non rectangular shape)

What type of music do you listen to? (tick any relevant)

- |             |                          |                |                          |
|-------------|--------------------------|----------------|--------------------------|
| JAZZ        | <input type="checkbox"/> | EASY LISTENING | <input type="checkbox"/> |
| GENERAL POP | <input type="checkbox"/> | HEAVY METAL    | <input type="checkbox"/> |
| CLASSICAL   | <input type="checkbox"/> |                |                          |

What items do you want incorporated in your system?  
(tick relevant boxes)

- |                       |                          |                                |                          |
|-----------------------|--------------------------|--------------------------------|--------------------------|
| AMPLIFIER             | <input type="checkbox"/> | RECEIVER                       | <input type="checkbox"/> |
|                       |                          | (combines amplifier and radio) |                          |
| RADIO TUNER           | <input type="checkbox"/> | TURNTABLE                      | <input type="checkbox"/> |
|                       |                          | (with arm and cartridge)       |                          |
| CD PLAYER             | <input type="checkbox"/> | CASSETTE DECK                  | <input type="checkbox"/> |
| CD PLAYER             | <input type="checkbox"/> | SPEAKERS                       | <input type="checkbox"/> |
| (with remote control) |                          |                                |                          |
- Any other items? .....

What items are you retaining in your system?  
(Please state with brand name and model no.)

Are there any particular brands or models you would like incorporated in our recommendations?

If you want a Radio Tuner which wavebands do you listen to?  
(tick any that are relevant)

- FM/VHF  MEDIUM  LONG

How do you intend mounting your speakers?  
(They should not be placed directly on the floor unless designed to be so.)

- FLOOR STANDS  WALL BRACKETS  EXISTING SHELVES
- If Stands or Wall Brackets, please tick the box if you want suitable ones to be quoted for.

Do you have any equipment you wish to part exchange?  
(Please state, giving brand name and model no.)

Is the equipment in full working order? YES  NO

What financial budget are you considering after deducting for Part Exchange allowance?  
(i.e. the nett amount you are prepared to spend) £ .....

Please tick box if quotation for instalment credit required

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MARANTZ · MERIDIAN · MICRO-SEIKI · MICHELL  
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MUSICAL FIDELITY · NAD · NAIM · NAKAMICHI  
ORACLE · P S AUDIO · PINK TRIANGLE  
QED · QUAD · QUICKSILVER · REVOLVER  
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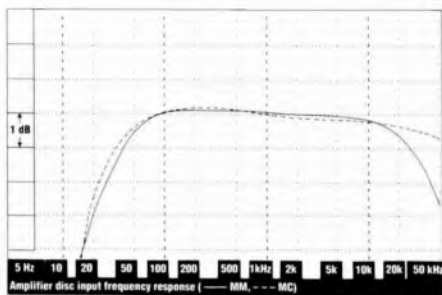
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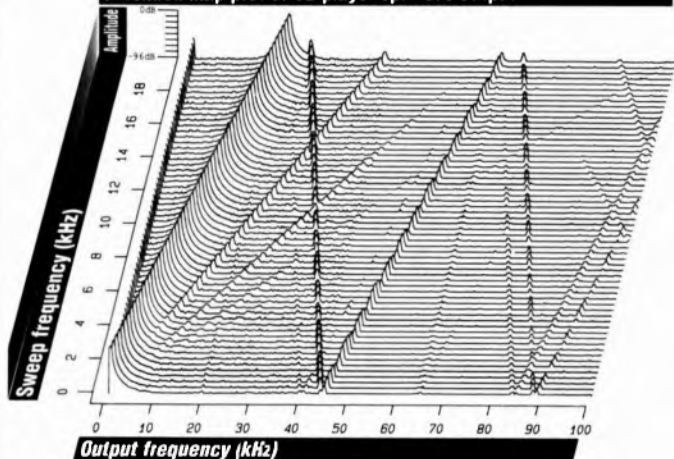
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Extended map plot of CD player spurious output



## SOUND QUALITY

Assessed as a high grade pre-amplifier in its own right, the true mettle of the 207 is soon revealed. It delivers a finely detailed and essentially transparent sound via the line input, albeit tinged with a slight coarseness on high level passages. Bass definition is good, though slightly more very low frequency extension might have been appreciated. Of course in the proper context of the full Meridian system, the adjustable balance of the speakers can accommodate any desired tonal flavour!

In practical use, the 204 FM tuner seems not all that sensitive, and the muting threshold is fixed too high for all but the strongest transmissions. Broadcasters' voices sounded mildly compressed and fuzzy in the higher registers, though this smearing is probably less subjectively disturbing than exaggerated sibilants, for example. Background burbles were commendably low once a decent signal strength was available, but the better quality signal simply lacked the clear-cut transparency and verve rendered intact by the best tuners. Soft and pleasantly rich-sounding, any loss of fine detail was concealed behind a smooth, coherent and very laid-back presentation. Despite (or perhaps because of) this sweet, gentle balance I found my attention wandering at times, the overall sonic incisiveness not really attaining the levels one would expect at this price.

With CD as the source, the 207/M20 com-

bination offers a very consistent, smooth and approachable sound that quashed the aggressive edge of some less-than-well-recorded discs. Treble detail seems particularly sweet and articulate, free of fatiguing grain but perhaps lacking the last vestiges of high frequency 'air' and spaciousness. In contrast the midrange was both pleasantly open and fluid, solidly recreating images between and behind the plane of the speakers.

As more demanding tracks are tried, instrument muddling and a general thickening of the sound becomes more noticeable. This reduction in transparency is linked either to the speakers or (more likely) the internal power amp modules, since the 207 Pro player achieves significantly better all-round performance when used outside the full Meridian system.

Viewed in isolation, the M20s deliver broad and deep imagery that is matched by a fine – indeed somewhat surprising – bass extension – considering the size of the enclosure. Some softening of transient edges was noted, however.

## VERDICT

In many respects this Meridian system offered a sweet, relaxing and appealing presentation of music, though the very laid-back sound will certainly polarise preferences one way or the other.

The 207 Pro CD player may be heartily recommended on an individual basis, even if the entire system achieved a somewhat lower

overall performance (especially with complex classical works). Nevertheless, taking into account the excellent build quality, discretely attractive aesthetics and delightful 'family sound', not to mention round-the-house future-readiness, the Meridian system warrants a cautious recommendation.

## TEST RESULTS

|   |                               |          |         |
|---|-------------------------------|----------|---------|
| CD player: Meridian 207, £950 (inc. preamp) |                               |          |         |
| Frequency Response (-3dB)                   | L: 21.6kHz, R: 21.56kHz       |          |         |
| Channel Balance, 1kHz                       | 0.05dB                        |          |         |
| Channel Separation                          | 1kHz: -67.3dB, 20kHz: -63.4dB |          |         |
| S/N ratio (A-wtd)                           | -104dB                        |          |         |
| THD (@ 1kHz, 0dB)                           | 0.0154%                       |          |         |
| THD, -10dB                                  | 0.0168%                       |          |         |
| THD, -60dB                                  | 1.02%                         |          |         |
| THD, -90dB                                  | 67.4% (R)/57.9% (L)           |          |         |
| IMD (19kHz/20kHz), -10dB                    | -78.9dB                       |          |         |
| Stop-band rejection                         | -41.77dB                      |          |         |
| Resolution at -90dB, L/R                    | -6.17dB/-8.96dB               |          |         |
| Peak Output Level, L/R                      | 2.392V/2.378V                 |          |         |
| Amplifier: Meridian 207 preamplifier        |                               |          |         |
| Maximum output (variable)                   | 9.56V                         |          |         |
| Output Impedance                            | 150ohm                        |          |         |
|   | CD/aux                        | MM       | MC      |
| Input sensitivity (1V)                      | 123mV                         | 2.11mV   | 113.8µV |
| Input overload                              | >7V                           | 75.8mV   | 4.154mV |
| Stereo separation                           | -103.1dB                      | -72.65dB | -65.2dB |
| THD (1kHz)                                  | 0.0144%                       | 0.0115%  | 0.025%  |
| IMD (19/20kHz)                              | -75.4dB                       | -62.2dB  | -52.2dB |
| S/N (A wtd)                                 | -89.3dB                       | -73.4dB  | -64.2dB |
| Tuner: Meridian 204, £495                   |                               |          |         |
| Sensitivity (@ -50dB S/N)                   | 8µV/37µV                      |          |         |
| Ultimate S/N, mono/stereo                   | 64dB/55dB                     |          |         |
| FM distortion (1kHz)                        | 0.109%                        |          |         |
| Output level (100kHz dev.)                  | 830mV                         |          |         |
| Loudspeakers: Meridian M20 (active), £1,295 |                               |          |         |
| Sensitivity (@ 0dBm)                        | 780mV                         |          |         |
| Max spl                                     | 103dB                         |          |         |
| Distortion                                  | 100Hz: 1.9%, 1kHz: 1.07%      |          |         |

# MISSION CYRUS

MISSION ELECTRONICS, STONEHILL, HUNTINGDON PE18 6ED. TEL: (0408) 52777.



Quite unintentionally, this Mission system turned out to be a blend between something old and something new. Representing the most recent developments at Mission HQ, the very new *Cyrus Two* integrated amplifier offers both a change in style as well as tonal character. The external *PSX* power supply was not included in this test, though it has proved to be a successful enough upgrade in the past systems. Mission's *Cyrus* tuner was also not included, but if past experiences are anything to go by this may well have been a considered move on the part of the manufacturer...

Representing the 'old' camp, we received the stalwart *PCM7000*, despite having specifically requested a sample of the new Mission *PCM II* CD player. Wrists having been summarily smacked, we hope to examine this model at a later date. A Mission *Isoplat* was thoughtfully provided for use under the CD player, providing a similar level of mechanical isolation as the *RATA Amplat* plus Sorbothane feet reviewed in the April issue of *Choice*. Other useful accessories included a sample of their new solid-core loudspeaker cable, a directional design featuring spaced conductors that proved just the job when used in conjunction with the *737 Renaissance* loudspeakers.

## PCM7000 CD PLAYER

Developed from the original 14-bit 4x oversampling *DAD7000*, the *PCM7000* adopts more recent 16-bit 4x oversampling format, with proprietary circuitry employed in the post-DAC stages. Like so many other players in this test group, the *7000* is a Philips

derivative, with electronic seasoning added to give it a characteristic Mission flavour.

While other players seem littered with hi-tech sounding labels and plenty of fairy lights, knobs and twiddly-bits, the *PCM7000* is singularly boring – or refreshingly discrete, according to taste.

Devoid of useful legends, clues to the purpose of the larger transport controls are provided in the form of raised figures situated on the buttons themselves. Stop, pause, play and fast music search facilities are supported by such ditties as track and index selection, repeat operation, memory recall and store.

Mission's 20-selection random access memory provides a useful twist, in that indices as well as tracks may be stored. However, as an index point must also be identified by track number, storing such precise positional information requires the use of two memory slots. Still, 10 track and index locations should be more than sufficient for most applications.

Aiding the process of programming and track identification, the *PCM7000* is graced with a very large and informative fluorescent display.

A coaxial digital outlet is fixed to the rear of the case, alongside the two analogue phono sockets. The accompanying remote handset has about 51dB of volume adjustment in 1dB steps, along with the basic transport controls.

On the technical side, Mission uses the standard Philips 16-bit 4x oversampling chipset, the comparatively poor linearity of the *IDA1541* DAC being reflected in the

–3.01dB/–9.23dB errors at –90dB. Despite this annual gaff, the level of THD at –90dB has been kept down to an acceptable 60-70%. Channel separation, stereo separation and IMD were all excellent.

Sitting alongside the main digital board is Mission's additional post-DAC circuitry which provides output filtering and slight frequency response tailoring (–1.15dB, 20kHz). The filter is based around two Signetics *NE5532N* op-amps with control over the loop gain (ie feedback) exercised by several *HEF4051BP* 1-pole 8-way latches.

The effectiveness of this output format is demonstrated by the 3-D plot which clearly highlights the progressive attenuation of second-order sampling, IMD (compare to the plot taken for the basic Philips player). The stop-band rippling is still clear enough, however, and the 2nd, 3rd and 4th harmonic distortion routes are also visible. Mission claim to be using a minimum phase network, though the application of such a filter in the first place may well have some subjective consequences.

## CYRUS TWO AMPLIFIER

Though destined to retail at the same price as its predecessors, the new *Cyrus Two* amplifier offers slightly more in the way of facilities, together with much improved standards of construction. The amplifier is now fashioned entirely from alloy, the chassis a one-piece casting that includes a thickly-finned heatsink. This is glossy black, while the cover is finished in a nextel-like material, lending a smooth and very attractive appearance. Despite all these aesthetic revisions,

most enthusiasts will still recognise the *Cyrus* control layout – including the upright input sockets – which has barely changed at all.

The ganged Alps volume control is now joined by a peripheral balance ring, with centre detent at 12 o'clock. Source and record out selectors now cater for vinyl disc (MM and MC determined at rear), CD, aux, video and tape. A mute function allows discs to be cued and inputs changed without 'thumping'.

Recessed 4mm loudspeaker sockets are fitted to the rear, though these are (deliberately) not disabled by the headphone socket – Mission decrying the unnecessary use of relays or switches. This socket is to the small 3.5mm diameter Walkman standard, which is handy in such a compact yet well filled design, where internal space is limited and the proximity of mains transformers are an inconvenience.

Technically this amplifier is very interesting because – in common with all previous past *Cyrus* designs – it employs a quasi-complementary output transistor configuration. Along with only a few other manufacturers (such as Cambridge and Naim), Mission benefit from the precisely matched characteristics of these common devices, but still have to contend with the phase-inversion circuitry required to effect complementary operation. In this instance two pairs of selected *8736N/PT77* devices (Thompson CSF) are combined with diodic output protection, though unfortunately a full discussion on the pros and cons of quasi-complementary techniques is beyond the scope of this review.

Signetics *NE5534N* op-amps are used extensively elsewhere, both in the feedback RIAA network and also as part of the input buffering. The signal from MC cartridges is first amplified via a differential input that uses ultra-low-noise, matched *LM394s*. These are configured with an *NE5534* op-amp to effect the required gain and the resultant signal then routed to the inverting RIAA input via the MM/MC selector switch. The RIAA equalisation curves were very similar to those obtained from the Rotel amplifier, showing a low frequency roll-off of  $-3\text{dB}$  at 13Hz on both MM and MC stages. Stage matching was very good, as expected.

Connected to an 8ohm load, *Cyrus Two* delivered some 60.1W, with a moderate reasonable increase to 92.6W when faced with a 4ohm load; this is 1.14dB less than the theoretical ideal, indicating that the amplifier is not quite as load tolerant as it might be. Stereo separation proved to be almost constant at 54-55dB across all inputs – perhaps indicating some sort of capacitive coupling in the output stage?

Noise could have been better via MC, but more worrying was the limited 84.7mV (ref. 1kHz) overload margin on the MM input.

Considering that peak modulation velocities may approach 30cm/sec at 1kHz, a MM cartridge capable of producing 1mV/cm/sec would raise 30mV peak, some 12dB below the peak overload threshold of the amp. If, however, a more efficient cartridge were used (say, 2mV/cm/sec), the peak output of the cartridge could be only 6dB below the overload threshold. On balance it's borderline, but probably acceptable for most application.

### 737R LOUSPEAKERS

Very well built for a speaker of this price, the *737R* has both a decent set of drivers and a highly rigid cabinet. The bass/mid unit is mounted in a die-cast basket, its generous polypropylene cone offering a wider bandwidth before breakup than conventional pulp cones of the same nominal diameter. This is mated to a soft-dome tweeter, itself loaded with a short flare, at a crossover frequency of 2.5kHz.

The low frequency alignment is fourth-order, reflex-loaded by a front mounted port composed of a honeycomb of smaller diameter tubes.

High constructional standards are maintained in the thick MDF baffle and the slightly lighter grade chipboard used for the remaining panels. Somewhat less impressive were the matching loudspeaker stands which fix into the cabinet base at three points. Not only do these stands lack rigidity, but one of the bushes designed to accept carpet-piercing spikes had not been thoroughly tapped, and as a result the threaded spike could not be correctly inserted. Furthermore, the stands were slightly too low for normal listening, the tweeter axis ending up somewhat below ear height under my conditions.

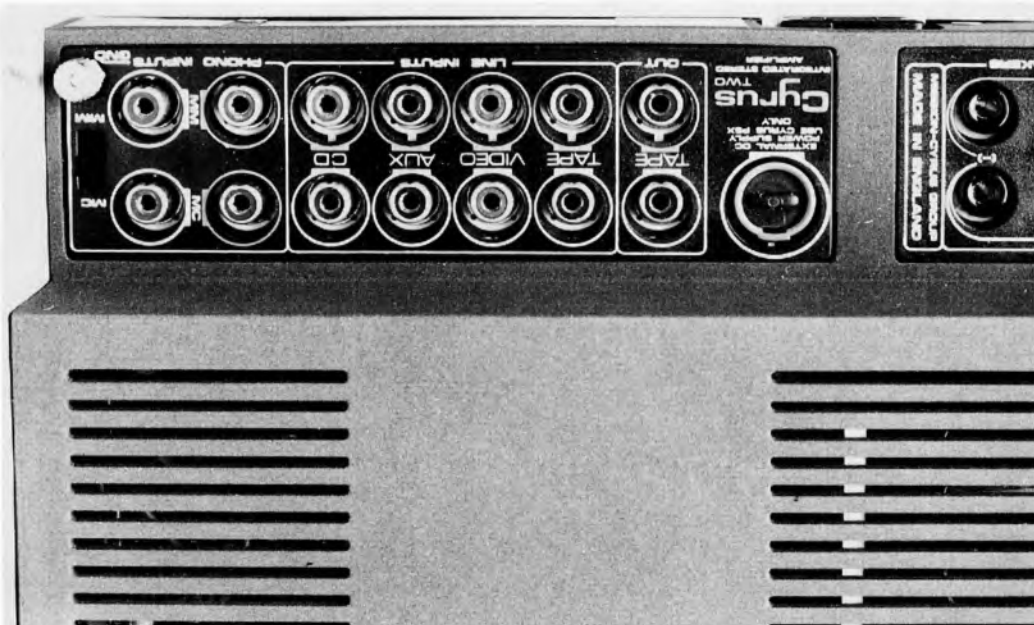
On a more positive note, the loudspeakers demonstrated very low levels of THD, possessed an easy load characteristic and were sufficiently sensitive to reach realistic volume levels with low power amplifiers.

### SOUND QUALITY

The initial sound of this system was quite immediate and impressive, though in part this could be attributed to the somewhat aggressive balance of the loudspeakers. Suffering a ragged and slightly coarse coloration at very high frequencies, the *737R's* incisiveness proved ideal for reproducing subtle detail in a clear and forthright manner. However, sharp percussive sequences or metal-stringed guitars, for instance, could become a little overpowering. And there was a similar though less disturbing loss of control at low frequencies, where thundering bass notes were accompanied by a slight but noticeable overhang. This particular aspect was progressively highlighted as the cabinets were moved nearer to rear and side walls.

Although it would be difficult to attribute any particular coloration to spurious output from the stands themselves, placing the loudspeakers on alternative, sand-filled pedestals (Target) of approximately the same height did bring certain subjective improvements. The bass in particular was brought into sharper focus, while the overall impression was one of greater tactility and realism.

Nevertheless, any discrepancies noted at both frequency extremes were made all the more regrettable by the delicate transparency of the midband, especially when used in open space and with Mission's own cables. Vocal images were solid and realistically proportioned, if lacking in 'height'.



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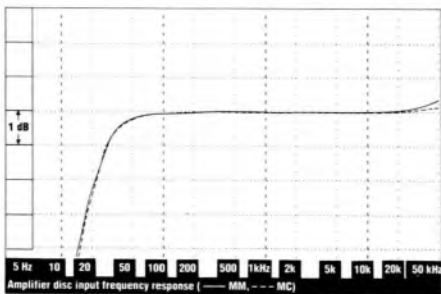
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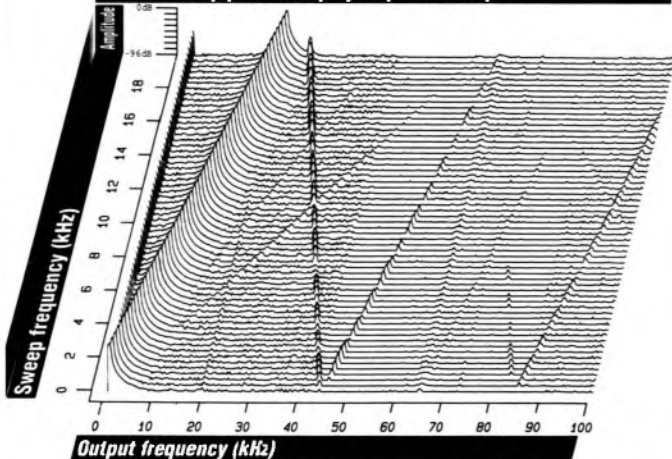
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Extended map plot of CD player spurious output



Concentrating on the integrated amp as a separate entity, the initial reaction was one of disappointment, such was the muted and rather dead 'feel' to the sound. The sample was then 'burned-in' (using a sustained pink noise signal into a purely resistive 8ohm load) and listening resumed. In much the same way as noted with the Rotel amplifier, this product certainly responded well to a protracted warm-up period. After this time and employing the aux input (which was preferred to the designated CD input), the amplifier seemed to have gained rather more of a spring in its step, displaying the punch liveliness often attributed to the cheaper *Cyrus One*.

That said, there was still a trace of muddling with high level passages – a problem which was compounded when used in conjunction with the *PCM7000* CD player. Strong female vocals tended to sound slightly too forward and an element of coarseness accompanied mounting crescendos. This was all the more noticeable because the treble was particularly sweet and detailed when playing simple, well-recorded pieces of music. Here any harshness was but a memory.

The disc (MC) input provided a less aggressive sound with a reduced tendency to harden up during high level or complex passages. However, some subjective tailoring was clearly evident, a certain added warmth throughout the midband together with a slight loss of 'air' in the highest octaves. A

sonic parallel could be drawn with that obtained using Rotel's latest integrated amplifier, although the latter was actually less prone to instrumental muddling than the Mission. The *Cyrus Two* was less transparent, less spacious and simply less comfortable to listen to over extended periods.

The sonic hallmarks of the basic Philips mechanism were quite apparent in the balanced and pleasantly transparent sound of the *PCM7000* CD player, though this particular derivative fared better on simple rather than complex passages. Large scale orchestral works seemed subject to an increasing amount of instrument modulation, clouding the presentation of subtleties within the performance. Massed strings would often sound a little shrill as well, a property not that desirable when partnering the *737R* loudspeakers.

Though not as obviously 'processed' as the sound of the Revox/Philips clone, the Mission *7000* was not recognised as being a particularly successful modification, especially in the light of competing designs from Marantz, Rotel, Arcam and of course Philips themselves. It was a pity that Mission were unable to supply their more up to date *PCM II* for this is reputed to be substantially better than its predecessor.

## VERDICT

Mission are a firmly established and highly regarded British audio manufacturer, a fact that led to high expectations concerning the

potential quality of this system. The actual results must therefore be considered a little disappointing, though not all is doom and gloom, despite the sometimes negative tone of the subjective remarks.

In fact the system delivered a generally pleasing sound, yet one that seemed somehow insufficiently musical and transparent to warrant the reputation earned by earlier Mission products, the amplifier being a particular case in point.

## TEST RESULTS

|   |                                |                 |
|---|--------------------------------|-----------------|
| CD player: Mission PCM7000, £400        |                                |                 |
| Frequency Response (–3dB)               | L: 21.0kHz, R: 20.8kHz         |                 |
| Channel Balance, 1kHz                   | 0.04dB                         |                 |
| Channel Separation                      | 1kHz: –100.6dB, 20kHz: –98.3dB |                 |
| S/N ratio (A-wtd)                       | –102.6dB                       |                 |
| THD (@ 1kHz, 0dB)                       | 0.0091%                        |                 |
| THD, –10dB                              | 0.0135%                        |                 |
| THD, –60dB                              | 1.06%                          |                 |
| THD, –90dB                              | 60.1% (R)/68.5% (L)            |                 |
| IMD (19kHz/20kHz), –10dB                | –85.4dB                        |                 |
| Stop-band rejection                     | –41.88dB                       |                 |
| Resolution at –90dB, L/R                | –3.01dB/–9.23dB                |                 |
| Peak Output Level, L/R                  | 2.12V/2.109V                   |                 |
| Amplifier: Mission Cyrus Two (II), £300 |                                |                 |
| Maximum continuous power                | 8ohms: 60.2W, 4ohms: 92.6W     |                 |
| Output Impedance/damping factor         | 0.082ohm/98                    |                 |
|   | CD/aux                         | MM MC           |
| Input sensitivity                       | 670.3mV                        | 2.69mV 184.7µV  |
| Input overload                          | >7V                            | 84.67mV 5.72mV  |
| Stereo separation                       | –55.2dB                        | –54.6dB –54.6dB |
| THD (1kHz)                              | 0.011%                         | 0.012% 0.019%   |
| IMD (19/20kHz)                          | –83.3dB                        | –82.1dB –78.7dB |
| S/N (A wtd)                             | –89dB                          | –81dB –68dB     |
| Loudspeakers: Mission 737R, £250        |                                |                 |
| Sensitivity (2.83V/1m)                  | 88dB                           |                 |
| Max spl                                 | 104dB                          |                 |
| Distortion                              | 100Hz: 0.33%, 1kHz: 0.105%     |                 |

# NAD VP/CD SYSTEM

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In many respects NAD was substantially responsible for the initial stimulation of the budget hi-fi separates scene. The mould-breaking 3020 integrated amplifier has now passed into the annals of audio folklore, though its great grandson still stalks the marketplace, in a highly evolved form. This very budget amp, the NAD 3020e, forms the heart of this starter system, dubbed VP by NAD to denote its vinyl playing front-end. Naturally, many first-time buyers will also be interested in purchasing a CD player, transforming the VP system into something of a two horse race.

NAD's latest British-built loudspeakers provide the final stage of the system, while 5m lengths of Phoenix multi-strand cable together with a natty test record complete the package rather nicely. All that is left is for the dealer to organise some loudspeaker stands, though in extremis these boxes could be used in the classic bookshelf locations. If not, expect to add about £50 onto the total system cost for a pair of rigid, spiked open-frame stands.

## 5220 CD PLAYER

One of a pair of budget CD players, the 5220 is £50 cheaper than the 5240 and lacks the latter's IR remote control. Struck from the traditional NAD mould, the matt grey fascia is adorned with only the most basic of facilities. Largest of these are the rocker-type switches that initiate play/pause, track skip and fast music search, the latter operating over two speeds with muted output if the player is left in pause mode.

A soft orange display breaks up the plastic

monotony of the player, showing track and either elapsed or remaining disc time information. A variety of simple status clues include repeat, pause, memory and play. The remaining smaller function keys change the display, enter repeat mode or start programming the memory. Up to 16 tracks may be entered into the random access memory, but the now unusual lack of direct track access keys slows the process somewhat. A button labelled 'reset' may also prove irritating since this is actually the stop command – I lost count of the times I mentally scanned the fascia, looking for a damn stop button!

Whereas the posher NAD 5240 player includes a dubious facility that goes by the name of CDR, or Controlled Dynamic Range, this has fortunately been omitted in the 5220 in favour of a timer facility. This is far more useful and allows the player to switch-on and commence play when the power cord is connected to a remote timer. Of course, with the power disconnected for a time the player will be unable to hold its memory in store; timer play is therefore non-programmable.

Other differences between the players include the lack of a digital volume control on the cheaper 5220 – this may also be an advantage since the 5220 has one less contact in its signal path. Furthermore because both players employ the same power supply with the same digital and analogue electronics, the 5220 actually makes less demand on the regulation. All of which may help to explain why the cheaper player sounds very slightly superior to its more costly stablemate.

So what of the technical side of the

design? There are no fancy electronics here, simply a non-oversampled, single channel Toshiba TD6720N 16-bit linear DAC followed by a passive low pass filter. Toshiba are in fact responsible for this unit's manufacture, though it is built to NAD's specific instructions and there is evidence of moderate circuit 'tweaking'. Toshiba's presence as the OEM source is reinforced by the use of a TA8101N servo-control IC and a TMP47C/420AF display/microprocessor control chip – in the 5240 this device also handles all the remote control commands.

Avid readers of test results will notice the low 1.53V peak output delivered by this player, some 2.27dB below the nominal CD standard of 2V. The reason behind this lies with the JRC4560 dual-channel op-amp that is employed in the final gain stage. As this runs off only  $\pm 5V$  supply rails the device would clip under normal peak conditions – hence the deliberately reduced maximum output voltage. The subjective consequence of this should be considered: if conducting straight A/B dems at a dealer where no attempt is made to match levels, wrong conclusions may easily be reached.

Channel balance was not brilliant at 0.17dB difference, and stereo separation fell markedly between 1 and 20kHz. Low level resolution was also poor, (the measured linearity being approximately 15 bits only); more importantly, the error was in a positive direction, boosting the output of heavily distorted signals by up to 8dB. Compare this with Philips-based units that actually suppress the high THD outputs of low level signals by up to 10dB. The frequency response

also demonstrates a rise of +0.45dB at 12.4kHz.

IMD will not win any awards either, but as this is a simple budget design at least the 3-D spuriae plot gives us something interesting to look at. First, note the effect of the sharp passive output filter which dramatically attenuates the 2nd-order 44.1kHz IMD route from its apex at 24.1kHz (44.1-20kHz) to its base at 44.1kHz. Also note that the filter has no effect beyond about 50kHz where the 2nd-order summation IMD routes appear relatively constant. Sampling harmonics in the DAC also give rise to 2nd-order IMD routes either side of an 88.2kHz leakage frequency.

Conventional 2nd and 3rd harmonic distortions are clearly evident, but most important of all the 4th-order difference IMD route (44.1kHz - 3F) steadily picks up in level until it tracks right into the audio band, reflecting at 14.7kHz (where 3F = 44.1kHz) to produce totally anharmonic distortion residues. This mechanism has been discussed often enough, but the 3-D display technique is one of the first records of its confirmation. (Note also the subjective correlation.)

## 5120 TURNTABLE

Basic but functional, the NAD 5120 is a belt-driven semi-automatic turntable that provides end-of-side lift-off as a matter of course. Although the deck seems rather flimsy, the platter affords a degree of self-damping while a crude leaf-type suspension keeps the whole transcription mechanism afloat. There is one rotary control for the arm lift and another to set platter speed.

The arm is also rather flimsy, being composed of a light alloy tube and plastic headshell with a complex rear counterweight assembly. This consists of a plastic moulding with the adjustable weight slung under the main gantry, supported by a decoupling spring. The arm/cartridge resonance may therefore be damped by coincident cancellation if the decoupled counterweight is properly calibrated. However, it does seem unfortunate to have gone to such trouble over a comparatively small detail when the arm itself has very slack bearings (if you can call them that) as a side-effect of the auto-lift mechanics.

The electrical noise (hum) spectrum extended up to 300Hz but mechanical bearing rumble at -69dB (DIN B-wtd) is more likely to have subjective consequences. Peak wow of 0.13% approaches the limits of acceptability, and some listeners who are very sensitive to changes in pitch may notice some tonal uncertainty as a result.

## 3020e INTEGRATED AMPLIFIER

Matching the CD for unassumingly discrete aesthetics, this latest version of the 3020 integrated amplifier is equipped with inputs for vinyl disc (MM only), tuner, CD and tape.

These input select buttons are located in the centre of the fascia, while rotary balance, bass and treble controls are situated over on the left near the headphone socket. No true tone defeat switch is fitted, the tone controls slotting into a 12-o'clock detent position, while a mono switch and low-level (-20dB mute) key complete the front panel feature count.

NAD has equipped the 3020e with its proprietary soft-clipping circuit and 4 or 8ohm output limiting. Depending on the position of the switch, output power ratings changed significantly. Changing from the 8 to 4ohm settings reduced power from 35.7W to 26.1W (8ohms) and 52.7W to 37.9W (4ohms). The interal build was a little untidy and perhaps a little over-complicated, the power amp section based around *2N3055/MJ2955* work-horse bipolar transistors. Spring-clip loudspeaker terminals do little for the macho image, I might add.

Disc and line input sensitivities are fine, and the MM overload margins a magnificent +34dB. RIAA equalisation was accurate throughout the midband, and showed some mild tailoring at the extremes, falling -2dB at 11Hz and rising +1dB by 50kHz; the general trend was of a slightly 'lightened' balance.

## 8020e LOUDSPEAKERS

Designed by KEF to NAD specification, this little reflex-loaded box could turn out to be one of the former's best bookshelf models to date - what a shame it has someone else's name on it! Constructed out of standard chipboard, the cabinet is lightly damped internally but essentially unbraced. The outside is covered in an attractive black wood-effect vinyl that contrasts with the lighter grey of the front baffle. The two comprise an

Elac bass/mid unit and a Tonagen soft-dome tweeter, crossing over at about 3.5kHz using a second-order network; this includes an auxiliary element to increase the ported LF roll-off to 5th-order, providing a measure of DC protection.

The general load characteristics seem to be quite favourable, falling no lower than 4ohms in the 300Hz region. Pair matching was excellent, but third harmonic distortion climbs rapidly at low frequencies - not uncommon phenomenon in such a diminutive design. For best results the grilles should be removed and the rear of the speakers positioned near to a back wall; stand mounting is also recommended.

## SOUND QUALITY

Initially assessed on an individual basis, the constituent parts of this system all offered a very similar, almost characteristic sound. In the 5220 CD player this was manifest as a buoyant, light and breezy balance that only started to crack up at very high frequencies. Fortunately, the in-band sampling IM distortion did not render the top-end obviously bright or coarse, simply rather fuzzy and soft, losing the detail resolution enjoyed throughout the lower octaves. For such an elementary design, the 5220 possesses a marvelously open and expressive midband, a hint of extra hardness tending to release transient notes with added zest and perceived clarity. Of course, the sound was not really any clearer; the extra 'tightness' this coloration introduced seemed to increase the sensation of stereo breadth and depth.

Very low bass notes were somewhat lacking, and this was made all the more obvious by the lean character of the accompanying amp and inherently restricted (albeit admir-



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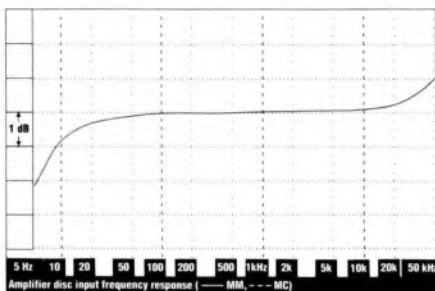


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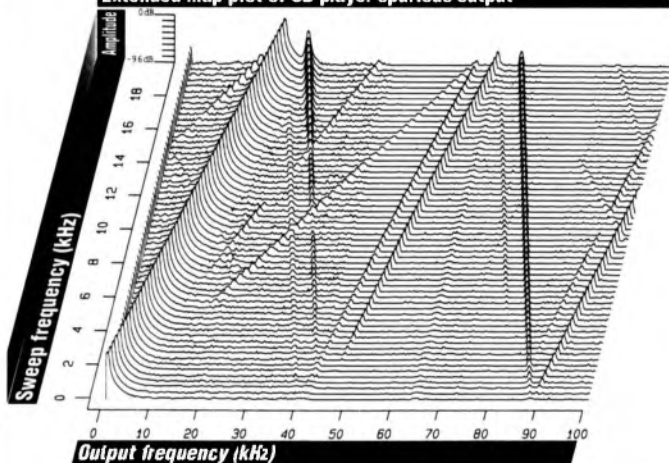
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Extended map plot of CD player spurious output



ably punchy) bass output of the small 8020e loudspeakers. These speakers in fact deliver a surprising degree of authority in the upper bass, doing little to impede the accurate recreation of acoustic ambience and musical rhythm. The midband was remarkably transparent once more, the see-through clarity and tactile stereo images proving a credit to the basic design. In the manner of most small and coherent boxes, the 8020e excelled in the reproduction of well-recorded voices; only a hint of added sibilance gives away the true budget-status of this product.

Overall, I felt it was most fortunate that the 5220/3020e/8020e combination did not err too far in the direction of lightness, for it could so easily have become insubstantial and ultimately uninteresting. In contrast, however, the universal sound combined fair neutrality with a lean but wholly transparent midband – a foot-tapping and highly musical sound in fact.

There was certainly a tilt in the balance of this system once the 5120 turntable was brought into play. Although the fitted Ortofon OM-10 cartridge delivers a quick, fluid and generally rather lively sound, it also sounds rather crude throughout the upper octaves. This in turn tends to corrupt subtle timbral detail and blemish the fine articulation of vocal tracks, especially with female singers. Furthermore, the amplifier sounds faintly warmer, weightier and, in some instances, somewhat slower than it does using the CD input. Whereas the sound of the sys-

tem with vinyl records might seem to be slightly better balanced, in truth this is achieved at the expense of detail resolution at the two frequency extremes.

As a final point, I found the supplied Monster-like multistrand loudspeaker cable ideal for getting the system up and running, but it was also responsible for a slight congestion at low frequencies. Smoother-sounding cables such as Kimber and Supra derivatives really did help this system to sing!

## VERDICT

As a first step on the yellow-brick road to hi-fi heaven, the NAD VP system represents an ideal choice for the first-time buyer, combining adequate facilities and a fine sound at a very realistic price. Apparently, many VP systems are sold through Hi-Fi Markets shops together with a 5220 CD player, mainly for reasons of cosmetic continuity (brand loyalty?). If you could suffer an alternative player that was not quite the aesthetic match of the 5220, similar priced units from either Philips or Marantz would complement the sonic attributes of this system far more efficiently. The 5220 is certainly not a bad player – far from it in fact – but it is simply a little dated compared to the advanced 16-bit 4x oversampling units currently leading the budget market. A little mix'n'matching never hurt anyone, but the heart of the VP system remains the stuff of which legends and Best Buys are made.

## TEST RESULTS

|                                 |  |
|---------------------------------|--|
| Turntable: NAD 5120, £89        |  |
| Type                            | Floating subchassis                    |
| Platter mass                    | 1.2kg                                  |
| Absolute speed                  | +0.19%                                 |
| Drift (1 hour)                  | -0.02%                                 |
| Peak wow (1-10Hz)               | 0.13%                                  |
| Peak flutter (10-100Hz)         | 0.09%                                  |
| Total rumble (unwtd)            | -49dB                                  |
| Electrical noise                | -51dB                                  |
| Rumble (DIN B wtd)              | -69dB                                  |
| Shock/Vibration sensitivity     | Fair/Fair                              |
| CD player: NAD 5220, £230       |  |
| Frequency Response (-3dB)       | L: 21.7kHz, R: 21.8kHz                 |
| Channel Balance, 1kHz           | 0.17dB                                 |
| Channel Separation              | 1kHz: -104.6dB, 20kHz: -77.2dB         |
| S/N ratio (A-wtd)               | -102.7dB                               |
| THD (@ 1kHz), 0dB               | 0.0102%                                |
| THD, -10dB                      | 0.014%                                 |
| THD, -60dB                      | 2.08%                                  |
| THD, -90dB                      | 46.2%                                  |
| IMD (19kHz/20kHz), -10dB        | -61.3dB                                |
| Stop-band rejection             | -22.1dB                                |
| Resolution at -90dB, L/R        | +7.81dB/+8.01dB                        |
| Peak Output Level, L/R          | 1.53V/1.56V                            |
| Amplifier: NAD 3020e, £120      |  |
| Maximum continuous power        | 8ohms: 35.7W/26.1W, 4ohms: 52.7W/37.9W |
| Output Impedance/damping factor | 0.215ohm/37.3                          |
|                                 | CD/aux MM                              |
| Input sensitivity               | 183.3mV 3.08mV                         |
| Input overload                  | > 7V 250.3mV                           |
| Stereo separation               | -75.9dB -77.1dB                        |
| THD (1kHz)                      | 0.0094% 0.011%                         |
| IMD (19/20kHz)                  | -80.9dB -75.3dB                        |
| S/N (A wtd)                     | -84.7dB -87.7dB                        |
| Loudspeakers: NAD 8020e, £110   |  |
| Sensitivity (2.83V/1m)          | 88dB                                   |
| Max spl                         | 100.5dB                                |
| Distortion                      | 100Hz: 4.4%, 1kHz: 1.8%                |



Prior to the inception of Compact Disc, Philips was not exactly renowned for playing a leading role in the world of high-quality audio. Past ventures have included the *Black Tulip* debacle, and of course introduction of the ubiquitous Compact Cassette, though it was left to manufacturers such as Nakamichi to turn this into a hi-fi format. (The double-deck included in this Philips system is certainly no great ambassador for the medium, it must be said.)

To some extent this trend is currently being reflected in the steady evolution of compact disc. While Philips still produces the most universally popular 16-bit 4x oversampling chipset, it is remarkable just how many other manufacturers are attempting to improve upon this basic configuration.

This not only includes the large number of Far Eastern producers who are currently busy playing the 'numbers game', but also those more specialist concerns who are looking in greater detail at specific aspects of the circuitry – notably the final analogue output stage. However, if Philips itself took a greater interest in such tweaking, this might end up encroaching upon the territory of sister company, Marantz. For the time being it appears that Philips is still (just) master of its own digital technology, though whether it can establish a similar grip on the rest of the separates market remains to be seen . . .

## CD473 CD PLAYER

Some £50 more expensive than the popular *CD472*, the *473* offers a more comprehensive remote control in addition to Philips' proprietary FTS memory facility. FTS stands for

Favourite Track Selection, a useful feature that enables a permanent record of favourite tracks to be stored for a large number of individual discs. Up to 254 discs are catered for, but a strict relationship exists between the total number of tracks stored and the final number of discs that can be accommodated. For example, if an average of 5 tracks are stored per disc then there will be enough room for about 150 discs in the FTS memory. For reasons of expediency, the FTS memory is non volatile and quite separate from the 20-track random access memory that is provided as a matter of course.

The styling of this product follows earlier players in the Philips range, using an angled lower section of the fascia to spread out the necessary function keys. Track and index skipping keys are located here alongside the pause, program, repeat and a suitably highlighted FTS button. A bright fluorescent display illuminates the main fascia, and may indicate either track/index number or elapsed playing time. As is the fashion these days, the *CD473* is equipped with a 20-track music calendar that may prove useful to some owners when loading, playing or selecting a desired track.

Of greater benefit, perhaps, is the matching remote control which adds a 10-digit direct-access keypad to the range of transport controls already fitted to the player. Additionally, this IR handset also carries two up/down volume buttons that offer control over the output in crude 3dB steps. A single digital phono output is also included next to the analogue phonos on the rear of the case.

Philips is offering an awful lot of CD player

for the price, so the use of plastic mouldings for the recently improved disc tray and main fascia should not really be contested. The usual *SAA/TDA* Philips ICs are seen inside, yet despite the dual-channel DAC a tiny 0.5° phase error was detected between channels at 20kHz. Linearity was as poor as always, though despite the -10.64dB error on the right channel (-90dB), distortion was actually lower than normal at 96.1%! However, it is important to appreciate that this negative reconstructural error has reduced the heavily distorted output to a mere 0.019mV relative to a nominal 0dB 2.05V peak output.

The in-band frequency response ripple is now reduced to within acceptable  $\pm 0.05$ dB limits, though the *SAA7220P/A* oversampling filter is still responsible for the more pronounced stop-band rippling shown on the 3-D plot. First and second sampling products are readily visible, the minimum stop-band rejection of -40.4dB actually being about 1dB better than that of previous Philips designs. IMD products derived from 3fs were suppressed to below -93dB. Fanning out from the main frequency sweep, 2nd, 3rd, 4th and 5th harmonic routes may just be detected, though there was no hint of slew-limiting between the -10dB and 0dB output levels.

## FA-960 AMPLIFIER

Manufactured in Philips' (ex-Marantz) Japanese factory, the solidly built but imposing carcass of the *FA-960* features a large rotary volume control that includes a peripheral band which glows a garish blue once

switched on; channel balance is adjusted by a small slider that lurks just beneath. I must admit the styling did seem a little awkward.

A vertical bank of status indicators separate the volume knob from the rotary input selector and record-out controls, these in turn situated alongside the customary bass and treble pots. No less than 8 inputs cater for vinyl disc (MM and MC), CD (with optional CD direct), tuner, 2x aux and 2x tape. Full tape monitor and dubbing facilities are provided alongside such notable features as a loudness contour, mono and tone defeat options. Two pairs of speakers may be switched via the front panel.

A huge mains transformer and four 6800 $\mu$ F electrolytics make up the main power supply, with separate rectification and sub-regulation for both L and R channels. Two pairs of C3182/A1265 output devices are used per channel, delivering 166.2W into 8ohms and an impressive 277.9W into 4ohms, indicating good load tolerance and an ability to drive so-called 'difficult' loudspeakers. The remainder of the test results were fine, save for the IMD and noise figures on the MC input which seemed a little high. RIAA equalisation was bandlimited to 24Hz (-3dB) on both MM and MC inputs, though a slight ultrasonic rise was detected via MM.

## FT565 TUNER

Contrasting the massive build of the amplifier, Philips' FT565 tuner seems distinctly lacklustre. As befits a digital synthesiser design, both manual and automatic tuning is available. Torquoise illumination highlights these controls, but the main frequency display itself could have been brighter. The tuned frequency, program number and stereo beacon are sited alongside a 5-step signal strength.

A bank of 8 preset keys select any stations from FM/LW/MW bandwidths. On depressing any of these buttons more than momentarily, the tuner reverts to the 9-16 memory section where only FM transmissions are stored. An FM noise reduction facility trades high frequency stereo separation for a reduction in background hiss, though the tuner sounded sufficiently dull for this to be hardly ever a problem anyway. Technically, the FT565 suffered from poor 19kHz pilot tone suppression (-28dB), and produced second-order IMD products in excess of this value. Muting threshold was set at a sensible figure of 12 $\mu$ V while FM stereo sensitivity was an acceptable 32 $\mu$ V.

## FC567 CASSETTE DECK

Festooned with a myriad facilities, the FC567 is a twin 'dubbing' deck with the added convenience of quick auto reverse. Furthermore, it is able to record with both the A and B transports and in either direction! You never get something for nothing, however, and the

FC567 suffered from both 6Hz capstan wow (0.15%) plus higher-rate flutter components at 30Hz and 65Hz (0.28%). The performance under high speed dubbing conditions do not bear thinking about.

As worrying to my mind was the indication of premature head overload in high (-18dB) second-order IMD product and reduced SAT margins of -13dB (IEC ref. Type I, 10kHz). Consequently it will be impossible to push many tape formulations hard without experiencing severe distortion, particularly at high frequencies. (Note the subjective remarks.)

Separate recording level sliders are linked to a pair of peak-monitoring meters. Dolby B and C noise reduction systems are both fitted (useful bearing in mind the limited dynamic range that may be exploited), together with mute, track search and a 16-selection random access memory. In all there are a lot of facilities for the money, but I feel that Philips may have strayed too far in this direction while compromising the prospects for good, stable sound quality.

## FB-563 LOUDSPEAKERS

Faced with the slogan 'Digital World Series' splashed across a badge on the lower half of the plastic-framed grille, things can surely only get better. They didn't. Behind the grille lurk three drivers mounted in a substantial but resonant chipboard enclosure. A 30mm soft-dome midrange sits atop a smaller (18mm) dome treble unit and these are separated from the bass driver by a moulded plastic port measuring some 23 x 84mm, tuned to approximately 55Hz. The bass driver is relatively insubstantial, with a ribbed pulp cone, pressed steel basket and small motor assembly.

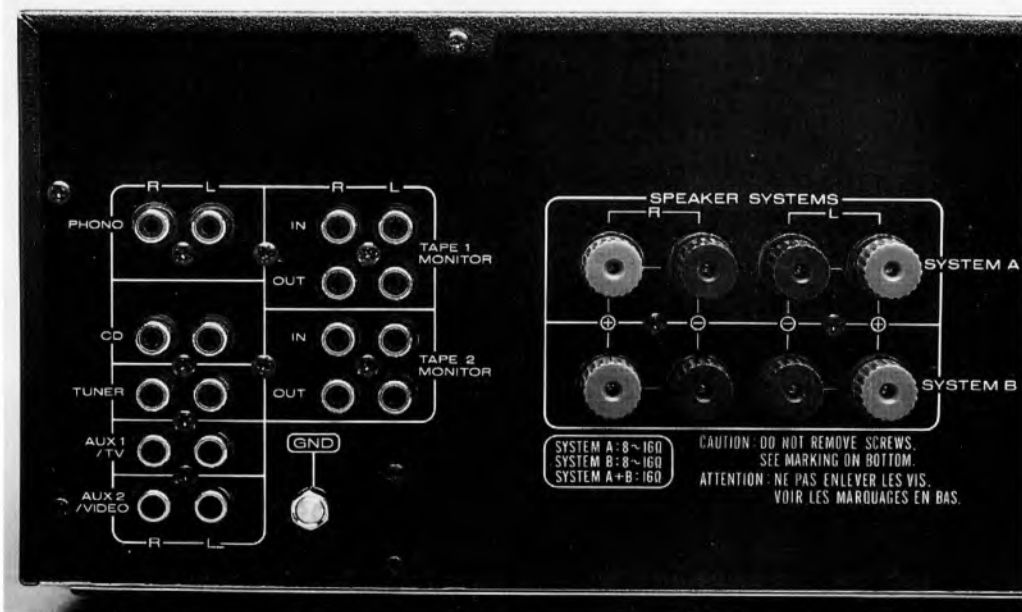
Inside, some medium density wadding clads the rear panel, but the cabinet is essentially unbraced and underdamped. The complex crossover network has three air-cored and one ferrite-cored inductor, two capacitors and three high power padding resistors. Perhaps as a result, system sensitivity was only about average at 87.5dB. Completing the package, a pair of open-frame steel stands and two 6m lengths of multi-strand copper loudspeaker cables are supplied.

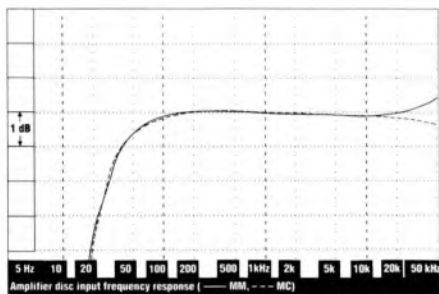
## SOUND QUALITY

The sonic prowess of Philips CD players seems almost assured these days, the 473 proving no exception. Cool, open and frighteningly detailed, this CD player has a remarkable clarity that allows listeners to hear right through the musical soundstage. In many respects the sound quality of this player indicates that Philips is snapping closely at the heels of Marantz when it comes to the last drop of clarity and resolution. More than its immediate predecessors, the CD473 successfully develops a deep and wide soundstage, possessing the scope, spaciousness and low frequency ambience that is more usually associated with a good (and expensive) analogue system. Furthermore, there was little hint of any compression or undue 'processing' of a sound which always seemed sparkling and buoyant.

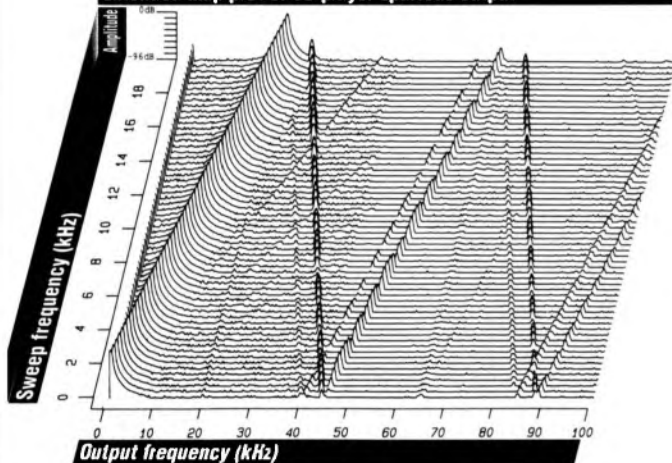
On the debit side the player would occasionally be aggravated by 'difficult' discs, resulting in a tendency to sound mildly 'glassy' or 'forward'.

To some extent this condition was ameliorated by the FA-960 amplifier which was certainly less explicit than the CD player at the frequency extremes - it tended towards a relaxed vagueness in fact. Viewed in a





Extended map plot of CD player spurious output



favourable light, this easy-going character affords the system a classic 'big-amp' sound, effortless available dynamics allowing massed orchestral works to swell convincingly.

Much of CD's energy and sparkle was retained throughout the all important mid-band, though the boom'n'tizz of the *FB563* speakers did its best to compromise the overall performance. As is so often the case, the overall sound of any system may be limited by just one component – and in this case it's the speakers. The resonant nature of the cabinets may have contributed to their general liveliness, but did little to promote sharply focused, tactile stereo images. This effect was most obvious at lower frequencies, whereas a coarse blandness took over at higher registers, restricting the resolution.

Speakers aside, the CD/amplifier combination was very enjoyable, and the latter even fared well when attached to a record-playing source. MM was preferred to MC, where a certain haziness was imparted to upper bass frequencies, and stereo depth and width was not as impressive as with CD. Viewed as a first-generation 'audiophile' amplifier, Philips has largely succeeded with this particular product. However, the same could not be said about either the *FT565* tuner or the atrocious *FC567* twin-tape deck.

Recordings made from the CD player sounded both muted and ragged, especially with Type I cassettes. Uppermost frequencies were most objectionable, either sounding crassly bright with simple material or

coarse and smeared on high level and percussive sequences. Metal tapes responded best overall, but users of this particular deck are hardly likely to splash out on such costly formulations. In any case, improving the tape performance tended to make the problems associated with pitch instability and premature head overload that much more audible.

Paralleling this performance to some extent, the *FT565* tuner sounded distinctly bandlimited and had a phasey quality at high frequencies. Even with strong transmissions that might be expected to develop a stable, tactile soundstage the *FT565* continued to reproduce musical events on a notably small scale. The lucidity, freedom and dynamics offered by competing tuners was quite obviously lacking in this design.

## VERDICT

Listening to this extremely mixed system I found myself running the gamut of emotions from profound elation to sick-as-a-parrot depression. Sunny side up, this combination benefits from one of the best sounding and best value CD players yet produced. In the context of high fidelity of this calibre, the lacklustre performance of both tuner and cassette deck was just too exasperating.

If nothing else, this Philips system is an admirable example of how one manufacturer can be the tops in one field while hitting rock bottom in another. To a large extent, the new non-CD separates are being launched off the back of the successful CD players; I only

hope this policy does not backfire.

## TEST RESULTS

|  |                               |                 |
|--|-------------------------------|-----------------|
| <b>CD player: Philips CD473, £250</b>      |                               |                 |
| Frequency Response (–3dB)                  | L: 20.8kHz, R: 20.9kHz        |                 |
| Channel Balance, 1kHz                      | 0.04dB                        |                 |
| Channel Separation                         | 1kHz: –96.8dB, 20kHz: –93.6dB |                 |
| S/N ratio (A-wtd)                          | –106.8dB                      |                 |
| THD (@ 1kHz), 0dB                          | 0.009%                        |                 |
| THD, –10dB                                 | 0.0135%                       |                 |
| THD, –60dB                                 | 1.06%                         |                 |
| THD, –90dB                                 | 96.1% (R)/59.3% (L)           |                 |
| IMD (19kHz/20kHz), –10dB                   | –84.4dB                       |                 |
| Stop-band rejection                        | –40.4dB                       |                 |
| Resolution at –90dB, L/R                   | –3.97dB/–10.64dB              |                 |
| Peak Output Level, L/R                     | 2.061V/2.050V                 |                 |
| <b>Amplifier: Philips FA-960, £300</b>     |                               |                 |
| Maximum continuous power                   | 8ohms: 166.2W, 4ohms: 277.9W  |                 |
| Output Impedance/damping factor            | 0.089ohm/89.8                 |                 |
|  | CD/aux                        | MM MC           |
| Input sensitivity                          | 221.8mV                       | 2.93mV 321.4μV  |
| Input overload                             | >7V                           | 186.3mV 20.6mV  |
| Stereo separation                          | –81.4dB                       | –79.1dB –80.9dB |
| THD (1kHz)                                 | 0.0205%                       | 0.019% 0.0125%  |
| IMD (19/20kHz)                             | –81.2dB                       | –75.3dB –55.7dB |
| S/N (A-wtd)                                | –86.1dB                       | –78.2dB –64.1dB |
| <b>Tuner: Philips FT-565, £130</b>         |                               |                 |
| Sensitivity (@ –50dB S/N)                  | 3.5μV/32μV                    |                 |
| Ultimate S/N, mono/stereo                  | 75dB/67dB                     |                 |
| FM distortion (1kHz)                       | 0.58%                         |                 |
| Output level (100kHz dev.)                 | 1.05V                         |                 |
| <b>Cassette Deck: Philips FC-567, £280</b> |                               |                 |
| Replay frequency response, –3dB            | 37Hz–9kHz                     |                 |
| Record/replay freq. response               | 20Hz–14.8kHz                  |                 |
| Peak wow (1-10Hz)                          | 0.15%                         |                 |
| Peak flutter (10-100Hz)                    | 0.28%                         |                 |
| S/N (A-wtd, Type II)                       | –55.1dB                       |                 |
| Distortion (315Hz, Type II)                | 1.55%                         |                 |
| <b>Loudspeakers: Philips FB-563, £230</b>  |                               |                 |
| Sensitivity (2.83V/1m)                     | 87.5dB                        |                 |
| Max spl                                    | 101dB                         |                 |
| Distortion                                 | 100Hz: 2.1%, 1kHz: 1.1%       |                 |

**Agfa Tape Stockists**

Jessop Photo Centres, 31/33 Market Street, **Aberdeen**.  
 Fisher of B Stoke Ltd., 2/3 Market Place, **Basingstoke**.  
 Jessop Photo Centres, 69 Smallbrook, Queensway, **Birmingham**.  
 Nam International, 22/26 Spencer Street, Hockley, **Birmingham**.  
 Honton Electronics (1987) Ltd., 9/9 Lower Temple Street, **Birmingham**.  
 Jessop Photo Centres, 10 Albert Road, **Bournemouth**.  
 Castle Cameras, 698 Wimborne Road, **Bournemouth**.  
 S.S. Audio/Video, 47/51 Carlisle Road, **Bradford**, Yorks.  
 S.S. Audio/Video, 56 James Street, **Bradford**, Yorks.  
 Jessop Photo Centres, 125 Queens Road, **Brighton**.  
 Hanningtons Ltd., North Street, **Brighton**.  
 Whitby's, 15 St James Street, **Brighton**.  
 Jessop Photo Centres, 8 St Augustine's Parade, **Bristol**.  
 Jessop Photo Centres, 98 Whitehalls Road, Clifton, **Bristol**.  
 The Cassette Shop, 29 Denmark Street, **Bristol**.  
 Good Viewing (Bristol), 11 Gloucester Road North, **Bristol**.  
 Jessop Photo Centres, 38/39 Green Street, **Cambridge**.  
 Jessop Photo Centres, 41 The Hayes, **Cardiff**.  
 Whitby's, 50 East Street, **Chichester**, W. Sussex.  
 Whitby's, 2 Sadlers Walk, East Street, **Chichester**, W. Sussex.  
 Ultimate Hi-Fi, 109/111 Old Church Road, **Chingford** E4 8ST.  
 Greens Camera and Computer Specialist, 22 Market Way, **Coventry**.  
 Jessop Photo Centres, 21a Cross Cheaping, **Coventry**.  
 Wright Vision & Sound Ltd., 73 Barkers Butts Lane, **Coventry**, W. Midlands.  
 Jessop Photo Centres, 12 Norfolk House, Wellesley Road, **Croydon**, Surrey.  
 Jessop Photo Centres, 1 The Spot, **Derby**.  
 Cameo Cameras, 58 London Road, **Derby**.  
 Jessop Photo Centres, 12 Cleveland Street, **Doncaster**.  
 S.J. Clear & Co., 65 High Street, **Dorking**.  
 Eden Video Productions, 93 High Street, **Edenbridge**, Kent.  
 Jessop Photo Centres, 27 Shandwick Place, **Edinburgh**.  
 Jessop Photo Centres, 167 Hope Street, **Glasgow**.  
 Jessop Photo Centres, The Oxboote, **Gloucester**.  
 Cameo Cameras, 3 Westgate, **Grantham**, Lincs.  
 Tuckers Supermarket, 2/8 Gateway Parade, Winfell Way, Awer View, **Gravesend**, Kent.  
 Greenford Photo Centre, 440 Greenford Road, **Greenford**, Middx.  
 Jessop Photo Centres, 6 Charles Street, East Precinct, **Hanley**, Stoke-on-Trent.  
 Fine Records, 32 George Street, Hove, East Sussex.  
 Jessop Photo Centres, 15 Jameson Street, **Hull**.  
 Jessop Photo Centres, 51 Buttermarket, **Ipwich**.  
 J. & H. Russell (Kidminster), 21/22 Coventry Street, **Kidminster**, Worcs.  
 Jessop Photo Centres, Ceres Court, File Road, **Kingston-on-Thames**.  
 Jessop Photo Centres, 51/53 Wade Lane, Merton Centre, **Leeds**.  
 Jessop Photo Centres, 43 Granby Street, **Leicester**.  
 Jessop Photo Centres, Photo Centre, Hinckley Road, **Leicester**.  
 Soni (Leics) Ltd., 135 Belgrave Road, **Leicester**.

Televidero (Shetland) Ltd., 155 Commercial Street, **Leurick**, Shetland.  
 Christophers Ltd., 31 The Precinct, **Lichfield**, Staffs.  
 Jessop Photo Centres, 19/21 Williamson Street, **Liverpool**.  
 Sound Plus Vision, 624 Rumard Road, Manor Park, **London** E12 5AQ.  
 College Camera Centre, 623 Forrest Road, Walthamstow, **London** E17 4NE.  
 The Cassette Shop, 20 Masons Avenue, Coleman Street, **London** EC2V 5BU.  
 Jessop Photo Centres, 121 Cannon Street, **London** EC4.  
 Jessop Photo Centres, 11 Frognaal Parade, Finchley Road, **London** NW3.  
 Selfridges, Audio and TV Dept., Oxford Street, **London** W1.  
 Ramsons, 4 Edgware Road, **London** W2 2EN.  
 Jessop Photo Centres, 67/69 New Oxford Street, **London** WC1.  
 Jessop Photo Centres, 11 St. Mary's Gate, **Manchester**.  
 Jessop Photo Centres, 7 Newport Road, **Middlesbrough**.  
 The Cleveland Camera Co Ltd., 271 Linthorpe Road, **Middlesbrough**, Cleveland.  
 Jessop Photo Centres, 17 Newgate Street, **Newcastle-upon-Tyne**.  
 Fenham Photo Ltd., 119 Grainger Street, **Newcastle-upon-Tyne**.  
 Jessop Photo Centres, 1 Abington Square, **Northampton**.  
 Jessop Photo Centres, 32 Market Street, **Nottingham**.  
 Cameo Cameras Warehouse, 8/10 Tintily Walk, **Nottingham**.  
 Jessop Photo Centres, 9 Westlegate, **Norwich**.  
 Jessop Photo Centres, 63 George Street, **Oxford**.  
 Jessop Photo Centres, 8 Cowgate, **Peterborough**.  
 Jessop Photo Centres, Armada Centre, **Plymouth**.  
 Jessop Photo Centres, 102 Cornwall Street, **Plymouth**.  
 Jessop Photo Centres, 110 Cornwall Street, **Plymouth**.  
 Jessop Photo Centres, 91 Armdale Street, **Poole**, Dorset.  
 Jessop Photo Centres, 15 Anundel Street, **Portsmouth**.  
 Purley Cameras, 4 Purley Parade, **Purley**, Surrey.  
 Jessop Photo Centres, 7 Duke Street, **Reading**.  
 Jessop Photo Centres, 21 Market Place, **Sheffield**.  
 Jessop Photo Centres, 26 Queensmere Centre, **Slough**.  
 Alternative Audio Ltd., 95 Hobs Moat Road, **Solihull**, W. Midlands.  
 Jessop Photo Centres, 19 East Street, **Southampton**.  
 Jessop Photo Centres, 57a Fawcett Street, **Sunderland**.  
 John Frost Ltd., 111/115 The Parade, **Sutton Coldfield**, W. Midlands.  
 Jessop Photo Centres, 6 Bellevue Way, **Swansea**.  
 Jessop Photo Centres, 1 St. James Street, **Taunton**.  
 P. Clandge, 43 High Street, Walsall Wood, **Walsall**.  
 Jessop Photo Centres, 75 Pymment Street, **Winchester**.  
 Jessop Photo Centres, 10/11 Queen Street, **Wolverhampton**.  
 Jessop Photo Centres, 30 The Cross, **Worcester**.  
 Roys Pharmacy (Wrotham) Ltd., Forge House, Station Road, **Wrotham**, Norwich.  
 Parlett, Shore Street, Ullapool, **Rosshire**, Scotland.  
 Jessop Photo Centres, 57 Middle Street, **Yeovil**.  
 Jessop Photo Centres, 2 Piccadilly, **York**.

# Agfa Audio Cassettes sound so good, everybody's talking about them.



Agfa C-DX II S is an exciting new dual-coated chrome tape for connoisseurs who demand top quality from their Hi-Fi equipment.

One reviewer recently described this tape as:

*"The best chrome tape there is"*

*"A perfect example of the current state of the art"*

Shouldn't you be looking into Agfa Audio cassettes too?

Ask your Agfa Hi-Fi stockist for C-DX II S C90 tapes at around £1.69 each. Or why not try one of the other tapes from Agfa's DX audio range starting with the Agfa F-DX I Ferro C90 from around 95 pence!

Agfa Hi-Fi stockists also carry a range of top quality Agfa Video tapes from the Agfa E180 HGX Hi-Fi at around £4.99 to the Agfa E180 High Color at only £2.99.



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 hour  
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Renowned for their superior workmanship and a distinctive if rather conservative styling, Revox products have remained resolutely expensive, restricting appeal to the better heeled enthusiasts. Judging by the price tag on our system, this trend looks unlikely to change, although this major European hi-fi manufacturer does appear to be responding to criticism in other areas.

Specifically, all the hi-fi separates have undergone recent metamorphosis, though only the tuner and integrated amplifier are completely new inside and out. It appears that the tape deck and CD player have benefitted mainly from cosmetic alterations.

The two-tier styling of silver alloy supported by a matt plastic lower fascia remains, though the chequerboard appearance and large grey/red function keys are no more. Instead, Revox have fitted rather more discrete rectangular pushbuttons which now nestle together on a darker matt black lower fascia. That said, the function buttons occupy the same space and purpose as before, providing a whole new generation of owners with the task of mastering the same incomprehensible internal logic.

Revox have also recently announced an 'off the shelf' multi-room hi-fi system which may be based on either the *B285* receiver or *B250* integrated amplifier. At its most basic, any Revox system may be controlled via their comprehensive *B208* IR remote handset but with the addition of one or more *B209* room controllers the whole concept takes a step forward. Ideally, the consumer would purchase additional amplifiers (any make) and loudspeakers for each local room, these

being operated as satellites from the master system via a balanced line and any number of *B209*s daisy-chained together. Volume, tone, balance, on/off and source facilities may then be accessed instantly, while the command information (BUS data) is said to be good for up to 300 feet of balanced cable.

## B226 CD PLAYER

As intimated in the introduction, a change of styling has made the quirky *B226* no less difficult to interpret and operate. At first sight the player is effectively split into left and right portions by the disc tray and low-slung back-lit LCD display. Nevertheless, the brighter top half of the fascia seems set aside for transport and direct track access keys, while the lower section carries secondary functions such as search, volume and memory.

Up to 19 tracks may be stored under the guise of track/index number or playing time, the 0-9 digit direct access keypad generally speeding up this operation. Additionally, the *B226* will allow specific time intervals to be memorised. This enables a certain total playing time to be defined, or, if mixed in with other programming options, may be of benefit to someone wishing to record from CD to tape. Using a cursor key it is also possible to define a repeat loop between two previously marked out and memorised time points on the disc. Finally, the *B226*'s memory will also allow the user to program in a 'stop' position or enable the unit to be switched off entirely. This is tantamount to a 'sleep' facility, I suppose.

No conventional track skip key is provided

(a bit of a pain in my opinion), but forward and reverse fast music search operates in both play and pause modes. There are fixed (2.28V) and variable analogue output sockets, plus two digital bitstream phono output sockets.

The most annoying feature concerns the LC display. On paper this may look very comprehensive, showing full track, time and index information in either normal or programmed play modes. But in practice it has the annoying habit of going blank. For instance, when loading a disc the relevant information is only temporarily displayed while you have no idea of the selected track number until the 'play' button is pressed! Once in play, the LC characters spring to life to show track/index numbers together with either the elapsed time, total remaining disc time or total remaining track time.

A quick peek inside reveals all the usual Philips 16-bit 4x oversampling system ICs. Build quality and layout is excellent, though the actual components themselves are of no special calibre. Some hint at the final sound quality may be gleaned from the two-stage filtering and an output stage which uses a bank of *RC5532N* op-amps (these not being the quietest of the breed).

The 3D plot demonstrates the stop-band noise characteristic of the Philips chipset, the ripple present throughout all sampling IMD routes being derived from the *SA47220P/A* digital FIR filter. Second and third harmonic distortions are slightly more prominent than with, say, the Rotel or Philips players but no trace of slew-limiting was observed. All the other figures were perfectly

acceptable, noting the only adequate 15.2Bit resolution which is fairly typical of a Philips-clone.

## B250 INTEGRATED AMPLIFIER

Matching the new *B260* tuner closely in style, the *B250* also represents a move towards better things in the Revox amplifier department. A bank of input select keys are situated on the upper (silver) half of the fascia. One MM phono input (with adjustable capacitance loading) was supplied, though an additional MC board may be purchased at a later date. It is also possible to use the *B250* as a separate power amp, or as a pre-amplifier for driving a real power amp or active speakers if so desired.

Two tape recorders are accommodated, with full source/record-out switching sited beneath a retractable glass door on the front panel. In fact, all input switching is effected by a row of solid-state CMOS devices fitted hard up against the rear panel. *RC5532A* op-amps act as input buffers, and also prevent gross breakthrough if phono leads are suddenly connected or disconnected.

A bright green 20-step fluorescent display indicates the volume setting, reading out the current amplifier function in text form. The perceived brightness of this display even varies according to the ambient light! Volume is actually manipulated via two huge rectangular push buttons on the upper fascia – steps of 1dB, 3dB or even 20dB are available, the latter for attenuation only.

A second, smaller back-lit LC display nestling amongst the secondary facilities behind the smoked door gives a graphic account of balance and tone control status, while Memory settings defines the power-on volume, the sensitivity of the various inputs and the relative level of the two loudspeaker outlets. Measured in the ex-factory/default state, both line and MM input sensitivities were just slightly low, but stereo separation, THD, IMD and noise were all perfectly respectable. The MM stage has a slightly tailored response, reaching  $-3\text{dB}$  at 20Hz.

The completely encapsulated mains transformer feeds 44,000 $\mu\text{F}$  of reservoir capacitance across each channel. Four pairs of NEC *A1232/D3012* output devices are employed per channel, mounted back-to-back on two large extruded alloy heatsinks – no doubt aiding the healthy load tolerance and power output which measured 143.2W into 8ohms and 231W into a 4ohm load.

## B260 TUNER

Bearing in mind the longstanding success of the *B261* tuner, the all-new FM-only *B260* marks an important step for the company. Not only is the product more attractively styled, but it sounds better, offers more facilities and is actually cheaper than the *B261*.

For the future, the *B260* will shortly be

available with an on-board RDS decoder, allowing extra information to be retrieved from a parallel digital data transmission signal. (Precise station, date and time information will be eventually broadcast alongside up to 64 characters of travel and other data.)

Auto and manual tuning is available alongside a total of 60 presets. Each of these also memorise up to 11 selectable tuning parameters, including station name, wide or narrow IF bandwidth, single or double RF preamplifier, antenna selection and output level of each station. The alphanumeric cursor and secondary (front-end) RF controls all lie behind a smoked glass door, paralleling the amplifier presentation. A comparable back-lit LCD reveals signal strength (output level) and operation of hi-blend, muting and IF circuits, while the larger 20-segment fluorescent display indicates station name, frequency and preset number. The two large pushbuttons initiate station or P-type scanning, and a 10-digit keypad gives rapid station access.

Provision has been made for two, switchable 75ohm RF aerial inputs, and an XY output facility allows the user to minimise multipath interference by adjusting the orientation of the aerial and monitoring the resultant Lissajous pattern on an oscilloscope. In terms of internal construction and technical specification, the *B260* sets new overall standards, and is quite beyond reproach.

## B215 CASSETTE DECK

Another recipient of Revox's revised styling, the underlying strengths and weaknesses of the *B215* remain unchanged. This three-head machine allows either source or off-tape signals to be monitored through the deck. One foible concerns the lack of a tape door, which

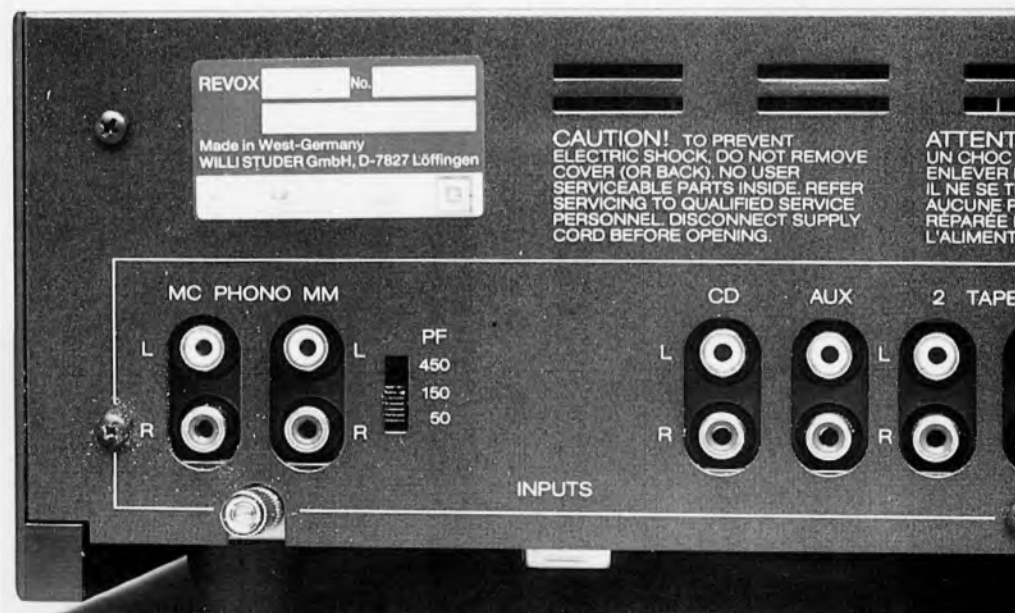
makes head cleaning easy but also leaves the heads exposed if the tape is removed. A snap-on plastic guard is supplied for when the machine is not in use.

The input level and L/R balance are adjusted via two sets of electronic attenuators, and the result is displayed on a fast-acting LCD monitor. Dolby B, C and HX-Pro are fitted as standard, but there is no provision for manually tweaking bias levels. In practice this is taken care of by an on-board auto-alignment system which takes a brief 20 seconds to determine optimum recording parameters for any tape, including bias, L/R level and equalisation. Furthermore, ideal settings for up to six favourite tapes may be stored in a non-volatile memory, obviating the need for auto-tuning with every recording.

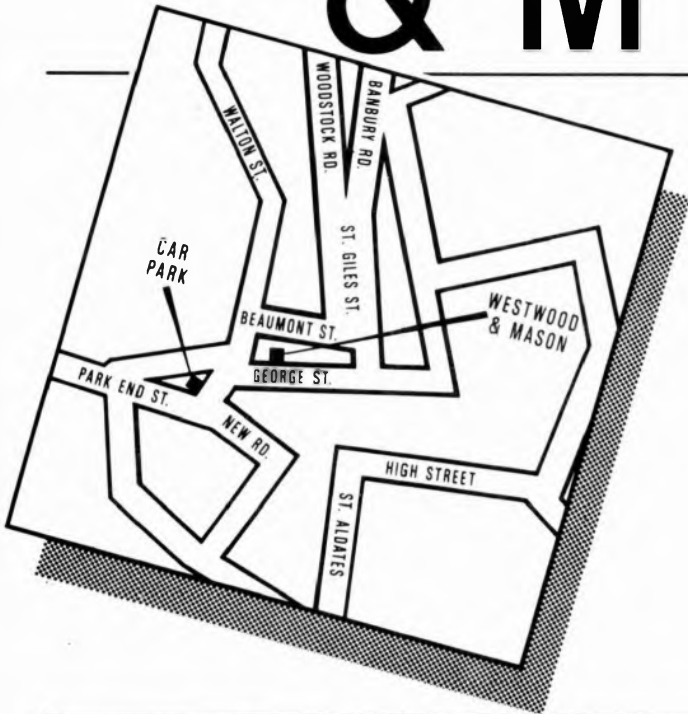
Adjusted closely to IEC standards, the pre-recorded replay response measured within 3dB across the audio spectrum, and extended usefully above 20kHz. The record/replay responses were similarly extended, demonstrating a slight (1dB) ripple at high frequencies. Mild 6Hz capstan wow contributed most of the 0.05% peak wow and flutter value; the 0.04% flutter was caused by high-rate components at 20, 40 and 60Hz.

## B208 REMOTE CONTROL

Available as an optional extra for £80, the *B208* infra-red handset actually controls all the separate system components featured here. Source selection, volume, balance, tone controls, record selection and pre-out selection applies to the amplifier. A 10-digit keypad plus skip and search facilities address both CD player and tuner. The cassette deck has full transport remote control.



# WESTWOOD & MASON OXFORD



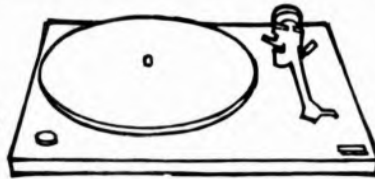
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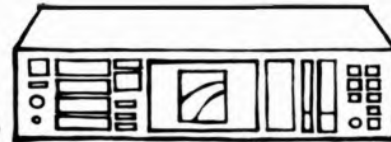
A&R, AUDIO TECHNICA, BEYER, CREEK, DENON, DUAL, EPOS, GOODMAN'S, HARBETH, HEYBROOK, INCATECH, KEF, LINN, MARANTZ, MONITOR AUDIO, MORDAUNT-SHORT, NAIM, NAKAMICHI, ORTOFON, QUAD, QED, REGA, ROTEL, SENNHEISER, SPENDOR, TANNOY, TEAC, YAMAHA.



LINN



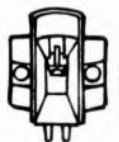
REGA



NAKAMICHI



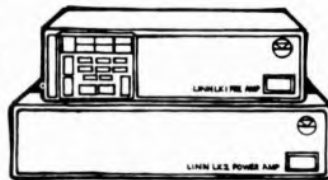
LINN



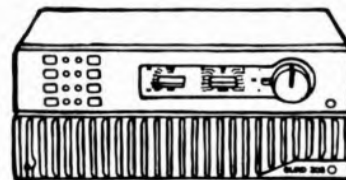
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NAIM



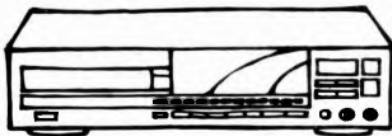
LINN



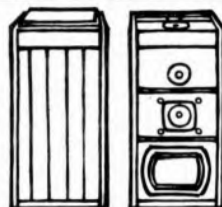
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MORDAUNT-SHORT



DENON



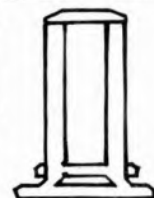
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BEYER



GOODMANS

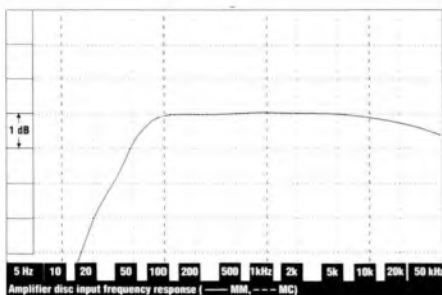


VARIOUS STANDS

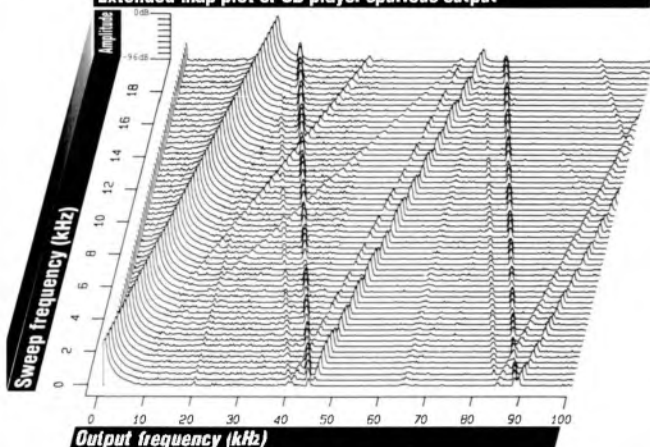
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Extended map plot of CD player spurious output



## SOUND QUALITY

The excellent *B260* tuner sits firmly at the top of the pile, able to receive weak and strong transmissions alike, and convert them into thoroughly believable musical performances without a hint of spurious background noise above  $400\mu\text{V}$  or so. Possessing a remarkable fluidity and seamless coherence throughout the entire audio band, the *B260* faithfully recreates the natural sense of acoustic space and atmosphere surrounding a decent, live transmission. Treble was pure while vocals are uncorrupted by sibilance or smearing. The *B260* sounded somewhat smoother, sweeter and more rounded in tone than the Sony *700ES* tuner; overall I found it the more consistent and listenable of the two.

Little of this endearing quality was lost through the *B250* amplifier, though there was a trace of hardness in the upper registers that faintly reduced resolution of subtle timbral detail. There was a hint of that old 'kid gloves' Revox sound via MM – an annoying blandness that gives the impression of listening to bits of electronics rather than music (though the CD player and tape deck suffered more from this problem). The hardness noted via line inputs progressed into a more obvious coarseness on the disc input, though I would hesitate to call the amplifier bright in any way. More appropriately, it simply lacked the get up and go of superior products.

Without labouring the point I was less impressed with both *B215* and *B226*. The for-

mer's decent transport avoided any pitch instability, although most recordings lacked the life and see-through transparency of the originals. Stereo images were well focused and fairly tactile, but the resolution of higher frequency musical detail was less sharply defined.

Likewise the CD player lacked the clear-cut articulation, lucidity and dynamic contrast offered by the most recent Philips derivatives, for example. The loss in ambience might well be tolerated but the accompanying loss in drive and transparency could not. With hand on heart there is nothing really wrong with this player; it simply lacks the ability to generate a strong emotional response in the manner of other, and less costly, CD players.

## VERDICT

Each of these Revox components represents a real masterpiece of engineering, and although the system as a whole fails to cut the mustard, there are strong signs that the old sonic register of earlier Revox products is being successfully bred out. The tape deck and CD player need to catch up of course, but the amplifier and particularly the superb *B260* tuner point the way forward. As the least 'processed' sounding unit in the whole system, the *B260* may be heartily commended. The other products may only be recommended on grounds other than sound quality. The exquisite build and inherent reliability counts for much these days, as will

the round-the-house capability for the discerning customer.

## TEST RESULTS

|                                   |                                |
|-----------------------------------|--------------------------------|
| CD player: Revox B226, £756       |                                |
| Frequency Response (–3dB)         | L: 21.1kHz, R: 21.0kHz         |
| Channel Balance, 1kHz             | 0.04dB                         |
| Channel Separation                | 1kHz: –124.1dB, 20kHz: –97.5dB |
| S/N ratio (A-wtd)                 | –109.3dB                       |
| THD (@ 1kHz), 0dB                 | 0.014%                         |
| THD, –10dB                        | 0.0154%                        |
| THD, –60dB                        | 0.945%                         |
| THD, –90dB                        | 74.9% (R)/124% (L)             |
| IMD (19kHz/20kHz), –10dB          | –82.4dB                        |
| Stop-band rejection               | –40.8dB                        |
| Resolution at –90dB, L/R          | –8.55dB/–6.34dB                |
| Peak Output Level, L/R            | 2.275V/2.284V                  |
| Amplifier: Revox B250, £1.187     |                                |
| Maximum continuous power          | 8ohms: 143.2W, 4ohms: 231W     |
| Output Impedance/damping factor   | 0.08ohm/99.6                   |
|                                   | CD/aux mm                      |
| Input sensitivity                 | 302.3mV 3.153mV                |
| Input overload                    | >10V 237.1mV                   |
| Stereo separation                 | –87.7dB –77.4dB                |
| THD (1kHz)                        | 0.01% 0.0097%                  |
| IMD (19/20kHz)                    | –95dB –82.5dB                  |
| S/N (A wtd)                       | –95dB –76dB                    |
| Tuner: Revox B260, £918           |                                |
| Sensitivity (@ –50dB S/N)         | 3.2μV/35μV                     |
| Ultimate S/N, mono/stereo         | 88dB/82dB                      |
| FM distortion (1kHz)              | 0.095%                         |
| Output level (100kHz dev.)        | 2.1V                           |
| Cassette Deck: Revox B215, £1.461 |                                |
| Replay frequency response, –3dB   | 25Hz – 20kHz                   |
| Record/replay freq. response      | 18Hz – 23.7kHz                 |
| Peak wow (1–10Hz)                 | 0.05%                          |
| Peak flutter (10–100Hz)           | 0.04%                          |
| S/N (A-wtd, Type II)              | –51dB                          |
| Distortion (315Hz, Type II)       | 0.95%                          |



Rotel must rank as one of the success stories of the recent hi-fi separates boom, having transferred from the rack system mainstream to a dominant position in the budget audiophile sector.

The latest Rotel separates have undergone a cosmetic facelift replacing the flat alloy fascias and razor-sharp edges with rounded, black plastic end-caps and wrap-around bonnets. Internal changes result from a continual development program, reflected in the latest *BX3* version of the classic *RA-820* integrated amp, rated at a conservative 30W.

Radio and CD sources are both catered for in this system, though no turntable or cassette machine was supplied. Rotel have had little success with tape decks in the past, but news has just filtered through that an entirely new design, featuring revised electronics and a proprietary transport, will be available soon. Rotel also handle UK distribution of the thick but flexible *Supra* loudspeaker cable, which was used during auditioning.

### RCD-820B CD PLAYER

Like many of the other CD players in this test, the *RCD-820B* is based around a Philips transport and 16-bit 4x oversampling chipset. As recipient of the *B* suffix, the *RCD-820* has enjoyed a minor aesthetic re-think in the form of a softer looking fascia, even if Philips' once-ubiquitous plastic drawer has been retained (for old-times' sake). Rotel have attempted to disguise its origins by a new turquoise display camouflage, but the classic Philips remote control gives the game away providing track and index skipping, together

with fast music search (three successive speeds), repeat and a 10-digit keypad.

There is no keypad included on the player itself, so the handset will help direct track accessing or programming the 20-slot random access memory. A programme review facility is included, and the display has enough digits to accommodate both track, index and timing information simultaneously. A small vertical bank of status indicators clearly demonstrates the current state of play.

Unlike Rotel's costlier *BX2* CD player, the *820B* does not benefit from a separate D/A converter PCB with its two additional filter stages and isolated power supply. Nevertheless, the *LM833* op-amp is replaced by a proprietary output stage based around two low-noise Signetics *NE5532AN* op-amps. Close tolerance polypropylene capacitors are used in the filter bank, and it is interesting to note that the 20kHz phase error has truly been reduced to zero. (The equivalent Philips system always suffers a residual, albeit inconsequential, 0.5° error as a result of its analogue gain stage.)

Stereo separation is a remarkably consistent 98-99dB right across the audio band, while channel balance is an excellent 0.02dB. THD was very low at a peak output level which hit the accepted 2V standard spot on. And although low level linearity only approached 15.2-bits, the monotonicity balance between channels was somewhat better than that obtained with a Philips model in this test. Furthermore, as the linearity error is in the negative direction, any heavily distorted output will be much

reduced in amplitude. The 3D plot demonstrates the low THD, showing minor 2nd and 3rd harmonic routes together with the usual second-order sampling IMD routes. Once more, Philips' *SAAT220* digital oversampling filter demonstrates its stop-band ripple, while third-order transition band IMD tracks are visible 4.1kHz to the left of each sampling route.

### RA-820BX3 INTEGRATED AMPLIFIER

Beautifully built, the *RA-820BX3* is the epitome of the no-frills audiophile amplifier. A dual-concentric volume knob controls left and right balance, while three adjacent selectors determine the mode, input function and tape monitoring. Alongside three other line stages, a dedicated CD input is equipped with a 230mV input sensitivity and has excellent noise performance. The front panel selector calls up the disc stage, but choosing between MM and MC cartridge sensitivities is done on the rear panel. Strangely, both these inputs have slightly low sensitivity – 4.4mV for MM and 405µV for MC in order to raise the amp to full output; not unexpectedly, both disc inputs have healthy overload margins. Two pairs of speakers may be connected via switched and direct 4mm terminals, the healthy power output being quite sufficient to drive four 8ohm loudspeakers. 41.6W was raised into a static 8ohm load, while the 68.4W available into 4ohms is only -0.84dB short of the theoretically ideal doubling of power, indicating that the *BX3* will be fairly tolerant of 'difficult' louds-

peaker loads. The *RL-850Bs* included in this system should pose absolutely no problem at all.

Rotel are now using a shielded toroidal mains transformer in the *BX3* amplifiers, the *820* version utilising no less than four pairs of high-current Sanyo output transistors fixed to an extruded alloy heatsink. The RIAA vinyl disc stage is based around a shunt-feedback network that incorporates a low noise Signetics *NE5534AN* op-amp at the input followed by a further *NE5534AN* device in the main network itself. Both MM and MC equalisation curves were well matched, with sensible low frequency tailoring that measured  $-1\text{dB}$  at 20Hz.

The line input stage is fully discrete with high quality Siemens layer capacitors and Dubilier polystyrenes in evidence, and runs directly into the final output stage. The small-signal bandwidth of the entire amplifier is determined by the earlier input stages, following normal Rotel practice.

## RT-850AL TUNER

The digital synthesiser *850AL* tuner is essentially the same design as the older *L* version but slotted into a more modern and aesthetically pleasing *A* carcass. A detachable AM loop antenna and both unbalanced 75 ohm and balanced 300 ohm FM aerial connections are fitted.

The memory keys are neatly laid out all in a row, with the rather small up/down tuning buttons above. Eight preset buttons operate on both FM and AM bands. With the muting switch left on, the tuner can scan up and down the airwaves, pausing under the influence of a suitably strong transmission.

Unfortunately this convenient feature is not found on the AM bands; manual tuning is required to unearth listenable stations across LW and MW frequencies. If a favourite AM station is not too closely bordered by other transmissions (some hope!), depressing the 'wide' button should increase the perceived bandwidth of the reception. A 5-LED signal strength meter assists tuning, while the selected frequency is constantly monitored by a bright fluorescent display.

The lynchpin of the design is the ubiquitous Toshiba *TC9157AP* synthesiser chip, but Rotel's own RF stage features good sensitivity ( $22\mu\text{V}$  RF @ 50dB S/N) and a 400kHz alternate channel selectivity of some 67dB. Some favourite 'audiophile' components are scattered about the final analogue and filtering stages, no doubt accounting for the very personalised sound quality!

## RL850/II LOUDSPEAKERS

A substantial box for the money, this sealed-enclosure design is attractively styled with a black ash veneer around the sides and a distinctive pattern on the grey baffle. The two drive units, crossing over at 2.5kHz via a sim-

ple second-order network, include a 200mm bass/mid unit sourced from Elac and a 25mm soft dome tweeter from Peerless. Both units are modified by Rotel, the base cone in particular doped with a lossy substance. Fibrous wadding fills the inside of the enclosure, helping control standing waves.

The  $-6\text{dB}$  bass roll off point is at a respectable 53Hz, but the 86.5dB sensitivity is barely average.

Distortion is admirably low, even at 96dBA where it reached 0.32% at 100Hz. This is an excellent result for a speaker of this price, though the sagging midband response of this design may encourage subjective 'boom 'n' tizz' with unsympathetic ancillaries. Placing the speaker near room boundaries will only compound the problem at low frequencies, so the *RL-850B* should be used well away from walls, on open, rigid stands.

## SOUND QUALITY

In the best tradition of all Rotel amplifiers, the *820BX3* required at least three or four days to run in (and will probably only reach a truly steady performance by two months if previous designs are anything to go by). However, it is important to appreciate that this only refers to the last 5 per cent of performance; the product is not transformed from awful to excellent in this time!

Driven from the *RCD-820B*, the sound is very comfortable – immediately approachable and relaxing, but not necessarily compromised in the resolution of fine detail. Treble is sweet, and sharp transients are finely executed without a hint of grain or coarseness.

Vocals suffered no additional sibilance, and the bulk of recordings enjoyed a controlled spaciousness filled with rock-steady

stereo images. Very low bass was curtailed or slightly softened, while the upper bass was notably faster and clear cut.

In some respects this matched the faintly ponderous nature of the accompanying *RL-850/III* loudspeakers. In all other respects these speakers delivered a performance way above their station, only the low bass seeming a trifle slow. Replacing the usual *Supra* speaker cable for either Kimber or Deltec types tended to create a slightly 'leaner' sound and improve the general transparency of the system.

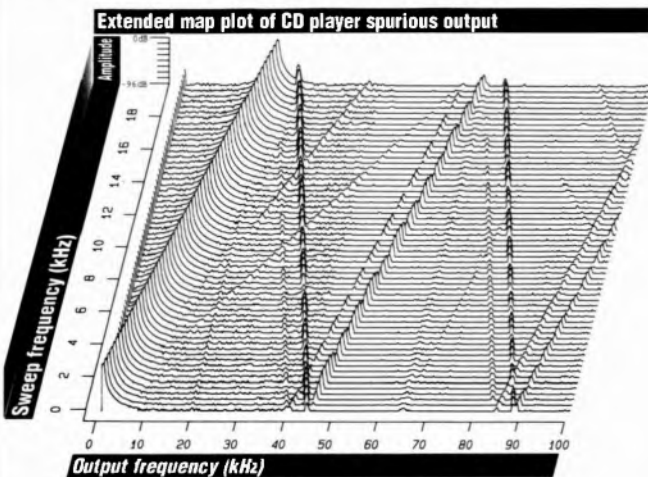
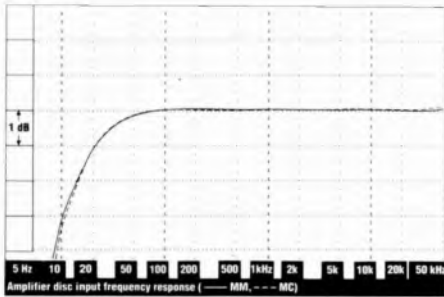
To some extent Rotel might have taken the cautious, sedate quality of the *820BX3* a little too far, for the *RCD-820B* has a similarly slow and deliberate signature. These two units, along with the *RL-850* loudspeakers, could sound just slightly bland or flattened at times, missing the verve and excitement shown by the latest *Arcam Two* loudspeakers, for instance. Nevertheless, the musical qualities of the system were always thoroughly engaging, its smoothness and richness almost always beguiling.

What it lacks in forthright attack is more than made up in the faithful reproduction of subtle musical and tonal contrasts; this little amplifier was never caught short, either in terms of delivering instant power or in handling musical complexity.

The low frequency extension actually seemed to improve when using the MC vinyl disc input. Low bass notes possessed greater impact and body than with equivalent CD recordings from the *RCD-820B*, though to some extent this reflects the slightly 'softer' bass resolution of the CD player itself.

While the amplifier fared very well with alternative (costlier) speakers that were able to handle this deep bass input, the





RL850s were occasionally overwhelmed. There was rarely unnecessary boom or upper bass overhang, simply a slight loss of control and general softening.

Of less consequence, faint bloom was imparted to the midband – a coloration certainly, but one that did nothing to reduce the musical satisfaction of the listeners. The emotional response engendered by all these products was powerful – the essence of a recording remained intact, and its emotive content was faithfully conveyed.

The MM input has similarly good-low bass resolution, and the music urged forth with greater pace and immediacy; stereo images were better focused too. Potential owners with MC cartridges might like to consider the use of a cheap step-up device such as the Ortofon T-5, and run directly into the high level MM input.

Turning finally to the airwaves, the RT-850AL tuner displays a characteristically broad and rich sound, with greater bite and clarity at higher frequencies than is usual from a tuner of this price. Broadcasters' voices sound relaxed and natural, suffering little sibilance, and classical transmissions can be enjoyed without interference from spurious tones and whistles. Sadly but perhaps inevitably the AM waveband was considerably noisier and rather more muted in tone – quite horrible in fact.

## VERDICT

As if this system were not competitive

enough, Rotel have just announced a £40 reduction in the retail price of the RCD-820B CD player. In overall terms this system is not only excellent value, but is a fitting tribute to the 'Rotel sound' – for there is no doubt that these products have been meticulously tweaked by ear.

The sound is warm, fluid and intimately detailed, uncompromised by fuzziness, with a character that should appeal to many first time buyers. Each component individually warrants the highest regard and warmest recommendation. Together they constitute a potent Best Buy.

## TEST RESULTS

|                                    |                                  |
|------------------------------------|----------------------------------|
| CD player: Rotel RCD-820B, £210    |                                  |
| Frequency Response (–3dB)          | L: 21.1kHz, R: 20.9kHz           |
| Channel Balance, 1kHz              | 0.02dB                           |
| Channel Separation                 | 1kHz: –99.7dB, 20kHz: –98.8dB    |
| S/N ratio (A-wtd)                  | –104.2dB                         |
| THD (@ 1kHz), 0dB                  | 0.0068%                          |
| THD, –10dB                         | 0.0092%                          |
| THD, –60dB                         | 1.173%                           |
| THD, –90dB                         | 86.6% (R)/65.2% (L)              |
| IMD (19kHz/20kHz), –10dB           | –89dB                            |
| Stop-band rejection                | –39.98dB                         |
| Resolution at –90dB, L/R           | –5.1dB/–8.1dB                    |
| Peak Output Level, L/R             | 2.066V/2.063V                    |
| Amplifier: Rotel RA-820Bx3, £160   |                                  |
| Maximum continuous power           | 8ohms: 41.6W, 4ohms: 68.4W       |
| Output impedance/damping factor    | 0.077ohm/103                     |
| Input sensitivity                  | CD/aux 230mV, MM 4.4mV, MC 405µV |
| Input overload                     | 6.8V, 202.4mV, 27mV              |
| Stereo separation                  | –82.3dB, –82.5dB, –71.8dB        |
| THD (1kHz)                         | 0.0263%, 0.0242%, 0.028%         |
| IMD (19/20kHz)                     | –73.2dB, –74.5dB, –71.3dB        |
| S/N (A wtd)                        | –95dB, –81dB, –72dB              |
| Tuner: Rotel RT-850AL, £160        |                                  |
| Sensitivity (@ –50dB S/N)          | 1.7µV/22µV                       |
| Ultimate S/N, mono/stereo          | –79dB/–75dB                      |
| FM distortion (1kHz)               | 0.27%                            |
| Output level (100kHz dev.)         | 590mV                            |
| Loudspeakers: Rotel RL-850II, £120 |                                  |
| Sensitivity (2.83V/1m)             | 86.5dB                           |
| Max. spl                           | 101dB                            |
| Distortion                         | 100Hz: 0.316%, 1kHz: 0.107%      |

WHAT THE CRITICS SAY:  
 SYSTEM: 'BEST BUY' RAREDA  
 'BEST BUY' RCARBBSO 'BEST BUY'  
 RA70BX 'BEST BUY' RL801L 'BEST  
 BUY' RT830L 'BEST BUY'



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# SONY ES

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As part of their 1988 offensive Sony recently launched no less than eleven CD players, most of these replacing existing models, incorporating the tray modifications necessary to play the new 3-inch CD singles without adaptors. Apparently the top-end *CDP-552ES/DAS-703ES* combination will remain on sale for the time being, while the most expensive single-box CD player has become the new *CDP-557ES*. Retailing at a few pence under £1000, this is the first commercially available unit to employ genuine 18-bit D/A converters.

This monster of a CD player was supplied alongside the equally monstrous *TA-F700ES* amplifier, both products being built on what Sony call their Gibraltar Chassis. This highly appropriate term refers to a special non-magnetic, non-conductive base cast from polyester resin and loaded with marble powder and glass fibre. The casting is strategically ribbed so that, according to Sony, the entire structure may be acoustically tuned.

Certainly, the sonic degradation in passive components and active devices caused by vibration is well accepted. So the clamping of mains transformers (one source of vibration) to a solid base is probably not a bad idea. Non-ferromagnetic material will help avoid the unwanted eddy currents that can be caused by a fluctuating magnetic field. The only drawback is the damn weight of the final components, though I hear Sony may be starting a truss (sic) fund for all those enthusiasts currently using G-chassis audio gear.

## CDP-557ESD CD PLAYER

Built to Herculean standards, the black ano-

dised fascia of Sony's *557ESD* player adopts a softer look than previous models with the massive multi-function display and transport keys located on a separate, inset portion. A 20-digit keypad ensures rapid direct track access as well as helping fill the 20-track memory. Sony's 'shuffle play' is included, with the extra option of shuffling only those tracks stored in the memory.

Track skip, fast music search, index skip and various repeat functions are all provided along with the usual transport controls, and duplicated on the *RM-D650* IR handset. Digital and analogue outputs are provided at the rear, the latter both fixed and variable, though unfortunately an output impedance that varies from 300ohms-6kohms depending on the position of the volume pot is far from ideal for driving power amplifiers directly.

Not only have Sony equipped their top player with a 20-track music calendar and a plethora of other indicators, they also offer several memory stores that fly under the banner of 'Custom Files'. To all intents and purposes this represents the Japanese answer to Philips' non-volatile Favourite Track Selection memory, enabling the desired tracks from a large number of discs to be memorised by the player for future recall. Not to be outdone, Sony have gone one step further.

The first Custom File concerns the storage of a 10-character remark that is unique to each individual disc: letters, numbers and a selection of weird looking hieroglyphics may be used to construct any desired message. When reloaded, the disc is instantly recognised by the player via its track content and total playing time, and the unique program-

med message appears on the broad fluorescent display!

Other Custom Files include a program bank of up to 20 favourite tracks per disc, and a Custom Index facility that allows you to locate and memorise up to six positions on any disc. Once reloaded, play may begin at any of the previously memorised custom index positions. Up to 226 discs may be accommodated in this grand system, with power-down memory backup lasting for over one month.

So what of the technology? Sony have adopted an acoustically sealed construction, a new chucking mechanism to accommodate off-centre discs, and a revised error-prediction/correction logic which attempts to forecast the degree of servo control necessary for optimum tracking. More important perhaps is the new genuine dual-mono 18-bit conversion system (PCM64s?) that (theoretically) should make maximum use of the 18-bit datastream arriving from the 8x oversampling digital filter.

Other manufacturers are currently using digital filters that offer 18-bit noise performance, but none are linking this with 18-bit linear DACs; most use a complementary array of 16-bit DACs, shifting the data stream up and down by two bits depending on signal conditions.

The internal construction seems a trifle over-complicated, though the use of independent transformers and regulation for the digital and analogue circuitry is a commendable feature. Technically this player offers no greater resolution than most £200-£300 units (you cannot expand upon the 16-bit disc for-

mat anyway), with an error of +4.04dB on the left channel. Fortunately, the accuracy of both oversampling and D/A reconstruction has minimised quantisation distortion at very low levels, reflected in the extremely low 25.4% THD at -90dB. The 3-D plot demonstrates superb linearity at peak level with only a trace of 4th-order IMD derived from 3fs at 132.3kHz. Traces of 2nd, 3rd and 5th harmonic routes are also just visible, any remaining noise being generated by the analyser itself. Channel separation measures an incredible -130.2dB at 1kHz while the noise floor (A-wtd) is found at an equally unlikely -121.1dB. Output was some 1dB up on standard at 2.24V - enough to influence A/B comparisons if care is not taken to match replay levels accurately.

## TA-F700ES INTEGRATED AMPLIFIER

Weighing-in at 18kg, the *TA-F700ES* amplifier caters for both MM and MC cartridges, the latter with 40- and 30ohm loading options, together with three line inputs and no less than three independent tape input/outputs. Cartridge selection is achieved separately but the remainder of the inputs are routed via two chunky controls, similar to a third rotary knob that defeats or selects both A and B speaker outlets. Defeatable tone controls are also equipped with variable turnover frequencies; -20dB muting, subsonic filter, balance and a huge volume knob complete the facilities line-up.

Sony's 'Spontaneous Twin Drive Circuit' basically refers to the independent supplies feeding the high-bias voltage gain stage and the final power output stage. Four pairs of high current Sanken output transistors and multiple supply regulation are responsible for the stiff load tolerance: 146.3W into 8 ohms and 239.1W measured into 4 ohms represents a modest -0.9dB shortfall against the ideal doubling. A further +1.6dB decrease afforded into a purely resistive 2 ohm load is very satisfactory. All distortion figures were fine, while the noise performance and channel balance could have been improved via the MC network. More seriously, the MC RIAA equalisation features a +1.9dB response rise at 50Hz (not mains-related). I have previously measured this same effect on an earlier *TA-F700ES*, and feel that Sony have had more than enough time to redress this inaccuracy.

## ST-S700ES TUNER

Designed to complement the *700ES* amplifier, the *ST-S700ES* digital synthesiser tuner is an ultra-modern design capable of quite superb results. The silky black anodised fascia sports 10 preset keys which may be used to fill the memory with either FM or AM (MW and LW) stations. Tuning may be effected manually or automatically with the

frequency shown on a central display. A 10-segment signal strength meter is fitted, though this is already fully lit some 300-400 $\mu$ V below the optimum quieting sensitivity. A novel touch concerns the use of a built-in 400Hz tone (50% modulation) so that users may accurately pre-set recording levels on an accompanying cassette deck.

Pilot tone/subcarrier residuals were generally below -70dB though 2nd-order IMD sidebands (derived before pilot suppression) reached a peak value of -35dB at high frequencies. Nevertheless, the excellent noise figures, sensitivity and alternate channel selectivity are partly the result of Sony's proprietary tuning 'tweaks'. These include a special bandpass filter that adjusts its characteristics according to the frequency and deviation of the FM transmission, reducing distortion and tracking errors as a result. However, this circuit only becomes operational when the tuner is set in to the preferred 'wide' IF bandwidth and incoming signals are >35dB in strength.

## TC-K700ES CASSETTE DECK

Yet another *700ES* series component, this luxury deck is equipped with three heads for off-tape monitoring and a 'Midship Drive System' that incorporates separate reel and capstan motors, linked by a servo to ensure optimum tape tension. Logic-controlled transport keys situated to the right of the central tape door include such convenience options as fast rewind-auto play (linked to counter memory).

Large peak-reading fluorescent meters display the recording/playback levels, the former set by a dual-concentric input control. Further tailoring is provided in the form of a  $\pm 20\%$  fine bias adjust, and a sensitivity

trimmer for accurate Dolby tracking of pre-recorded tapes. Auto tape recognition and Dolby B/C are also included. Technically this deck is quite superb, the only wow component being a slight 6Hz capstan modulation. THD was slightly high with Type II tapes but the noise performance was better than most at 54.5dB (ref. 30VU).

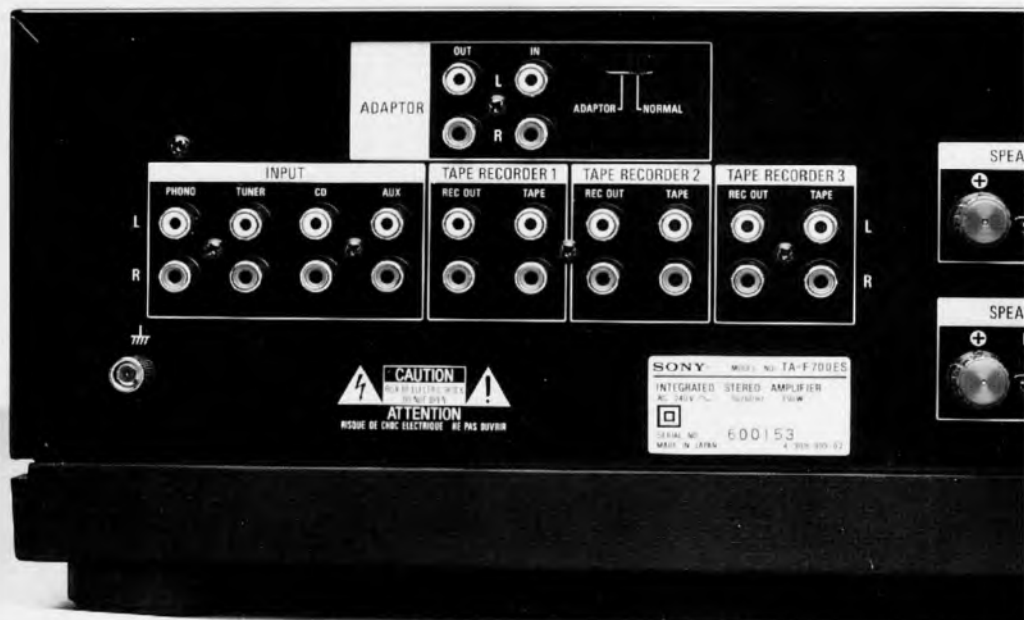
## APM-22ESII LOUDSPEAKERS

The flat (APM) tweeter previously employed in the *22ES* loudspeaker is now replaced by a more conventional soft dome HF driver in the *mkII* model. Other than this (and the fact that Sony have now painted both drivers and frame a matt black), the *APM-22ESII* is pretty much the same loudspeaker. The flat, light but extremely rigid alloy-sandwich bass mid unit crosses over to the new treble driver at 2kHz, and it is clear that Sony has made some detail modifications to achieve what it sees as a 'British' sound.

Curved baffle edges reduce the likelihood of HF diffraction, while a rectangular port provides reflex loading and a fourth-order roll-off below about 60Hz. These loudspeakers are ideally suited to stand mounting, well clear of rear and side walls.

## SOUND QUALITY

From memory I would suggest that the latest version of Sony's APM-22ES monitor is somewhat richer in balance, and at the same time less openly detailed at the very top end - a change in character directly attributable to the change in tweeter perhaps. The tonal balance was essentially neutral, with a fine sense of integration across the audible spectrum. Detail resolution was very good, though not to the standard of Acram's *Plus Two* speakers when it came to resolving



WHAT THE CRITICS SAY  
 SYSTEM - RECOMMENDED  
 DP880SG, KA660D, KT660L  
 KX660D



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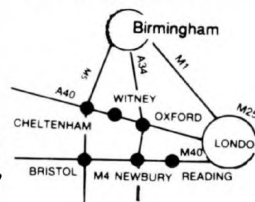
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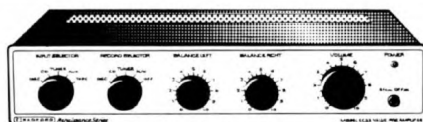
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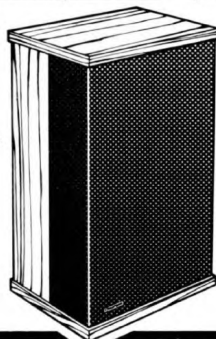
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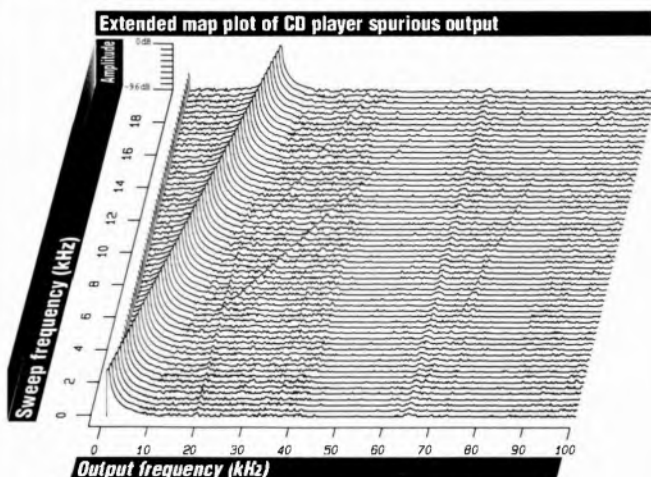
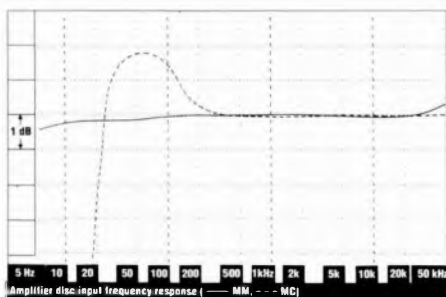
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massed strings, for example – the more explicit edge and insight afforded by the original tweeter would have been welcome here.

However, the Sony electronics generally provided such an 'edge', as both amplifier and tuner came across in a forthright, positive fashion. The tuner provided excellent results on FM, where the sound was almost always open, detailed and wondrously transparent. Broadcasters' voices simply hung in space, the totally silent background seemingly made to capture the wide dynamic range of live broadcasts from *Radio 3*. AM also benefitted from unusual clarity, the overall performance challenging the equally advanced though different Revox *B260*.

The *700ES* tape deck sounded remarkably unlike most other decks. Recordings on TDK *SA* and That's *MR-XPro* enjoyed a rare lucidity, unhampered by the mild flattening and loss of sparkle that afflicts so many other tape machines.

Listening via line inputs, the *TA-F700ES* amp seemed a little imprecise at the frequency extremes, though this situation was redressed once the disc inputs were tried. The profound bass lift was instantly recognised via MC, though to be fair the amplifier still managed to retain a good sense of control.

Potent works were delivered with such ferocity that any cobwebs were cast aside as the music took on new freedom, jumping clear of the boxes to recreate a substantial 3-D soundfield. However, the slightly heavy-

handed presentation and associated loss of subtle details might prove a little disconcerting. Nevertheless it was interesting to hear how the loudspeakers, which could tend to blandness when auditioned separately, were brutally knocked into shape by the amplifier.

Listening to the new *CDP-557ESD* CD player in isolation and via the *700ES* amp brought mixed reactions. Erring on the lean side of neutral, with a smooth but faintly lightweight bass character, it could become a little harsh and unforgiving for my liking, responding in an overly aggressive fashion to forward-sounding discs.

Initially very favourable impressions over a praiseworthy lack of instrument modulation, fine detail resolution and good stereo image facility are tempered by a trace of grain and coarseness.

## VERDICT

Considering the truly lavish construction, state-of-the-art technology and comprehensive facilities, it seems nothing short of curiously to disparage the performance of Sony's *CDP-557ESD* CD player. It does offer great material value even though there are cheaper players that simply offer a more rewarding sonic experience. Conversely, the tuner and cassette deck set new standards way above their respective price points, even if the amplifier basically failed to impress. As it stands this particular Sony combination remains a trifle unbalanced, though I concede that the squeaky-clean hit-them-

between-the-eyes presentation might well suit some listeners.

## TEST RESULTS

|  |                                 |                           |
|--|---------------------------------|---------------------------|
| <b>CD player: Sony 557ESD, £999</b>        |                                 |                           |
| Frequency Response (–3dB)                  |                                 | L: 21.6kHz, R: 21.6kHz    |
| Channel Balance, 1kHz                      |                                 | 0.02dB                    |
| Channel Separation                         | 1kHz, –130.2dB, 20kHz: –104.8dB |                           |
| S/N ratio (A-wtd)                          |                                 | –121.1dB                  |
| THD (@ 1kHz), 0dB                          |                                 | 0.0015%                   |
| THD, –10dB                                 |                                 | 0.009%                    |
| THD, –60dB                                 |                                 | 0.476%                    |
| THD, –90dB                                 |                                 | 25.4%                     |
| IMD (19kHz/20kHz), –10dB                   |                                 | –97.3dB                   |
| Stop-band rejection                        |                                 | –98.5dB                   |
| Resolution at –90dB, L/R                   |                                 | +4.04dB/+3.72dB           |
| Peak Output Level, L/R                     |                                 | 2.239V/2.234V             |
| <b>Amplifier: Sony TA-F700ES, £500</b>     |                                 |                           |
| Maximum continuous power                   | 8ohms: 146.3W, 4ohms: 239.1W    |                           |
| Output Impedance/damping factor            |                                 | 0.094ohm/85               |
|  | CD/aux                          | MM MC                     |
| Input sensitivity                          | 192.2mV                         | 3.38mV 320µV              |
| Input overload                             | >7V                             | 176.3mV 15.3mV            |
| Stereo separation                          | –61.1dB                         | –70.5dB –75.7dB           |
| THD (1kHz)                                 | 0.0025%                         | 0.004% 0.0065%            |
| IMD (19/20kHz)                             | –95.1dB                         | –79.3dB –75.7dB           |
| S/N (A-wtd)                                | –91dB                           | –82dB –74dB               |
| <b>Tuner: Sony ST-S700ES, £300</b>         |                                 |                           |
| Sensitivity (@ –50dB S/N)                  |                                 | 3.1µV/42µV                |
| Ultimate S/N, mono/stereo                  |                                 | –83dB/–74dB               |
| FM distortion (1kHz)                       |                                 | 0.042%                    |
| Output level (100kHz dev.)                 |                                 | 590mV                     |
| <b>Cassette Deck: Sony TC-K700ES, £500</b> |                                 |                           |
| Replay frequency response, –3dB            |                                 | 25Hz–18.8kHz              |
| Record/replay freq. response               |                                 | 20Hz–19kHz                |
| Peak wow (1–10Hz)                          |                                 | 0.04%                     |
| Peak flutter (10–100Hz)                    |                                 | 0.08%                     |
| S/N (A-wtd, Type II)                       |                                 | –54.5dB                   |
| Distortion (315Hz, Type II)                |                                 | 1.05%                     |
| <b>Loudspeakers: Sony APM-22ESII, £250</b> |                                 |                           |
| Sensitivity (2.83V/1m)                     |                                 | 88dB/W                    |
| Max. spl                                   |                                 | 103dB                     |
| Distortion                                 |                                 | 100Hz: 1.05%, 1kHz: 0.35% |



An interesting combination of old and new come together in this particular Yamaha system. As ambassador for the latest high technology, the *CDX-810* CD player benefits from no less than 8x oversampling rate albeit one step behind the luxurious Hi-Bit models that use 2-bit shifting to obtain 18-bit resolution and noise performance when reconstructing those music signals below  $-12\text{dB}$ .

In contrast, the loudspeakers are the renowned *NS-1000*, a stalwart design that was distinctly ahead of its time when launched some ten years ago – witness the use of beryllium for both midrange and treble drivers, combining both exceptionally high propagation velocity and rigidity with an equally low overall mass. Compared to an ordinary soft dome tweeter, for example, the beryllium dome is about an order of magnitude lighter while its primary breakup mode will be beyond 20kHz. It is interesting to note that metal dome tweeters have since become something pre-requisite in high class loudspeaker design. It is also interesting to note that if the *NS-1000s* ever caught fire, the amount of beryllium oxide produced could well be sufficient to kill many people!

## CDX-810 CD PLAYER

Equipped with a 44-key remote handset to duplicate most of the functions on the player itself, the *CDX-810* has the usual gaggle of facilities. A 24-digit direct access keypad (0-9, +10 on the machine itself) speeds up either accessing a specific track or programming the 24-position random access memory. All the track information is flashed up on a music calendar incorporated in the bright

fluorescent display, and there's even a little bar graph to remind you of the percent of playing time remaining. Four repeat modes are available, alongside the customary track skip, music search (without sound monitoring if used in pause mode), random play and index search facilities.

The disc tray has been designed to accommodate the new CD singles, but mechanical integrity was not one of the high points of this transport. The machine in fact rejected any CD loaded with the thinnest of disc stabilisers. Internal wiring was a trifle messy, with some rather crude attempts at RF filtering. All components are assembled on one board, with separate supply and regulation for servo, digital and analogue sections. In one corner an inverted PCB carries a separate headphone amplifier, this linked to a dedicated volume control. The main fixed outputs of the player are very near the accepted standard, 2.09V with an acceptable channel imbalance of 0.05dB. Channel separation was somewhat less impressive (comparatively speaking of course) falling some 26.6dB from 1kHz to just  $-61.55\text{dB}$  at 20kHz.

A proprietary 8x oversampling digital filter is used in conjunction with two Burr-Brown *PCM56P* DACs, thereby pushing stop-band noise to even higher frequencies (cf. 352.8kHz) and minimising interchannel phase errors. Low level linearity was good to about 15.6-bits although the  $-90\text{dB}$  resolution error moved in the positive direction, increasing the effective amplitude at this level with THD of 79.5 per cent.

Despite using an 8x oversampling system, the 3-D plot clearly demonstrates third and

fourth-order difference routes associated with the third oversampling frequency of 132.3kHz. This plot was obtained with the discrete third-order filter switched-in, though as far as listening is concerned it is best left out of circuit. Additionally, substantial third and second harmonic distortions, coupled with a worrying IMD of  $-53.1\text{dB}$  (2nd and 3rd orders), would seem to indicate the onset of compression at peak level/high frequencies. This was attributed to the output gain stage, an entirely necessary transconductance circuit fitted to all CD players despite Yamaha's patently absurd claims that the signal is routed direct from the DACs.

## AX-500 AMPLIFIER

Representing something of a halfway house between a no-frills audiophile amplifier and one festooned with facilities, the *AX-500* is equipped with a sensible number of controls. Bass and treble controls offer a 110dB cut and boost about 350Hz and 3.5kHz centre frequencies, but may be withdrawn from the circuit entirely by a true tone-defeat switch, and a variable loudness contour provides a useful variant on an old theme, allowing greater equalisation at progressively lower volume levels.

One channel driven, the *AX-500* delivered substantial 136W into 8ohms. The increase to 192W into 4ohms represents a modest 1.5dB drop against the ideal. The 0.215ohm output impedance is a little high, corresponding to an effective damping factor of just 37.2, a figure that might compromise bass performance.

The amplifier is equipped with both MM

and MC vinyl disc inputs in addition to five line stages. The CD input may be routed directly to the power amplifier section (via the volume control), omitting filters and balance control.

Yamaha have incorporated corrective ALA circuitry in the *AX-500*, but the basic design remains fairly conventional. Disc equalisation is based around a dual channel op-amp, the RIAA equalisation circuitry fixed hard up against the phono input on a separate PCB and controlled by a separate power supply. 34dB MC input overload headroom and separation approaching -79dB are fine results, though the MM input fared slightly worse, with some 30.5dB headroom and separation of just -56.5dB (input shorted). Both vinyl disc inputs registered around 0.4dB attenuation at 20kHz, with the MC stage also tailored at low frequencies.

Two pairs of Toshiba *2SA1301/2SC3280* high power output stage devices are bolted into a multi-finned but relatively insubstantial heatsink. Up to two pairs of speakers are catered for, switched remotely via the front panel.

## KX-500 CASSETTE DECK

One of Yamaha's latest designs, the two-head *KX-500* offers such luxury items as Dolby HX Pro, a  $\pm 20\%$  bias and play trim adjustment. The bias control will allow such difficult tapes as TDK *S4-X* and That's *TX* to be brought under control, while the play trim slider ensures that there will be no Dolby level mismatch when using tapes recorded on other machines. A vertical master fader is used in conjunction with two balance-setting L/R pots to adjust final recording level.

A peak-reading display of some 12 segments monitors record/playback levels, while a 4-digit real-time counter gives indication of tape length. Both Dolby B and C are fitted, with such additional extras as an mpX filter (for when recording from a tuner), intro-scan and auto-tape select. Most of these facilities, including the logic transport, are also controlled by the IR handset, though you will still need to get out of your chair to change the tape over!

The prerecorded replay response was limited to 13.8kHz, but the record/replay response demonstrated significant improvements progressing through the respective tape types; the -3dB point registered at 15.7kHz with an IEC standard Type II formulation. THD was an acceptable 1.57 per cent, the predominance of 3rd-order products indicating head rather than replay electronics nonlinearity. A 6Hz capstan modulation accounted for the bulk of the peak 0.1 per cent wow and figure reading, while highish peak flutter was caused by an anomalous 40Hz component - note the subjective remarks.

## NS-1000 LOUDSPEAKERS

Constructed from 30mm thick particle-board and rigidly braced, the *NS-1000* loudspeakers weigh in at a substantial 40kg. The higher frequency drivers are offset to reduce baffle diffraction effects, but decent stereo imagery is ensured by mirror-image construction.

This three-way design has crossover frequencies at 500Hz and 6kHz, each operating with second-order roll-off characteristics. Ferrite-cored inductors are combined with metallised caps on a single block. The system proved very sensitive at 90.5dB 1W/1m, with very low distortion components both at low and high frequencies - a worse case figure of 0.65 per cent was recorded between 100Hz and 10kHz.

The low mass beryllium mid and high frequency drivers have already been discussed; the massive (30cm) woofer with die-cast basket and protective net is rather more conventional in construction, if massive in build. Quite out of character in this substantial system are the ridiculous spring-clip cable terminals provided at the rear, which would not even accept standard 4mm plugs! Another throwback to days gone by are the individual attenuators provided on the baffle for both midrange and high frequency drivers, offering continuous adjustment from zero output to +3dB. Subjectively, the -1.5dB HF setting seemed most appropriate.

## SOUND QUALITY

Despite their age, Yamaha's *NS-1000* loudspeakers proved more than capable of revealing the strengths and weaknesses of this brandname system. In many respects they were simply too good, revealing flaws in the sound of amplifier and CD player in particu-

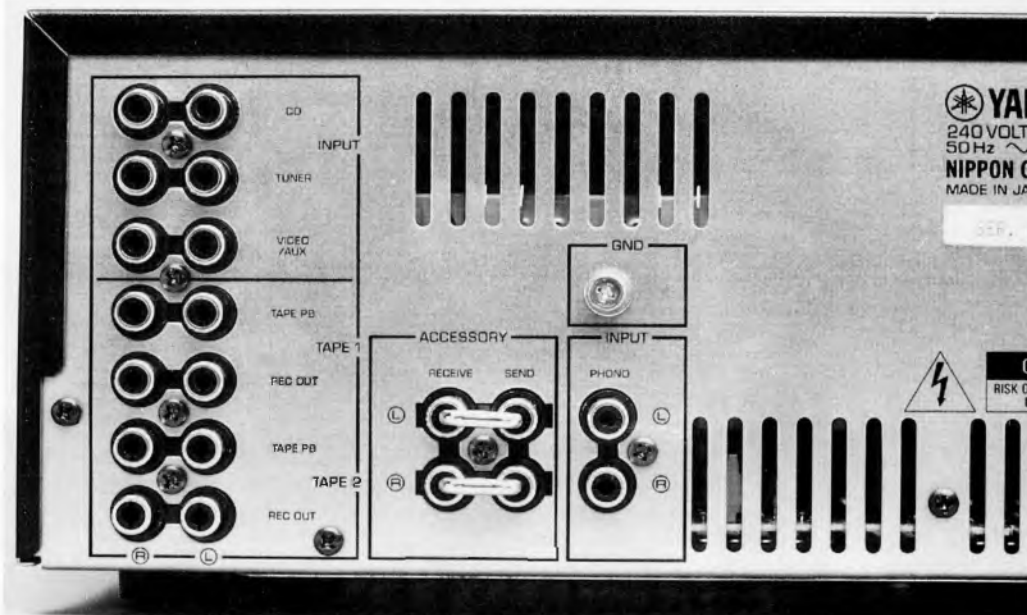
lar. It made a change for one of our systems not to be let down by the final link in its chain!

The dry neutrality of the loudspeakers was perfectly clear even though the *AX-500* amplifier introduced a certain, deliberate softness at the bottom end. And when auditioned separately, the *CD-810* was similarly marked down for its vague quality at the frequency extremes.

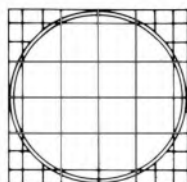
That said, the CD player was not without weight at the bottom end. Bass lines thunder through but simply lacked the precision and focus expected of a product at this price level. The *CD-810* displayed an excellent sense of stereo depth, gentler passages revealing higher frequency spatial clues very well indeed, but with increasing complexity there was an attendant muddling, even via the preferred (but misleading) 'Hi-Bit' direct facility.

To its credit, this CD player handled sharp female vocals with extreme dexterity, the feathery treble quality tending to mask any acid sibilance without introducing any significant blurring of its own. Yet in general terms the sonic fingerprint of this player could only be described as a little lacklustre and ultimately disappointing. Its tendency to close up with increasing level and complication made long term listening a rather fatiguing experience.

The amplifier possessed a silky smooth embellishment that extended right through the midband to the lower treble registers via line inputs. Rather than being some sort of detraction this suited the loudspeakers admirably, resulting in a sweet, approachable and thoroughly relaxing sound - some feat for a pair of monitors capable of reaching ear-shattering levels with modern rock



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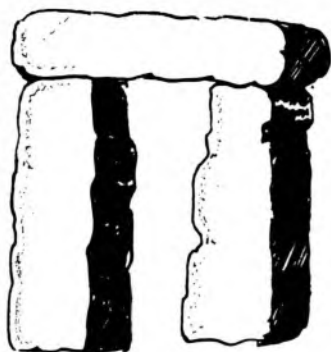
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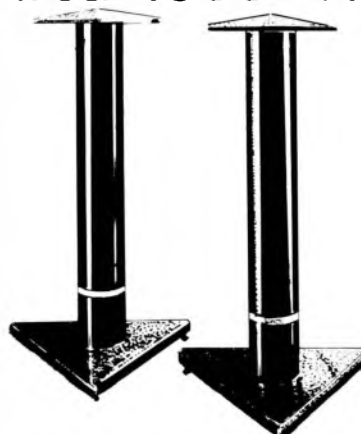
### No. 1 — The Evolution of the Loudspeaker Stand

Circa 2,500 B.C



This early prototype was eventually abandoned due to the extreme transportation difficulties it presented to hi-fi dealers of the period.

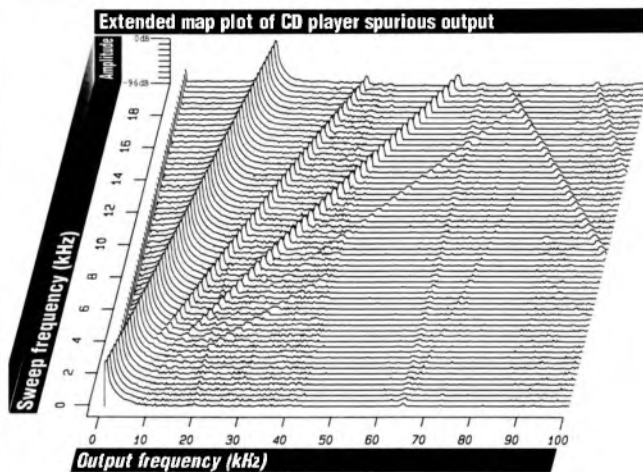
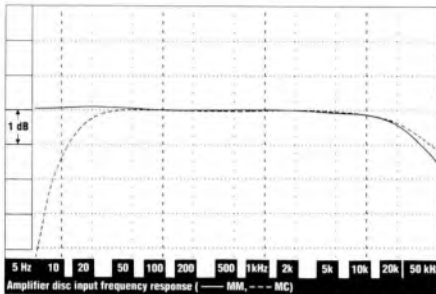
Circa 1988 A.D



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recordings! That said, in many respects this faint veiling drew inevitable parallels with the subjective ailments suffered by the accompanying CD player.

At higher levels both amplifier and loudspeakers tended to 'harden up' slightly, the latter suffering a 'spitty' coloration that degraded the definition of metallic percussion while increasing sibilance from female vocals – adjusting the HF attenuator was quite successful in reducing this problem. To its credit, the amplifier was sufficiently transparent to reveal the qualities of the *KX-500* cassette deck, which varied markedly in its reaction to Type I and Type II tape formulations.

Due to the inherent limitations of ferric tapes and the slightly high peak flutter content of the transport, *KX-500* recordings suffered slight high frequency vagueness, which seemed all the more obvious since the bass was both rhythmically tight and satisfyingly extended. The internal electronics cast a faintly blurred hue over all recordings anyway, but within these constraints the deck produced some marvellous open and transparent copies with TDK *SA* and That's *MRX Pro* formulations. With these higher bias tapes, both tonal and dynamic contrasts were faithfully revealed, no doubt aided by the low levels of hiss enjoyed by this player.

The softening noted earlier via CD increased through the MC vinyl disc input, resulting in a tempering effect rather than a straightforward information loss. Gritty tre-

ble colorations were less obvious when monitoring at high levels, but the impact of kick drums, for instance, was notably less effective. The reproduction of vocals was also compromised: stereo images were indeed located stage front, but lacked precise focus and solidity.

These criticisms were far less applicable to the higher-level MM input, where voices seemed to enjoy greater presence, solidity and articulation. Nevertheless the bottom end lacked the punch available via CD, and there was a tendency for the system to become a little ragged and 'shouty' with complex recordings.

## VERDICT

For a system composed of high grade components, notably the tape deck, amplifier and particularly the speakers, the overall end result was a little mixed. Performing admirably on an individual basis, *NS-1000s* are perhaps a little too ambitious for the ancillaries assembled here. These speakers are far from 'past it' and represent particularly good material value. The remainder of the system did not quite match up, so perhaps a pair of more modest – though no less revealing – loudspeakers would be more appropriate in an otherwise promising overall package.

## TEST RESULTS

|  |                                 |                 |
|--|---------------------------------|-----------------|
| <b>CD player: Yamaha CDX-810, £300</b>     |                                 |                 |
| Frequency Response (–3dB)                  | L: 21.77kHz, R: 21.8kHz         |                 |
| Channel Balance, 1kHz                      | 0.05dB                          |                 |
| Channel Separation                         | 1kHz: –88.19dB, 20kHz: –61.55dB |                 |
| S/N ratio (A-wtd)                          | –107.3dB                        |                 |
| THD (@ 1kHz), 0dB                          | 0.011%                          |                 |
| THD, –10dB                                 | 0.016%                          |                 |
| THD, –60dB                                 | 4.37%                           |                 |
| THD, –90dB                                 | 79.5%                           |                 |
| IMD (19kHz/20kHz), –10dB                   | –53.09dB                        |                 |
| Stop-band rejection                        | –84.9dB                         |                 |
| Resolution at –90dB, L/R                   | +3.32dB/+3.59dB                 |                 |
| Peak Output Level, L/R                     | 2.094V/2.082V                   |                 |
| <b>Amplifier: Yamaha AX-500, £200</b>      |                                 |                 |
| Maximum continuous power                   | 8ohms: 135.9W, 4ohms: 191.9W    |                 |
| Output impedance/damping factor            | 0.215ohm/37.2                   |                 |
|  | CD/aux                          | MM MC           |
| Input sensitivity                          | 211.2mV                         | 3.371mV 240µV   |
| Input overload                             | >7V                             | 168.8mV 25.8mV  |
| Stereo separation                          | –72.5dB                         | –56.5dB –78.4dB |
| THD (1kHz)                                 | 0.0144%                         | 0.0232% 0.0108% |
| IMD (19/20kHz)                             | –80.5dB                         | –79.9dB –79.5dB |
| S/N (A wtd)                                | –85.8dB                         | –74.1dB –68.5dB |
| <b>Cassette Deck: Yamaha KX-500, £210</b>  |                                 |                 |
| Replay frequency response, –3dB            | 35Hz–13.8kHz                    |                 |
| Record/replay freq. response               | 20Hz–15.7kHz                    |                 |
| Peak wow (1–10Hz)                          | 0.107%                          |                 |
| Peak flutter (10–100Hz)                    | 0.27%                           |                 |
| S/N (A-wtd, Type II)                       | –54dB                           |                 |
| Distortion (315Hz, Type II)                | 1.57%                           |                 |
| <b>Loudspeakers: Yamaha NS-1000M, £900</b> |                                 |                 |
| Sensitivity (2.83V/1m)                     | 90.5dB                          |                 |
| Max. spl                                   | 109dB                           |                 |
| Distortion                                 | 100Hz: 0.56%, 1kHz: 0.37%       |                 |



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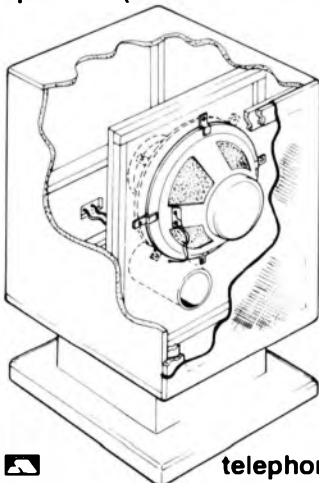
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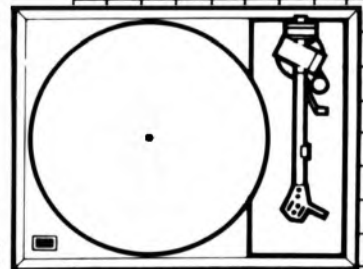
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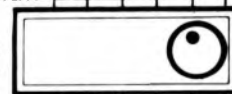
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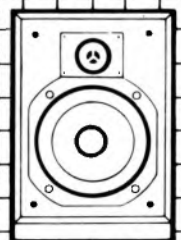
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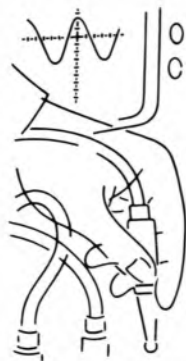
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# ONE-NAME SYSTEMS TECH TALK

*Paul Miller outlines the technical test procedures adopted in the reviews.*

Recognising the prime subjective importance of the CD players and amplifiers in the systems, these components were also subject to a more rigorous testing program. All components were measured using an IBM-controlled HP3561A FET analyser, the data acquisition achieved through the HP-IB (IEEE) interface and stored directly to disc. Other IEEE-488 designated devices included a Röhde & Schwarz AFG function generator and frequency synthesiser, SMH (2000MHz) RF signal generator and MSC2 stereodecoder.

Much of the work, in particular the three-dimensional CD player spurious plots and the MM/MC RIAA equalisation, was achieved by using proprietary computer programs, developed specifically for the purposes outlined in the following text.

## CD PLAYERS

Frequency response was obtained by transposing a broad-band impulse from the time domain, the quoted figure representing the HF -3dB point. THD was measured at peak level using a 1kHz tone, the value obtained from an assessment of up to 20 harmonics, yielding slightly higher (though more accurate) distortion figures than usual. IMD was measured at -10dB with an ultimate resolution of -126dB - most second-order products are at a somewhat higher level than this. Channel separation was assessed at both 1kHz and 20kHz (input shorted), S/N was subject to A-weighting before obtaining a broad-band figure (input shorted). The -90dB low level resolution was measured at 1kHz to an accuracy of  $\pm 0.01$ dB. Output and channel balance were measured using a computing DVM to an accuracy of 5 decimal places.

The three-dimensional plots published for all the CD players represent the sum total spurious output generated by the players when subject to a frequency

sweep from 10Hz to 20kHz. The three axes are as follows: x - the resultant output of the CD player monitored up to 100kHz with 10kHz ticks; y - the amplitude of the sweep, with peak level at a nominal 0dB, the baseline at -96dB, and a tick each 12dB (this axis has been shifted for improved clarity); z - the input frequency covering a 20kHz range using linear progression. This particular technique effectively replaces the traditional two-dimensional 19/20kHz IMD spurious plot; improved noise-correlation (averaging) demonstrates more clearly many of the complex sampling mechanisms that are often at work.

This technique, its implications and further research work will hopefully be fully covered in a forthcoming *Choice* article; a brief discussion suffices for this occasion. Basically, most players will show multiple-order IM distortion derived from interaction between the reconstructed (audio) frequency (known as F) and the 44.1kHz sampling rate (and multiples thereof). All Philips-based designs, for instance, display two slanted 'V' patterns (known individually as 'routes'), their origins at 44.1kHz and 88.2kHz respectively (y axis). The mathematics of the routes is elementary: 44.1kHz - F, 44.1kHz + F, 88.2kHz - F and 88.2kHz + F. Further irregularities in the operation of either the oversampling filter or DAC may result in additional 'V' patterns with a wider base angle; these are derived from 44.1kHz - 2F, 44.1kHz + 2F, 44.1kHz - 3F and so on.

Most worrying from the subjective viewpoint may be the effect of higher-order difference IMD routes travelling right into the passband and reflecting at the 0Hz point (y axis). The 'reflection' is due to the reversal of that particular IMD equation, ie 44.1kHz - xF becomes xF -

44.1kHz as  $F > 44.1 \div x$ . Such phenomena have been discussed in the past but never graphically demonstrated.

## AMPLIFIERS

Power output was measured into standard 8 and 4ohm loads to the onset of clipping (<1% THD) with one driving channel only. The quoted rise into 4ohms should be compared against the theoretical ideal of +3dB (a doubling of the numerical power figure). The output impedance was extrapolated from the voltage drop across an 8ohm load, and should be as low as possible. Conversely the equivalent 8ohm damping factor should be as high as possible (>100) in my opinion, in order to obtain a reasonable bass performance. Input sensitivities were measured at full gain and denote the input level required to raise full output into 8ohms. THD, IMD, stereo separation (input shorted) and A-wtd noise (ref. 1kHz, input shorted) were all assessed at inputs +20dB above the nominal sensitivity for the disc stages, +10dB for the line inputs.

All overload figures relate to clipping of the respective input stage at 1kHz, quoted in mV; any headroom figures quoted in the text are relative to the IHF standard sensitivities of 0.5mV (MC) and 5mV (MM). RIAA equalisation was run by computer using a proprietary, active inverse-RIAA network correctly loaded for both MM and MC stages (accuracy  $\pm 0.02$ dB). An extended frequency band of 5Hz to 50kHz is used to examine subsonic and ultrasonic performance.

## TURNTABLES

Full wow and flutter spectrum analysis was undertaken using B&K QR2010, integral calculus being employed to derive very accurate peak W&F measurements - far more accurate than those obtained using a conventional meter in

fact. Electrical and mechanical rumble figures were taken using CBS STR120 and a Thorens rumble-coupler. The unweighted result provides a representative indication of LF bearing noise (while taking steps to avoid the arm/cartridge resonance), while DIN B weighting provides insight into the extent of mains supply harmonics.

## CASSETTE DECKS

First generation IEC Primary Reference Tapes were used throughout. The replay response refers to nominal -3dB limits (measured using periodic noise at -10dB), as does the record/replay response using the latest IEC-ratified Type II formulation. 0VU was checked for its adherence to the IEC 0dB flux of 250nWb/m. THD was measured at 315Hz to the 20th harmonic (inc. noise), with IMD checks at 11/12kHz to correlate with SAT10k performance when required. Peak W&F was also assessed mathematically, in much the same way as with the turntables.

## TUNERS

Selectivity at  $\pm 400$ kHz, together with mono and stereo sensitivity (rel. 50dB S/N) were measured in accordance with IHF T200 guidelines. FM THD was taken at an RF level of 1mV, 75kHz deviation (100 per cent modulation), maximum S/N and output at 100kHz deviation. Pilot tone/subcarrier suppression together with IMD product rejection were also assessed and commented on where necessary.

## LOUDSPEAKERS

All measurements were obtained under heavily damped conditions, extensively corrected, using a phantom-powered AKG C460B microphone and calibrated sound source. Distortion was measured at 96dBA at both 100Hz and 1kHz, assessing 10 harmonics.

# HEYBROOK POINT FIVE



## A REALLY DIFFERENT LOW COST TWO WAY LOUDSPEAKER

Heybrook's Pint-Size Point Five is the latest addition to the ranks of low cost two-way loudspeakers. But in a world which is mostly populated by clones, makeweights and also-rans, this one really is different. What the Point Five is really all about, though, are the 3 qualities, speed, resolution and control. Speed in this context means, for example, that percussive piano phrases have real attack and force. There's enough substance backing it up to add some flesh to the bones, too, so the music also has body and a well defined resonant structure. The very high levels of resolution achievable with this design were plainly apparent on a wide range of materials, control was evident all the time, in the way notes were released, in the build-up to crescendos, in the tidiness of the bass, in the precision with which stereo images were projected into the space around, and in front of, the speakers.

Finally - and on a resoundingly positive note - I must mention the unusually dynamic nature of the Point Five. Unlike most smallish loudspeakers, it doesn't appear to compress or change in sound as it goes loud, and with this unusual freedom from squash, it's quite easy to take the speaker right up to, and even beyond, its working dynamic range. In short, this is one budget loudspeaker that works. Instead of trying to squeeze every last Hertz in the bass, or decibel in concentrated on

making a loudspeaker that is, above all, detailed, articulate and dynamic, whilst retaining excellent control, it's a powerful list of virtues at the price.

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## HI-FI Answers Sound quality is, in a nutshell excellent

The speaker is always under firm and positive control, transient and dynamic behaviour are both exemplary or better, and bass quality is fast, pitch accurate and has lots of drive.

The Point Five is simply very refined, and gives a 'big' sound with excellent dynamics and space, and very good resolution of detail. Best of all, though, is the midband which has a rare openness and an alive quality that is not easily mistaken. This is a loudspeaker where, given a decently well behaved reproduction system, the stereo soundstage comes out more than half way to meet the listener.

I believe that the new budget Heybrook is a significant product. By designing intelligently within tight cost constraints, the company have come up with something genuinely new and with obvious potential design stretch for future up-market models to exploit. Meanwhile, the Point Five's lively, forthcoming sound is very much in tune with what is required of a small, modern speaker. I'm positive it's going to be enormously and deservedly successful.

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## The Heybrook is an excellent all-round design

that could easily be awarded top marks for compatibility. It is easy to drive, very clean-sounding and it is well-balanced at both bass and treble extremes.

One excellent feature of the Heybrook speaker is its full bass performance.

The treble frequencies sounded excellent too, and the sound was unusually clean and dynamic - particularly when playing material with lots of cymbal work. Indeed, the little Point Fives often sounded the equal of a much bigger and much more expensive design.

Stereo imagery was pin-point sharp and highly detailed, yet not in a cold or dissecting manner. The Heybrook Point Five is an excellent example of cost-effective engineering where economies have been made to overall advantage. From the clever design of the cabinet with its medite top and bottom pieces off the simple crossover and specially designed bass/mid unit, the whole speaker is an example of how to build a top class small speaker at a very reasonable selling price.

## SPEAKERS

### HEYBROOK POINT FIVE

MC, 2W, CB  
Review: January 1988 Design/  
Manufacture: UK

The new Point five, a small two-way loudspeaker from Heybrook, marks a break with the past in more ways than one. The enclosure is easily the most novel feature, the baffle being part of the main structure rather than being mounted in afterwards as usual. Heybrook had to use new construction techniques to achieve this, the benefit being a structure with greater physical integrity and which is easier to control.

Internal wiring is solid-core, which should be observed elsewhere in the partnering system too, and the crossover is also built in line with solid-core ideas as far as possible. Used a few inches clear of a wall the Point Fives have a bass and midrange that are marvellously expressive and articulate, and exhibit real control and excellent stereo. On very early samples the tweeter was slightly uncouth, but this trait has now been cured.

## THE HIT LIST





# ONE-NAME SYSTEMS: CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS

In answer to the question posed at the introduction to this test, many of the featured systems actually reinforced the contention that no one manufacturer is responsible for the best components in all fields. In many cases the overall performance of a system exceeded what one might have expected from the sum of its parts, yet in other instances the system 'jigsaw' required something more substantial than a hammer to ensure all the pieces blended satisfactorily.

The art of component matching is a rare and highly subjective one, for it clearly distinguishes those systems which function as a unified whole from those that are little more than a random collection of separates. Those systems that achieved such synergy at a realistic price were awarded Best Buy status, while other good performers that were either slightly too expensive (>£1,000) or not quite up to scratch were rated Recommended. Below this performance standard overall, some systems were also designated Worth Considering – a significant step-up from no rating at all.

## BEST BUYS

Only two contenders here, the Rotel *BX* system (£650) and NAD *VP/CD* system (£550). Both offer quite remarkable value for money, even though, subjectively at least, each follows an entirely different tack.

The NAD system is blessed with both record-playing and CD sources, while the Rotel collection has a CD player and tuner – the latter arguably providing a higher quality of musical entertainment on live broadcasts than a record player can at any time. Rotel's CD player also pipped the NAD *5220* at the post, though the capabilities of

the two loudspeakers were more evenly matched.

In general terms the Rotel 'sound' is characterised by a certain warmth, richness and enticement; the NAD system delivers a more forthright, immediate quality that was always very refreshing. Both systems clearly outshine anything else in this price territory, their very individual flavours ensuring that each will have its adherents. Classic Best Buy stuff, each is a positive steal for midi system upgrades or first time buyers.

## RECOMMENDED

Had it been a little cheaper, the £1,597 Arcam *Delta* system could well have been in the running for a Best Buy, but as it stands it certainly deserves one of the more solid Recommendations.

Throughout the listening tests the *Delta* system demonstrated rare clarity and transparent insight, the bubbly exuberance of the loudspeakers tempered by the graceful control of amplifier and CD player. The *Black Box* outboard D/A convertor was particularly admired for the profound effect it had on the *D70* CD player which, in common with every other Philips-based design, sounded cleaner, quieter, more extended and greatly improved in detail resolution. More than any other system featured here, the *Delta* provides a standard of reproduction significantly in excess of the sum of its parts.

Meridian obviously deserves its recent Design Council Award, and fortunately the calibre of both the internal electronic performance and the final sound quality are on a par with the highly original aesthetics. Note however, the CD player and (optional) vinyl disc pre-amplifier are somewhat better than the accompanying active loudspeakers, the latter creating

a lucid and friendly, but nevertheless highly individualistic sound.

Retailing for a substantial £2,740, this active system represents one of the few – if not the only – system concept of its type. Not only have Meridian stuck by their guns and substantially developed the active design approach, but they have also furnished a high level of user-convenience, which will eventually culminate in total room-to-room system control.

Bringing up the rear in the list of Recommended systems are those provided by Kenwood and Marantz. Both are a little mixed but each includes certain products of such merit that the whole is pulled through from 'Worth Considering'.

For Marantz these units are the *FM-45* amplifier and the superb *CD-65DX* CD player, the latter vying strongly for a state-of-the-art label in its particular marketplace. Overall the Marantz combination fails to enjoy the seamless meshing demonstrated by the *Delta* system, for example, but the digital front end goes a long way in redressing the somewhat lacklustre presentation of the *LD20DMS* loudspeakers.

Kenwood's star performer is undoubtedly the *KT-660L* digital tuner with its fantastic array of features and fine sound quality, contributing just £130 towards a total system cost of £710. The amplifier, CD player and cassette machine all rate a firm 'good', offering plenty of features, a pleasantly open and lively sound, together with an unusually fine standard of construction and finish.

## WORTH CONSIDERING

Of the remaining contenders, the systems from AR, Mission, Philips and Sony all rank as Worth Considering.

Philips is obviously in a strong position thanks to their remarkable *CD473* CD player and surprisingly transparent *FA-960* amplifier, but the poorer showing of the tuner, loudspeakers and tape deck (especially the latter) loses sufficient brownie points to preclude unreserved Recommendation.

AR's set-up was also capable of very fine results, but the loudspeakers – for all their virtues of openness and delicacy – seem just a trifle too expensive.

Sony is also facing a dilemma of sorts, but for completely opposite reasons. The new *CDP-557ESD* CD player seems quite reasonably priced even at £1,000, taking the standard of construction and technology into account. However some technical anomalies (such as the unexpected linearity error) and the slightly hard and unforgiving sound quality throw some doubt on the wisdom of this latest approach.

Of the remainder, perhaps the Mission system proved the most disappointing, since a great deal had been expected, yet our hopes were somewhat dashed by the 'sat-on' quality of the new *Cyrus II* amplifier. Fortunately, early reports of the new *Cyrus I* amplifier are rather more positive, compounding the surprisingly negative results obtained with the costlier amp.

## BEST BUYS

|           |      |
|-----------|------|
| Nad VP/CD | £550 |
| Rotel BX  | £650 |

## RECOMMENDED

|                 |        |
|-----------------|--------|
| Kenwood         | £710   |
| Marantz         | £885   |
| A&R Arcam Delta | £1,597 |
| Meridian        | £2,740 |

## WORTH CONSIDERING

|                   |        |
|-------------------|--------|
| Mission           | £950   |
| Philips           | £1,190 |
| Acoustic Research | £1,230 |
| Sony              | £2,550 |

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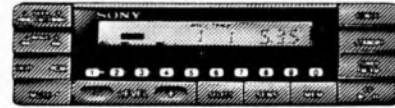
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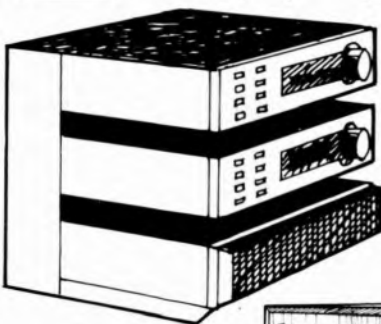
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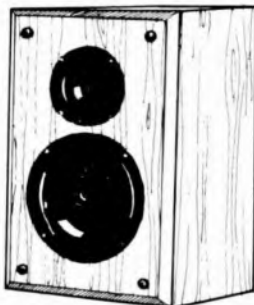
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# CHOOSING AND USING . . . IN-CAR ENTERTAINMENT

*Isn't it about time you changed the factory fitted Motorola for something more musically entertaining?  
Jason Kennedy examines the market.*

Many of us spend as much time listening to car radios and tape players as domestic hi-fi systems, but do we apply the same criteria when selecting in-car equipment, or just stick with what is already there?

The way we listen to music in the car is probably less intense, less critical and even perhaps more relaxed than the domestic hi-fi experience. Because of the need to concentrate on the driving, music becomes more a backdrop than the total entertainment. But it nevertheless seems able to alter moods, sometimes to the extent of affecting the way one drives (or is that only me?) I find tracks from bands like AC/DC or the Clash fill me with rebellious bravado, so I'm inclined to drive in the same spirit, whereas something like John Martyn makes me feel relaxed. But both extremes stop me getting annoyed in traffic jams, which can't be a bad thing.

Sceptics point to the noise level inside the car, questioning whether it is worth having a refined and subtle in-car system if half the information is going to be blocked out by wind, motor and road noise. I suspect that this is largely irrelevant, especially of course for those fortunate enough to own comparatively quiet cars. Extra watts is of course one way of getting more sound to the ears, if perhaps a rather crude solution; well placed speakers with accurately balanced crossovers would seem more effective – such as dash mounted tweeters and rear shelf mounted mid/bass units.

In extremis, a new breed of hi-fi oriented ICE (in-car entertainment) specialist has evolved. Like Mike Wells, for example, the distributor for Nakamichi's in-car range, who kits out vehicles with multi-speaker, multi-amp systems using high quality speaker and interconnect cables. The approach seems close to the

'more is better' philosophy, one extreme example being a Porsche 911 fitted with 16 individual drive units and amplification to match. Needless to say, such installations cost a lot more than the average domestic hi-fi system. Whether they sound better is another question.

So, is there any point in replacing the factory-fitted Motorola with something costing as much as a good budget amplifier? We decided to try to find out, and so have tested a selection of integrated cassette receivers from £100-£250, including examples from both specialist in-car manufacturers as well as those familiar to the audio world.

The machines under scrutiny are all integrated units consisting of a cassette player, FM/AM tuner and amplifier. Most are capable of driving two pairs of loudspeakers, and a few of the costlier examples are fitted with line output sockets for optional additional power amplifiers.

A nominal power rating of 20watts per channel seems to be the highest one can expect of this particular price range, which isn't bad considering the size and voltage constraints at work. Facilities don't vary enormously, so rated power appears to be directly related to price and street credibility. However, as technical/radio consultant Norman McLeod points out in *Tech Talk* on page 103, the maximum power delivered from a 12volt DC supply into a 4ohm load is 10watts, so some manufacturers would seem to be optimistic.

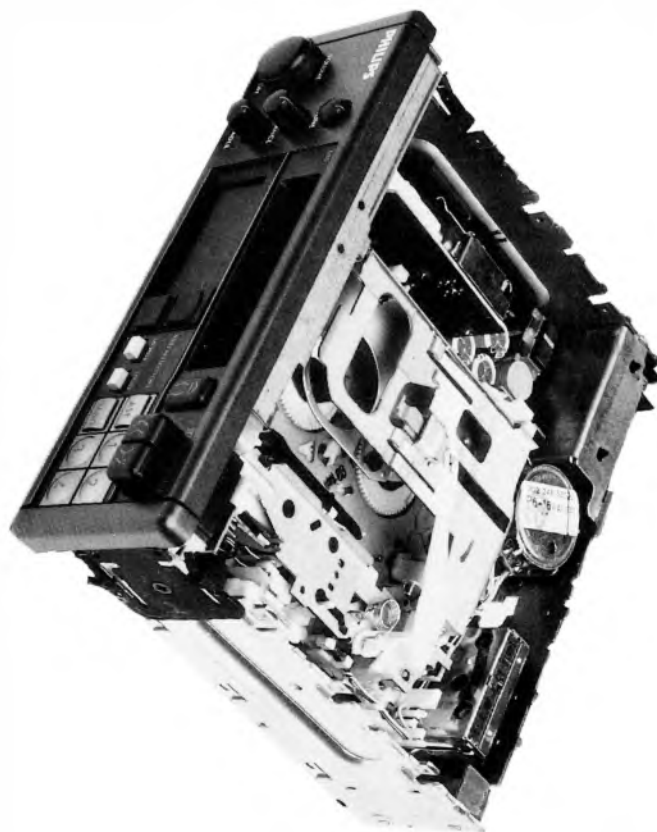
## OUR LISTENING TESTS

To take advantage of the high current capability and low voltage restrictions of 12volt car batteries, in-car machinery is designed to drive 4ohm loudspeakers. For the purposes of the listening tests therefore, a pair of KEF 104.2 speakers was used. These have the unusual

characteristic of presenting a constant 4ohm load regardless of frequency variations, while they are also fine quality monitors and more than adequate for the job. However, the KEFs have very healthy low frequency extension which tended to make most of the units sound bass heavy, this part of the frequency range obviously being boosted to compensate for the average in-car transducer. For maximum information transfer we used Audionote speaker cable from Audio by Design which, although expensive for in-car use, creates a neutral bridge between amp and speaker. There is no reason why audio speaker cables shouldn't be used in the car as even the most modest installations are likely to benefit from something half decent.

The listening tests were carried out in JK's usual listening room with the units powered by a 12 volt car battery. Radio waves were picked up with a basic car aerial clamped to a suitable piece of furniture. Admittedly this is not typical of the in-car listening experience, nonetheless the set-up proved quite capable of revealing the differences between machines. Both home-made tapes and prerecorded musicassettes were used including Strauss' Oboe concerto in D – a merciless revealer of transport instability – and Talk Talk's *The Colour Cf Spring* – a well made album.

Thanks are due to Alvin Gold who lent the facilities for the cassette player lab tests. His patience and cups of coffee were greatly appreciated.



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# ALPINE 7282L

ALPINE ELECTRONICS UK LTD., 13 TANNERS DRIVE, BLAKELANDS, MILTON KEYNES MK14 5BU. TEL: (0908) 611556.

RECOMMENDED



The Alpine 7282L is a slick piece of Japanese built equipment. It's not cheap at £250, and doesn't look it either, so it's more suitable for garage owners than street parkers. The most attractive element of this machine is possibly the group of six matt surfaced transparent preset keys, which light up when the player is switched on. Combined with the general layout neatness, these put it in the same aesthetic ballpark as some of the sexier cassette decks around.

In some areas this machine is very user friendly: the illuminated station presets are easy to find and use, and the backlit volume knob is well proportioned and placed. However, many of the radio tuning buttons have only small, sometimes obscure inscriptions and completely lack distinction in shape. Finding the right button without looking to tune up or down manually could be tricky, for instance, though familiarity should eventually make such operations simpler.

## RECEIVER

The amplifier side of this beast includes the usual balance, fader and sliding bass/treble controls. Whilst a cassette is playing or the unit is switched off, a digital clock appears on the display. An 8-pin DIN socket on the back of the case carries a line level signal for use with an optional separate power amp.

The tuner features manual and seek tuning in 25kHz steps, with the option of local or distance mode sensitivity on the latter. Twelve FM preset frequencies can be stored alongside six MW or LW AM stations. Allocating presets is a straightforward matter of tuning in and consecutively pressing two buttons.

The sound is relaxed yet powerful. It still has the typical car radio bass/lower mid hump, but is essentially very listenable. A piano piece on Radio 3 FM sounded quite dynamic, the sonic character of instrument and environment being remarkably distinct. The quality of the broadcast ultimately is the determining factor, of course, but this Alpine made a good job of what it received.

Even pop and rock music seemed a little more than usually informative, the synth

bass on the dreaded *'I should be so Lucky'* sounding dry, solid and well defined.

## CASSETTE

The cassette player is a regular autoreverse job, distinguished by the fact that it automatically equalises for chrome/metal tapes.

Sound quality was quite revealing, and the limitations of some pre-recorded classical tapes were made rather obvious. Some form of noise reduction would have been handy. A degree of wow and flutter was noticeable with one tape, but rock material had a solidity and musical consistency that made for enjoyable listening.

## LAB REPORT

The 7282L delivers 8W output, from a very quiet -62dB output stage noise floor. The FM section has very clean noise figures, which is always an encouraging sign. Although the response is rolled off at the HF end, sufficient correction is available on the slider treble control. Distortion figures are higher than they might be, a clue to this lying in the strange behaviour of the muting. This tones down what sound like quite acceptable, if slightly detuned signals, but fails to mute some which have turned out rather nasty. A little more care in alignment would perhaps have helped.

AM could have been worse but is awful nonetheless. The AGC range and sensitivity are pretty good, but the selectivity is far too steep, potting all AM audio down to a telephone bandwidth. The 1kHz distortion figure shows promise but 8 per cent distortion at LF is not good at all. Still, the ultimate signal-to-noise ratio is staggering, and the sensitivity among the best.

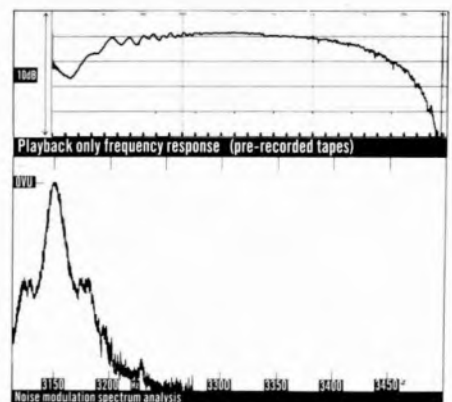
The tape wow and flutter results are nothing to rave about for a player of this price, but neither are they particularly bad, rating above average for the group tested in this issue - flutter in fact being close to the best. Speed error is acceptable, if poorer than one might have hoped for. Though a little inconsistent up to 200Hz, the frequency response is quite good for a machine of this type, and again amongst the best in the group.

## CONCLUSIONS

Despite shortcomings in some areas the 7282 is a nicely designed and musically rewarding piece of equipment, well worth Recommendation.

## TEST RESULTS

|  |                   |                            |
|--|-------------------|----------------------------|
| <b>Amplifier</b>                                 |                   |                            |
| Power output (4ohms, 13.8V)                      |                   | 8W/9dBW                    |
| Noise (residual)                                 |                   | -62dB                      |
| <b>Radio</b>                                     |                   |                            |
|  | AM                | stereo FM (mono)           |
| Distortion                                       | 8%/0.6%           | (1.2%)                     |
| AGC range  | 33-105dB/ $\mu$ V | n/a                        |
| Signal/noise (ultimate)                          | 65dB              | 60dB (60dB)                |
| Sensitivity (40dB/50dB S/N)                      | 20 $\mu$ V        | 2000 $\mu$ V (200 $\mu$ V) |
| Frequency response (corrected):                  |                   |                            |
| AM: 2.2kHz: -3.7dB; 4.7kHz: -15.6dB; 9kHz: -78dB |                   |                            |
| FM: 2.2kHz: 0.6dB; 4.7kHz: 0.2dB; 10kHz: -3.3dB; |                   |                            |
| 15kHz: -8.3dB                                    |                   |                            |
| <b>Cassette</b>                                  |                   |                            |
| Wow & Flutter (pk. DIN wtd.)                     |                   | 0.17%                      |
| Wow/Flutter (pk. DIN wtd.)                       |                   | 0.15%/0.25%                |
| Speed error                                      |                   | +1.4%                      |
| Typical Retail Price                             |                   | £250                       |



# CLARION 916HP

CLARION SHOJI (UK) LTD., UNIT 1, MARSHALL ROAD, HILLMEAD, SWINDON, WILTSHIRE SN5 7DW. TEL: (0793) 870400.



Clarion's £160 916HP model is one of the least formidable looking players in the bunch – it even has dashes of white around the rubbery tuner buttons. OK so it's hardly going to match the white leather trim of your turbo convertible, but it's a step in that direction.

For the most part this machine is very simple and straightforward – most of the switch functions are obvious at a glance, and the tuner buttons are appealingly tactile. The awkwardness (if you can call it that) of having to press preset buttons for two seconds to store a station is easily offset by the simplicity of the procedure. The only ergonomic irritation is the size of the treble control lever, and that is hardly disastrous. One handy feature is the way the volume knob stays pulled out for balance adjustment until you push it back in.

## RECEIVER

There's nothing spectacular on the amplifier side – just the usual fader and balance controls on the volume knob, with concentric treble and bass controls below it.

The tuner has five presets for each band – FM, MW and LW. It can seek stations of adequate strength when scanning upwards only, and setting a preset is a simple matter of pressing the required button for a couple of seconds. A secondary function of the seek switch is scan, which is supposed to run through the preset stations on a particular band. In practice it stops at other strong signals as well. Manual tuning is of course available, in 50kHz steps.

Radio reception seemed quite sensitive but the sound was a bit bass heavy on domestic loudspeakers with their much greater LF extension than any car speaker. Acoustic music had a tendency to distort at high frequencies if the volume was pushed, but rock material seemed less fussy and sounded reasonable.

## CASSETTE

The cassette deck couldn't be simpler; or could it? Looking at the frequency response, some sort of automatic loudness system seems to be at work, though this is not mentioned in the manual.

The cassette transport is mechanically

quite noisy, though this is no big deal in the noisy car environment. Classical material sounded unnatural, almost synthetic, the unusual frequency response making itself obvious in the weak midrange. Noise levels were also a bit obtrusive and some form of noise reduction would have been useful. Adjusting the tone controls definitely improved matters and stopped rock tracks getting bogged down in bass. But the balance still tended to make vocals sound strained, and quite unlike the other players on test.

## LAB REPORT

Nine watts of audio from this modest looking radio conceals a poor –47dB output stage noise floor (clearly audible on sensitive speakers in a quiet place). The FM response is nearly right, and the ferocious tone controls would have no trouble bending it to taste. But the FM section has a fairly nasty sound, spitty and sibilant on some voices, backed up by a high distortion figure. Sensitivity was well up to scratch.

AM lets the side down again. Disgraceful distortion figures and terrible overload margins, with less than 60dB AGC range, indicate a fundamentally third-rate circuit. But – and it's a noteworthy but – the sound here is in some ways better than the rest because Clarion have got the selectivity curve very nearly right. You stand a better chance of getting an apparent 5kHz or so of bandwidth from a suitably processed transmission than with any other set in the test batch.

Surprisingly the 916 gave exactly the same wow and flutter results as the more expensive 946. In fact, depending on the weighting given to speed error, the 916's figures could be considered the best in the group.

The noise mod. graph is reasonably clear, but the unusual frequency response looks as though the tone controls had been left on full, which wasn't the case; 'auto loudness' is the likely culprit. The separate tone controls may help flatten this out a bit, but it's a poor starting point nonetheless.

## CONCLUSIONS

I liked the feel and simplicity of the 916, but the rather poor tape sound quality makes it hard to recommend.

## TEST RESULTS

### Amplifier

Power output (4ohms, 13.8V) 9W/9.6dBW  
Noise (residual) –47dB

Radio AM stereo FM (mono)  
Distortion 16%/6% (1.8%)

AGC range 32-91dB/μV n/a

Signal/noise (ultimate) 59dB 54dB (57dB)

Sensitivity (ultimate) 70μV 500μV (50μV)

### Frequency response (corrected):

AM: 2.2kHz: 0.2dB, 4.7kHz: –4.1dB, 9kHz: –7.4dB

FM: 2.2kHz: –2dB, 4.7kHz: –1.9dB, 10kHz: –3.4dB,

15kHz: –5dB

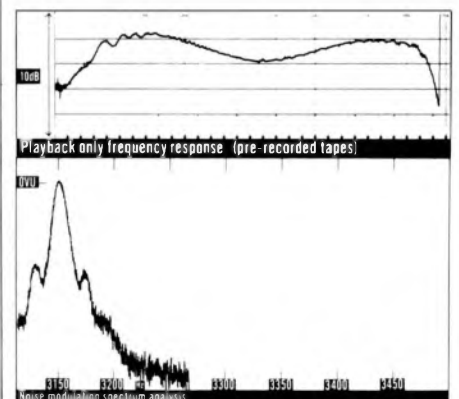
### Cassette

Wow & Flutter (pk. DIN wtd.) 0.14%

Wow/Flutter (pk. DIN wtd.) 0.09%/0.27%

Speed error +1.76%

Typical Retail Price £160



# CLARION 946HP

CLARION SHOJI (UK) LTD., UNIT 1, MARSHALL ROAD, HILLMEAD, SWINDON, WILTSHIRE SN5 7DW. TEL: (0793) 870400.

RECOMMENDED



The Clarion 946HP was to have been the first player on test, but a critical omission in an otherwise comprehensive instruction manual left me unable to get any action from it. Like most of the sets there are two power lines, one with a permanent 12 volts for the memory, and the other *via* the ignition; this crucial latter cable doesn't appear on the wiring diagram, and wasn't labelled amongst the fourteen or so cables sprouting from the machine.

The 946 has an outer case which fits to the car, allowing the player to be withdrawn when the Clarion key is inserted into a small aperture. Regrettably, other screwdriver-like instruments will also perform this function.

One of the cleverest things about this player is the way the different groups of switches have totally different shapes, so it's possible to carry out station changes without having to look at the player. The way the seek button has concave and convex surfaces for up and down is particularly neat. The volume knob could perhaps be a little bigger, and the need to press seek twice to get distance sensitivity might prove a minor nuisance, but otherwise this is a friendly machine to use.

## RECEIVER

The amplifier controls are much as usual, with push-out treble and bass controls. The tuner has six presets on each band plus an extra six on a second FM band called SAM (signal auto memory) which automatically stores six FM signals – which six probably depends on signal strength. Manual tuning can be carried out in 25kHz steps, and seek tuning will automatically run in local mode unless the button is pressed twice or there are no strong signals in the area.

FM radio has a smooth and powerful character which was predictably a bit bass forward with domestic loudspeakers. Some female vocals on Radio 3 sounded very nice in the midrange, though they could get a tad painful if the volume was pushed. Rock music came through with nice solidity and clarity, and was very much in its element.

## CASSETTE

The autoreverse cassette deck has a noise limiting system and is inscribed with the

legend "dual azimuth adjustment mechanism" – a feature that was not elucidated by the manual.

The Talk Talk track sounded articulate and full of information, if a bit fast in tempo. Some wow was evident on the oboe track and the top end did sound a bit distorted at volume. Overall though this was one of the better cassette decks of the group.

## LAB REPORT

The 946 came top of the batch in terms of power yield into 4 ohms, managing to deliver 22V p-p across the loudspeaker terminals before gross distortion set in – a little over 15 watts. Residual noise from the audio stage was a fairly good –56dB.

The FM response was relatively level, corrected values revealing only a slight tilt to the curve which the tone controls can easily correct. Noise reached a very reasonable –59dB from 100 $\mu$ V in mono, and although it took the best part of a millivolt aerial input to achieve the stereo noise floor, this was at a reasonable –54dB. However, distortion at peak modulation was on the high side at 1.6 per cent, and the FM muting bandwidth extended to –75/+50kHz either side of nominal, the asymmetry suggesting poor setting-up.

AM quality, on the other hand, was atrocious: the input signal had to be reduced to 3mV to enable distortion to be measured with 100Hz modulation, and even then it was 16 per cent, while 2 per cent at 1kHz does not inspire confidence either, and the selectivity distortion was no better. Even after correction, the response at 4.7kHz was more than 13dB lower than it need be, giving telephone line timbre at best. An overload point of just 40mV will bring reception problems when driving near transmitting stations. The only AM measurement that wasn't outstandingly bad was the ultimate noise floor, a staggering 65dB down (equal to the best FM broadcast!).

The wow and flutter figures match those of the cheaper 916 model, but it's the noise modulation graph which shows up the real difference between these two machines. The 946 comes far closer to the single peak goal which some manufacturers strive for, and is

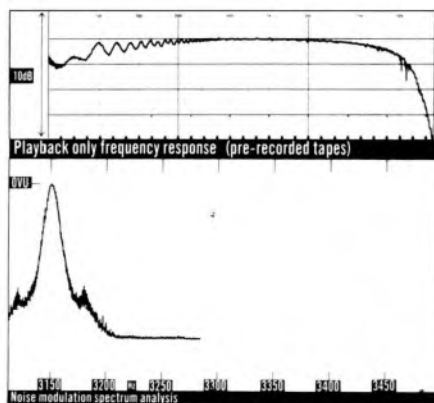
far cleaner than any other in this test. The frequency response is likewise very clean.

## CONCLUSIONS

The Clarion 946 is undoubtedly one of the more desirable machines on test, not only looking good and handling well but even sounding nice. At the highish price a Best Buy would be inappropriate, but Recommendation is mandatory despite poor AM radio performance.

## TEST RESULTS

|  |                  |                            |
|--|------------------|----------------------------|
| <b>Amplifier</b>                                   |                  |                            |
| Power output (4ohms, 13.8V)                        |                  | 15.1W/11.8dBW              |
| Noise (residual)                                   |                  | –56dB                      |
| <b>Radio</b>                                       |                  |                            |
|  | AM               | stereo FM (mono)           |
| Distortion   | 16%/2.1%*        | (1.6%)                     |
| AGC range  | 34–92dB/ $\mu$ V | n/a                        |
| Signal/noise (ultimate)                            | 65dB             | 54dB (59dB)                |
| Sensitivity (ultimate)                             | 50 $\mu$ V       | 1000 $\mu$ V (100 $\mu$ V) |
| <b>Frequency response (corrected):</b>             |                  |                            |
| AM: 2.2kHz: –3.2dB; 4.7kHz: –13.1dB; 9kHz: –81dB   |                  |                            |
| FM: 2.2kHz: –1.5dB; 4.7kHz: –2.4dB; 10kHz: –3.7dB; |                  |                            |
| 15kHz: –4.2dB                                      |                  |                            |
| <b>Cassette</b>                                    |                  |                            |
| Wow & Flutter (pk. DIN wtd.)                       |                  | 0.14%                      |
| Wow/Flutter (pk. DIN wtd.)                         |                  | 0.09%/0.27%                |
| Speed error  |                  | +2.13%                     |
| Typical Retail Price                               |                  | £250                       |
| *at 70dB $\mu$ V, see text                         |                  |                            |



# GOODMANS GCE 229

GOODMANS LTD., 2 MARPLES WAY, KINGSCROFT CENTRE, HAVANT, HANTS PO9 1JS. TEL: (0705) 486344.



Goodmans concentrate their UK manufacturing efforts on competitively priced domestic and in-car loudspeakers, including vast numbers of line-fit OEM models for major motor manufacturers. But they also market a wide range of Far Eastern sourced audio electronics, in-car being one element thereof.

The macho *GCE 229* is their £150 maximum feature, carry-out, mean machine, with barely a square centimetre lacking some form of inscription. It beats the competition hands down when it comes to gizmos like music search and 24-hour clock.

Having so many legends and six multi function switches on a machine of this type doesn't make for straightforward ergonomics. The majority of the functions aren't even illuminated, and finding your way around at night must be a serious business. The volume control at least has backlighting and is well proportioned, as is the identical bass control below it.

## RECEIVER

The amplifier side is endowed with separate concentric tone controls, loudness switching and a front-to-rear fader. The tuner will only store six FM and six MW stations on its three two-way buttons. It will automatically seek stations in either local or distance mode and proved capable of picking up some of the more obscure stations in the area. The scan function theoretically runs through the stored stations, but likes to stop at other strong signals as well – whether this is a sample fault or something that was overlooked in design I'm not sure. Locking stations into the presets is an easy 2-button affair – which could almost be carried out on the move!

Given a signal of reasonable strength, the Goodmans was capable of sounding smooth and reasonably open, although the top end could get a bit gritty and unpleasant if the volume was pushed. The 25 watt rating seems a little optimistic, but fair levels were nonetheless achieved.

## CASSETTE

The cassette deck has a few unusual novelties such as a music search system to help find the low level gaps between tracks. It

trips up on quiet music passages and needs a gap of at least four seconds, but is effective in most situations and quite useful. Another rarity at this price point is Dolby noise reduction, not found on the other players in this test group. Otherwise it's a straightforward autoreverse machine with the option of 70µS metal/chrome equalisation.

Cassette playback didn't sound too bad. Clarity was reasonable, and Talk Talk sounded quite lively – indicative of the speed error discovered on test. A bit bass light and less than clean in the treble, a metal tape recording of acoustic guitar sounded fast in the incorrect sense, and rather metallic in tone. Classical tapes were rendered more listenable thanks to the Dolby noise reduction, and, despite the figures, oboe recordings didn't sound too bad.

## LAB REPORT

To claim this as anything more than a ten-watt per channel rig would seem to be stretching the truth. However, the audio stage noise at –59dB is quiet enough.

FM performance was also better than many: 0.4 per cent distortion on peak modulation is pretty good for this grade of machinery. The response with tone controls neutral was rolled-off and boomy (but who knows what the partnering speakers will be like?). There was a certain tidiness on mono FM not present on many other sets, but it rather fell from grace on switching to stereo. Ultimate noise figures (always a good test of an FM front-end) scored well, but needed pretty high aerial signals to attain this.

AM, as usual, hardly bears thinking about. The 9kHz intercarrier whistle is far too high, whereas the response at 4.7kHz is over 16dB too low, indicating the cheapest and nastiest selectivity imaginable. The range of the AGC (78dB) and the commendable 1kHz distortion figure show that the circuit has potential.

Though not the worst, the wow and flutter figures fail to inspire confidence in the mechanical integrity of the tape transport, and the spectrogram bears this out with its wide base and capstan-wow sidebands.

The 2+ per cent speed error is also below par, so it looks like some quality control cor-

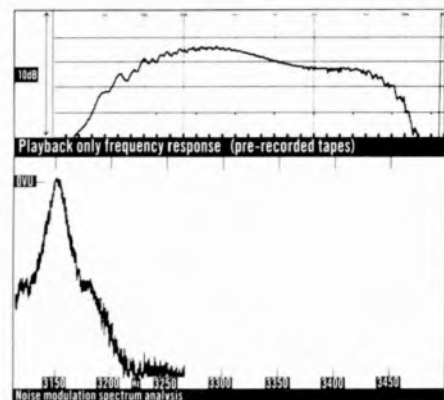
ners have been cut here. The replay response, produced using the –5dB line as 0dB, reveals this player's affinity for the mid-range and its disregard of the frequency extremes.

## CONCLUSIONS

You do get quite a lot for your money with this chunky little player, and for the price it's hard to criticise. So hard in fact that it rates Best Buy overall.

## TEST RESULTS

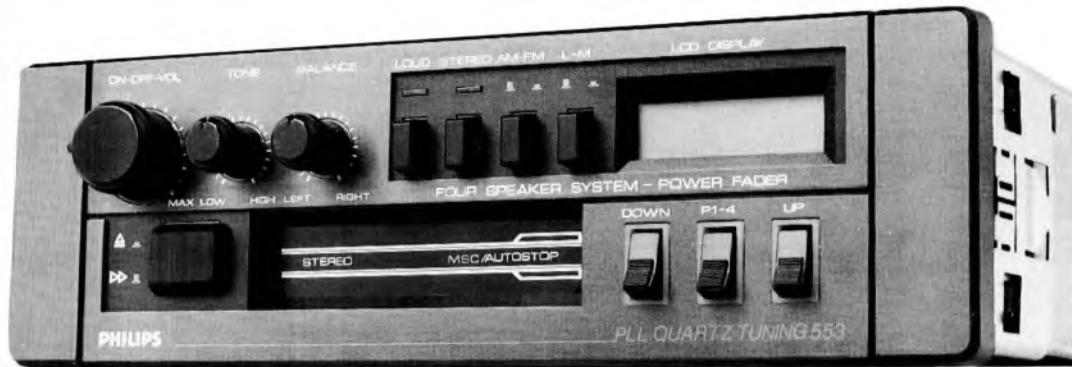
|  |             |                  |
|--|-------------|------------------|
| <b>Amplifier</b>   |             |                  |
| Power output (4ohms, 13.8V)                                      |             | 10.1W/10.1dBW    |
| Noise (residual)   |             | –59dB            |
| <b>Radio</b>   |             |                  |
|  | AM          | stereo FM (mono) |
| Distortion   | 8%/0.6%     | (0.4%)           |
| AGC range  | 30–108dB/µV | n/a              |
| Signal/noise (ultimate)  | 56dB        | 55dB (60dB)      |
| Sensitivity (ultimate)   | 50µV        | 3000µV (200µV)   |
| <b>Frequency response (corrected):</b>                           |             |                  |
| AM: 2.2kHz: –3.4dB, 4.7kHz: –16.6dB, 9kHz: –51dB                 |             |                  |
| FM: 2.2kHz: –0.5dB, 4.7kHz: –2.3dB, 10kHz: –6.5dB, 15kHz: –9.9dB |             |                  |
| <b>Cassette</b>  |             |                  |
| Wow & Flutter (pk. DIN wtd.)                                     |             | 0.25%            |
| Wow/Flutter (pk. DIN wtd.)                                       |             | 0.2%/0.34%       |
| Speed error  |             | +2.16%           |
| Typical Retail Price   |             | £150             |





# PHILIPS DC-553

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



Long a leader in in-car entertainment, Philips have pioneered many innovations over the years, while holding onto a substantial share of the market despite intensive Far Eastern competition. The 553 comes in at £120, which is close to our price floor. Consequently it lacks the sophistication of the other models on test, but still manages to have a lot of buttons, plus a black on green LCD display.

Ease of use is not one of this player's strengths, the fiddly presetting system and tiny LCD display not exactly encouraging accident-free re-tuning on the move. Whilst the volume knob is an improvement over the more expensive 680, its use is marred by the nearby tone control and large eject/FF button – though the latter only comes out when a cassette is being played. This proves a bit of a pain as radio and cassette require quite different gain settings to achieve the same volume level.

## RECEIVER

The amplifier section has rotary controls for volume, fading (yes two pairs of speakers can be used), tone and balance, with a loudness button thrown in for good measure.

The tuner is capable of holding four preset stations on each bandwidth, but has only one preset switch with which to run through the stored stations. Search and manual tuning is possible, if slightly tricky for the uninitiated. To get the radio to search for the next strong signal (up or down), first you must press the appropriate manual tuning button until the radio mutes (this takes between a half and two seconds); press this button for more than two seconds and it moves into fast manual tuning – some concentration is obviously required. Preset assignment is also a matter of holding a given button down for a certain amount of time, a double bleep indicating success.

Classical music sounds quite clear and dynamic on FM radio. Although tending towards thinness, at least it wasn't bogged down in bass, the sound being barer and sparser than other models, lacking their plushness and power.

## CASSETTE

The cassette deck is a rather basic unidirectional type with the facility to fast forward but not rewind. One rather evocative line from the manual reads: "To avoid tape salad take the cassette out if cassette player is not in use". Could this mean that the 553 was adapted from a Philips food processor?

Cassette replay was a little less than refined, and sounded rather muffled yet occasionally edgy in the treble. Wow and flutter, however, were for the most part inaudible.

## LAB REPORT

This set delivers a modest 3.12W into 4ohms with the front-rear fader central. The noise floor is down at -62dB, but that's nothing to be proud of when the output is 7dB quieter than some before it clips.

FM is about par for the course, with a gentle tilt over the whole audio band, and respectable, if hardly outstanding, noise figures. Distortion is a shade higher than it ought to be, tuning was clumsy, and the absence of effective muting made it possible to mistune the receiver without noticing it.

AM has some unusual merits: though much higher than it need be, the distortion didn't rise much at the LF end, which is unusual – and favourably reflected in the sound. The AGC range and overload margins were most impressive, but the selectivity was about as poor as it could be, which is a shame. This is really a case of spoiling the ship for a ha'pennyworth of tar, given the modest cost of decent ceramic filter selectivity these days. Fine-tuning in 1kHz stages is another unusual feature, enabling one to achieve more useful HF response than the centre-tuned figures might suggest, but this is not the correct way to engineer a sensible response.

The wow and flutter results are quite reasonable in the context of the other players tested – as the noise modulation graph bears out. Lacking the linearity of a more refined machine, the shape is nevertheless indicative of half decent mechanics. Speed stability is about par for the bunch.

The frequency response curve corres-

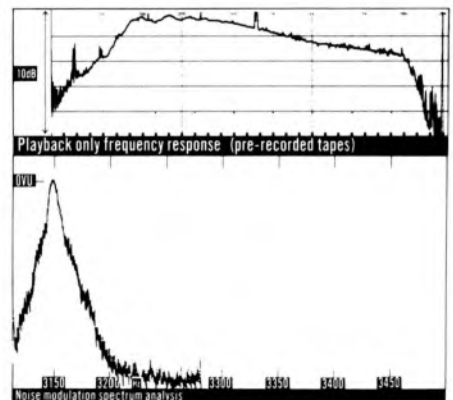
ponds directly to the listening test findings – the steep and messy decline after 10kHz not boding well for HF harmonics.

## CONCLUSIONS

Whilst not as user friendly as other models, this relatively inexpensive machine is still capable of reasonable sound quality, and is worth considering.

## TEST RESULTS

|  |                   |                            |
|--|-------------------|----------------------------|
| <b>Amplifier</b>                                   |                   |                            |
| Power output (4ohms, 13.8V)                        |                   | 3.1W/5dBW                  |
| Noise (residual)                                   |                   | -62dB                      |
| <b>Radio</b>                                       |                   |                            |
|  | AM                | stereo FM (mono)           |
| Distortion   | 5%/3.2%           | (1.2%)                     |
| AGC range  | 34-122dB/ $\mu$ V | n/a                        |
| Signal/noise (ultimate)                            | 54dB              | 52dB (58dB)                |
| Sensitivity (ultimate)                             | 160 $\mu$ V       | 1000 $\mu$ V (150 $\mu$ V) |
| <b>Frequency response (corrected):</b>             |                   |                            |
| AM: 2.2kHz: -5.9dB; 4.7kHz: -17.8dB; 9kHz: -52dB   |                   |                            |
| FM: 2.2kHz: -4.1dB; 4.7kHz: -5.6dB; 10kHz: -7.3dB; |                   |                            |
| 15kHz: -8.2dB                                      |                   |                            |
| <b>Cassette</b>                                    |                   |                            |
| Wow & Flutter (pk. DIN wtd.)                       |                   | 0.24%                      |
| Wow/Flutter (pk. DIN wtd.)                         |                   | 0.15%/0.34%                |
| Speed error  |                   | +1.43%                     |
| Typical Retail Price                               |                   | £120                       |



# PHILIPS DC-680

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



The almost colourful appearance of the DC-680 disguises a complex anti-theft security code system, designed to render the player unusable if stolen. If power is completely cut off, it is necessary to input a specific 4-digit code before the machine can be used again. If the wrong sequence is entered you have to wait a minute before another can be entered; if that's wrong the time doubles and so on.

The most important knob on any music machine is the volume control, so it ought to be easy to use. This one isn't, not because of its size but because the grippable part is too close to the fascia; what's more it's quite stiff to turn. The push-out controls are fine if used one at a time, but less accessible if left out together. The rubber-faced auto/manual tuning buttons are rationally placed between the display and the oddly positioned mono and loudness switches. The silver grey preset switches have backlit numerals and contrast well with the rest of the fascia, making them easy to find day or night. The cassette controls are pretty much the norm for car players – reasonably easy to use, and in this case with the advantage of backlit legends allowing visual identification at night.

## RECEIVER

The amplifier section of the 680 features push-out balance, tone and a front-rear fader, the latter altering the relative balance of two pairs of speakers, though with one pair it served to blank out the left channel! Green and purple buttons switch loudness and mono.

The tuner has only four preset buttons but will hold eight FM stations alongside four on Medium and four on Long wave AM. A slightly unconventional seek tuning system scans a given bandwidth at three different levels of sensitivity; it's a system that takes some getting used to, and is frankly rather unhelpful if you want to find a station quickly. A bit more useful is the autostore function which runs through the band, picks out the four strongest signals and assigns them to the four presets, but like other such systems it proved partial to emergency services.

Manual tuning is a bit better, moving quickly in 50kHz steps, and with a useful signal strength display to help find the opti-

mum frequency for a station with more than one position on the dial.

Given a healthy FM signal the DC-680 can sound reasonably clean with good clarity and minimal distortion. The tonal character is reasonably neutral, with a slight emphasis at lower frequencies. LF nevertheless sounds tight and solid within admittedly limited power constraints.

## CASSETTE

The cassette player is a pretty run of the mill autoreverse type, with a dual function eject and direction change button, the status of the latter being displayed on the LCD screen.

Cassette replay sounds quite subtle and involving, giving good body to vocals and acoustic instruments. Some lack of pitch stability was apparent with certain instruments, but not to an unbearable degree. Again, this is not a very powerful machine, and in this respect cassettes sounded less clean than FM radio at higher volume levels.

## LAB REPORT

This set delivers a fairly low power output, from an adequate but far from impressive noise floor. FM performance is similar to the other Philips model tested but the noise figures do not take account of a curious 'ticking' noise clearly audible above the noise floor. De-tuning by 100kHz causes the sound to drop into mono, but leaves the stereo beacon LED unscathed (why?). Rather more irritating are the 'space invader' noises which accompany various functions.

AM selectivity is far too narrow, and there's no de-tuning option on this model. The above mentioned 'ticking' again interrupts the noise floor. Curiously, although the AM section boasts a range of 84+dB, this is because the audio output is held until the signal virtually drops into noise, whereas it doesn't take much more than 15 millivolts to cause overload at the other end of the scale; strange design compromises here, and no mistake.

Both wow and combined wow & flutter figures are quite healthy for a player of this price, but the flutter element is a bit high, and is sometimes audible. Speed accuracy was the best of the bunch at less than 0.5 per

cent fast. The replay response is quite mid strong and the slow downtilt from 1kHz on means that pre-recorded cassettes will tend to sound a bit dull. However, in general car speakers will tend to counter this.

## CONCLUSIONS

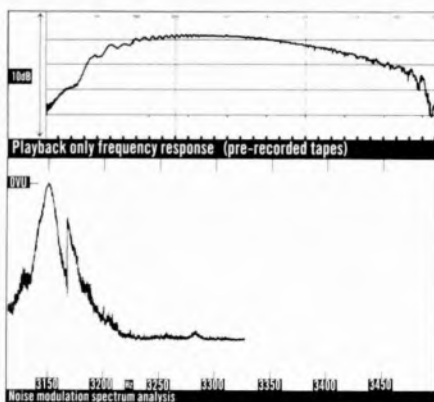
Despite a few ergonomic anomalies, the 680 turns in a fair musical performance for the price, and merits Recommendation.

## TEST RESULTS

| Amplifier  |                 |                          |
|--|-----------------|--------------------------|
| Power output (4ohms, 13.8V)                                    |                 | 3.5W/5.5dBW              |
| Noise (residual)   |                 | -58dB                    |
| Radio  |                 |                          |
|  | AM              | stereo FM (mono)         |
| Distortion   | 6.8%/2.8%       | (1.6%)                   |
| AGC range  | 0-84dB/ $\mu$ V | n/a                      |
| Signal/noise (ultimate)  | 62dB            | 51dB (57dB)*             |
| Sensitivity (ultimate)   | 50 $\mu$ V      | 600 $\mu$ V (60 $\mu$ V) |
| Frequency response (corrected):                                |                 |                          |
| AM: 2.2kHz: -3.4dB, 4.7kHz: -19.8dB, 9kHz: -72dB               |                 |                          |
| FM: 2.2kHz: -0.8dB, 4.7kHz: -2.2dB, 10kHz: -5dB, 15kHz: -6.9dB |                 |                          |

| Cassette                     |             |
|------------------------------|-------------|
| Wow & Flutter (pk. DIN wtd.) | 0.21%       |
| Wow/Flutter (pk. DIN wtd.)   | 0.13%/0.38% |
| Speed error                  | +0.46%      |
| Typical Retail Price         | £180        |

\*plus curious 'ticking' noise!



# PIONEER KE-3030

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



The cheaper of the two Pioneers tested, the *KE-3030* is quite similar in appearance but has a few inevitable concessions to the £80 price difference.

The *3030* is reasonably good from an ease of use point of view. The radio and tape controls are well separated, and the presets are fairly large. The volume knob is a small 16mm in diameter, but deep enough for adequate grip, while the balance and tone controls have rather stiff action for their small size – which at least stops them being accidentally altered when you're fumbling for the mono button. The latter is one of three small but well-spaced buttons that glow orange for easy location. The preset and band buttons have back-lit legends for easy visual identification, though this is less obvious in direct sunlight. Also useful are the little bumps on the two centre presets which give tactile feedback and avoid unnecessary distraction.

## RECEIVER

The *3030* is designed to drive only one pair of 4-8ohm speakers, and uses a shared negative lead to do so, which seems a bit cheapskate on a £150 unit.

The tuner is a more luxurious device, conceding little to dearer units. Its 6-button, 4-band memory allows for storage of up to 18 FM stations and 6 AM stations, the former allowing useful station duplication for those who regularly cross transmitter boundaries. One can search for these stations using the seek or manual tuning bars, the latter working in both local (for strong signals) and distance modes. Manual tuning is a bit crude and it's hard to hit an exact frequency first time, but at least seek tuning will pick up anything listenable on FM so this is not a problem.

Not the most subtle and refined of machines, rather it leans towards a 'thick', bassy balance which sounds totally inappropriate on domestic loudspeakers, but may well be suited to more feeble car installations. Heavy volume levels can be sustained without any threat to one's ears, but the lack of clarity is pretty obvious on most FM material. That said, a good Stevie Nicks track played on Radio 1 sounded OK – after all, information isn't everything – and if the balance covers a

less than clean treble maybe it's a valid compromise.

## CASSETTE

The autoreverse cassette player has only three controls. The rewind and fast forward buttons double as eject, whilst the third changes the direction of tape travel. It's a pretty basic selection, but when you're cornering at mach2 in your *XR3i* turbo, how many knobs do you want to fiddle with?

Cassette replay sounds much like FM – walloping bass and rolled off treble. Using the rather crude tone control helps a bit. Some wow & flutter is noticeable with certain material, electronic music sounding better than the acoustic variety.

## LAB REPORT

Unlike most sets in the test group, this receiver only has a single-ended output stage (not to mention a common earth lead for both speakers). This limits power output to just 4.2W, nearly 6dB quieter than the loudest set tested. It does, however, keep residual noise down to -60dB.

Like its more expensive counterpart, the *KE3030's* FM response is well-engineered – indeed virtually identical to the more up-market machine. The noise and sensitivity figures look similar too, but are marred by a synthesiser 'whine', especially in the stereo mode (-49dB relative to peak modulation). There really is no excuse for this: if other manufacturers can make digital synthesis tuners that don't whine, why not Pioneer?

AM has good noise and a better-than-average bandwidth (not that it's anything to write home about). The 9kHz intercarrier whistle is well down in the noise which is quieter and more wholesome than its FM equivalent, but distortion performance is disappointing.

Wow and flutter is distinctly unspectacular, though oddly a tad better than the *5080* – both these players could do with some tightening up in this respect. The noise modulation graph with its gaping under peak area further confirms less than wonderful mechanical integrity.

The replay response shouldn't need explaining. It shouldn't even exist – but it

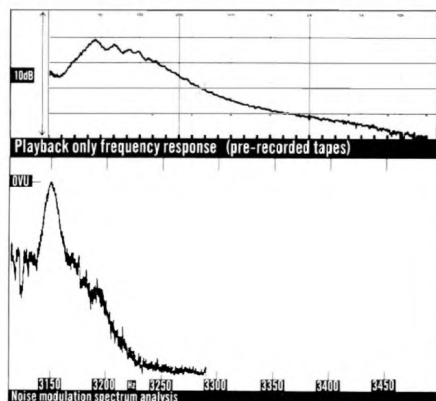
does. And so (fortunately or otherwise) do car speakers with an opposite response. Don't say you weren't warned.

## CONCLUSIONS

The *3030* seems to have been tailored for a specific sound – high volume but little subtlety. And it could suit inexpensive fullrange drivers reasonably well. However, the balance needs to be a bit more accurate to warrant serious consideration.

## TEST RESULTS

| Amplifier   |                   |                           |
|---|-------------------|---------------------------|
| Power output (4ohms, 13.8V)                       |                   | 4.2W/6.2dBW               |
| Noise (residual)                                  |                   | -60dB                     |
| Radio   |                   |                           |
|   | AM                | stereo FM (mono)          |
| Distortion  | 13%/1.8%          | (2%)                      |
| AGC range   | 44-110dB/ $\mu$ V | n/a                       |
| Signal/noise (ultimate)                           | 54dB              | 49dB (56dB)               |
| Sensitivity (ultimate)                            | 30 $\mu$ V        | 125 $\mu$ V (350 $\mu$ V) |
| Frequency response (corrected):                   |                   |                           |
| AM: 2.2kHz: -3.6dB; 4.7kHz: -7.6dB; 9kHz: -78dB   |                   |                           |
| FM: 2.2kHz: 0.1dB; 4.7kHz: -0.1dB; 10kHz: -1.6dB; |                   |                           |
| 15kHz: -2.4dB                                     |                   |                           |
| Cassette  |                   |                           |
| Wow & Flutter (pk. DIN wtd.)                      |                   | 0.29%                     |
| Wow/Flutter (pk. DIN wtd.)                        |                   | 0.17%/0.66%               |
| Speed error                                       |                   | +1.33%                    |
| Typical Retail Price                              |                   | £150                      |



# Thomsons



If you walk along the High Street, Great Baddow, in the direction of the "Blue Lion", next door to the public house you will find, tucked away in the corner, THOMSONS TV, HI-FI AND VIDEO. It has its own car park alongside the shop, a most useful asset.

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# KENWOOD

**M31CDS** Excellent Value  
**£499.50**



Offering excellent value, the M-31S provides high-quality sound reproduction (via full-size 3-way speakers plus superb versatility and ease of operation. The system powerhouse is a digital-ready amplifier combined with a double cassette deck that offers high-speed dubbing, synchro-recording and Relay Play. Stereo broadcasting is picked up by the quartz synthesized tuner with 20-station preset memory and SNPS, while records are handled with precision and delicacy by the fully automatic turntable.

**Fully Automatic Turntable**  
 ■ Precision belt drive system ■ Auto lead-in and return ■ Auto sizes/speed selector ■ Auto repeat ■ Cueing and manual search keys (P-31)  
**30W x 2 Integrated Amplifier with Double Cassette Deck**  
 ■ 30W x 2 power unit (DIN 8 ohms) ■ Independent inputs for CD, DAT, TAPE, TUNER, PHONO, AUX ■ Separate bass and treble tone controls ■ Mic mixing ■ Headphone monitoring jack ■ Automatic tape selector ■ Mech-logic tape controls ■ Timer relay play ■ High speed dubbing

■ Dolby<sup>®</sup> B NR ■ LED peak meter ■ Timer record/play (tuner) ■ Synchro-recording (AX-31)  
**Quartz Synthesized FM/MW/LW Tuner with Timer**  
 ■ Station Name Preset System (SNPS) ■ Random presets for 12 (with SNPS) or 20 (without SNPS) stations ■ Preset scan ■ Automatic Tuning ■ Twice-a-day 2 programme system timer ■ Sleep timer (T-91L)  
**70W 3-way Speaker System**  
 ■ 70W maximum input power ■ 16cm woofer ■ 5cm cone tweeter ■ 3cm piezo-electric super-tweeter ■ Bass reflex design ■ Frequency response: 50Hz-20kHz (S-51)

**Programmable Compact Disc Player**  
 ■ 3-beam laser pick up ■ Double oversampling digital filter ■ Optimum Sens Control ■ 15-track programme memory ■ 99-track random access play ■ Memory Check & Clear ■ Search & Skip keys ■ Dual mode play/remaining time display ■ Repeat ■ THD less than 0.01% (DP-310)

**EXTRA OPTIONS**  
**Stereo Graphic Equalizer**  
 ■ 7 band ■ Independent left/right channels ■ ± 6dB or ± 12dB variable range ■ LED equalizer display ■ Equalizer recording ■ Line and tape inputs (GE-600)

Packed with features, the fully remote M91-S offers you many unique functions, such as IDRS dual-independent recording, Auto Bias, the Cross Dolby NR system, and the Station Name Preset System (SNPS). The powerful, digital-ready amplifier has three video inputs enabling playback, recording and dubbing of videotapes together with sound injection. There's a valuable built-in timer, plus random access record play and much more.

**Programmable Linear Tracking Turntable**

■ Direct drive system ■ Fully automatic computer controlled operation ■ 7 programme random access memory play ■ Auto sizes/speed selector ■ Auto repeat ■ Synchro-recording system ■ System remote controlled (P-91)

**Double Auto-Reverse Cassette Deck**

■ Computer Controlled CD Recording System (CCRS) ■ Auto Bias ■ Full logic control ■ Independent Dual Recording System (IDRS) ■ Cross-Dolby system with Dolby B/C ■ Automatic tape selector ■ LED peak meter ■ 3 reverse modes ■ Direct 16-Programme Search System (DPS) ■ Relay record ■ Timer relay play ■ High speed dubbing ■ Timer recording ■ Synchro-recording ■ System remote controlled (R-91)

**100W 3-way Speaker System**

■ 100W maximum input power ■ 23cm polypropylene cone woofer with Double Voice Coils ■ 6.5cm cone mid range ■ 5cm piezo electric tweeter ■ Bass reflex design ■ Magnetic Shield for audio video system use ■ Frequency response 35Hz-20kHz (S91V)

**EXTRA OPTIONS**

**Double Graphic Equalizer/Spectrum Analyser**  
 ■ Double 7 band equalizers ■ ± 6dB or ± 12dB variable range ■ Electronic controls ■ 20 memory presets ■ 10 programmable and 10 built-in ■ Dual spectrum analyser (R displays) ■ A/B selector ■ Equalizer recording ■ Reverse mode ■ Real response switch ■ System remote controlled memory (GE 910)

**Programmable Compact Disc Player**

■ Computer Controlled CD Recording System (CCRS) ■ 3 beam laser pick up ■ Double oversampling digital filter ■ Optimum Sens Control ■ 20 track random programme memory with Music Calendar display ■ 10 key input and -10 key for Rapid Direct Play system ■ Memory Check & Clear ■ Dual mode play/remaining time display ■ Repeat ■ Auto-spacing ■ System remote control (DP-110)

**Quartz Synthesized FM/MW/LW Tuner with Timer**

■ Station Name Preset System (SNPS) ■ Random presets for 12 (with SNPS) or 20 (without SNPS) stations ■ Preset scan ■ Auto music tuning ■ Twice a day 2 programme system timer ■ Sleep timer ■ System remote controlled (T91L)

**30W x 2 Integrated Amplifier**

■ 30W x 2 power unit (DIN 8 ohms) ■ Three video inputs and video dubbing with sound injection ■ Inputs for CD, DAT, TAPE, A/B ■ CD & DAT Direct switches ■ Computerised input selectors ■ Electronic volume and balance ■ ± 30dB muting ■ Mic mixing ■ Headphone monitoring jack ■ System remote controlled (A-91)



**M91S The Ultimate System**

**2 HIGH STREET, GT BADDOW  
CHELMSFORD 71465**

**Thomsons**

# PIONEER KEH-5080B

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

RECOMMENDED



The KEH-5080B is a chunky and very black looking beast before power is applied, but once the volume knob is depressed coloured lights start flashing in time with the music. Well, not exactly: Pioneer thankfully seem to have abandoned that approach, and use orange illumination with reasonable discretion; the preset numbers are particularly neat.

This model features Pioneer's secret code anti-theft device, which is an optional means of rendering the unit unusable if stolen. Each time power to the unit is completely cut off, a pre-registered four-digit code has to be entered before use. If a wrong code is tried three times, it's necessary to wait three hours before another attempt can be made. A more fundamental alternative is to remove the player completely from its slide-in tray.

The 5080 has been quite sensibly laid out with the tuner and amplifier controls at one end, cassette controls at the other. On/off is easily achieved by pressing a suitably proportioned volume knob; balance is altered by pulling the same knob out; the preset buttons are quite easy to find, if less brightly illuminated than some.

## RECEIVER

The LCD display tuner has six preset buttons plus three FM bands to give a total of 18 preset stations – very useful for long distance travellers with our short range transmitters. Medium and Long wave AM stations share the same band, with six presets between them. A useful feature is the 'best stations memory' (BSM) which scans the FM frequency range for the six strongest signals and assigns them to the presets on the selected FM band; this worked quite well, except that two of the chosen signals turned out to be emergency services, and not such great listening.

More down to earth is manual and seek tuning in 50kHz steps, with an option of either high or low sensitivity. Seek works by running through the frequency range until it finds a signal of appropriate strength where it stays unless the button is depressed again. Preset allocation is a simple matter of pressing the preferred preset button for two seconds after which the display indicates the

channel, or preset number, for that frequency.

This plush-sounding player is easy, relaxed and yet quite powerful – somehow reminiscent of Eagles albums. A 'softened' top end and slightly exaggerated bass makes for painless high volumes, well suited to shelf- rather than door-mounted speakers.

## CASSETTE

The cassette deck is a fairly straightforward autoreverse affair with electronic direction change and a switchable noise suppression device.

Its strength lies in rock music, which is pumped out at a serious level. Some wow & flutter was detectable when playing a Strauss track, but the machine lent good weight and punch to Talk Talk's *Happiness is Easy*.

## LAB REPORT

The FM section is fair enough: the distortion is twice that of the best in this batch, but half that of others, and the response is at least fairly level with tone controls flat. Ultimate noise figures are a shade on the high side, reaching only 50dB in stereo at just under a millivolt.

AM boasts a noise floor 11dB lower than the stereo FM figure – not that you'll need it in practice. It also manages to bury 9kHz well in the noise, but at the price of a narrow bandwidth. The 48dB AGC range conceals a remarkable sensitivity but, as so often is the case, fantastic sensitivity figures risk a poor overload margin.

The audio stages deliver 9 watts before clipping and have a very acceptable –65dB noise floor. Watch out for the fierce action of the loudness control at low volumes.

The wow and flutter figures were a little disappointing, coming close to the worst in the test group; flutter alone managed that distinction by being marginally worse than its less expensive brother. On the other hand, speed error is quite presentable at less than one per cent fast.

The replay response is reasonably even, showing the treble shy balance typical of musicassettes. The bass response starts at some 5dB down, but recovers pretty well by 70Hz, quite adequate for all of us who don't

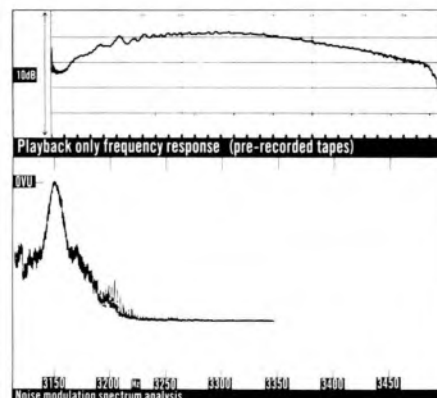
fit subwoofers into our motors.

## CONCLUSIONS

This player certainly looks the part, and also manages to turn in a reasonable – if rock oriented – musical performance, meriting not only *Choice* Recommendation but also perhaps a rather better quality tape transport than that found on our sample.

## TEST RESULTS

|   |                   |                           |
|---|-------------------|---------------------------|
| <b>Amplifier</b>  |                   |                           |
| Power output (4ohms, 13.8V)                                     |                   | 9W/9.6dBW                 |
| Noise (residual)  |                   | -65dB                     |
| <b>Radio</b>  |                   |                           |
|   | AM                | stereo FM (mono)          |
| Distortion  | 12%/1.2%          | (0.8%)                    |
| AGC range   | 55-103dB/ $\mu$ V | n/a                       |
| Signal/noise (ultimate)   | 61dB              | 50dB (54dB)               |
| Sensitivity (ultimate)  | 16 $\mu$ V        | 800 $\mu$ V (150 $\mu$ V) |
| Frequency response (corrected):                                 |                   |                           |
| AM: 2.2kHz: -2.2dB; 4.7kHz: -13.7dB; 9kHz: -80dB                |                   |                           |
| FM: 2.2kHz: 0.3dB; 4.7kHz: -0.1dB; 10kHz: -1.5dB; 15kHz: -2.6dB |                   |                           |
| <b>Cassette</b>   |                   |                           |
| Wow & Flutter (pk. DIN wtd.)                                    |                   | 0.29%                     |
| Wow/Flutter (pk. DIN wtd.)                                      |                   | 0.18%/0.68%               |
| Speed error   |                   | +0.86%                    |
| Typical Retail Price  |                   | £230                      |



# SANSUI RX-3100L

SANSUI (UK) LTD., UNIT 10a, LYON INDUSTRIAL ESTATE, ROCKWARE AVENUE, GREENFORD, MIDD. TEL: (01) 575 1133.



The £180 *RX-3100L* is the cheaper of two Sansuis tested, but is nevertheless very smartly packaged. Finished in black with beige lettering, various parts are illuminated in orange when switched on. The presets have small lights above them rather than backlit numerals but these are quite adequate in low light conditions.

The grouping of amplifier controls in one section seems fairly logical until you notice how close the beefy volume knob is to the bass and treble controls below it, making the latter particularly fiddly to adjust. The presets are quite nicely divided up and easy to find, whilst the manual tuning buttons are just a little stiff. Four predominantly tuner-related black buttons are very small (6mm long) against a black background, and are therefore pretty hard to find in poor light.

## RECEIVER

The amplifier controls, grouped together on a rather flimsy mounting, include separate treble and bass knobs and a front to rear fader behind the fat volume control. The power lead to the unit has an in-line mini transformer, supposedly to liberate extra space inside.

The tuner can store 12 FM and 12 AM stations, using a band selection button and six presets for their retrieval. Scan tuning works in one direction only and defies convention by stopping at every strong signal for five seconds before carrying on. It's possible to stop the scan when it hits a required station, but not skip past junk signals like emergency services. Preset assignment uses a conventional simple consecutive button technique.

The sound on FM radio is fairly middle of the road – hard to enthuse about yet hard to criticise. The receiver can achieve reasonable volume levels without too much distortion, and pumps out good solid bass given appropriate material – such as the B52's classic *Planet Clair* found on ye olde Radio One, bless its cotton socks. But definition and clarity could both be improved.

## CASSETTE

The cassette player is pretty much the norm except for pressbutton chrome/metal equal-

isation (if you can find the button).

Cassette replay was slightly marred by a noisy transport mechanism which sounded like other machines in rewind mode. Lively and noticeably fast, it didn't sound tonally as bass heavy as the playback response would suggest (possibly because of the speed error). Treble seemed a little distorted and the oboe track was not exactly delightful; noise reduction would have helped here. When a cassette deck is playing too fast it tends to make rock music sound more lucid and fresh, and as such isn't really a problem unless you are particular about tempo. Acoustic music is far more critical of such inconsistencies, piano and orchestral tracks tended to sound distinctly unrealistic and processed.

## LAB REPORT

Just eight watts and –53dB noise show that this cheaper Sansui set is decidedly down-market from the *5100*. The FM section is passable. Tolerably sensitive in mono, it needs a fair millivolt to get just a miserable –50dB S/N in stereo. At least the response is flat, but the distortion could be a lot better.

AM hits rock bottom, which is a shame since history shows that more than most Sansui know how to make AM sections properly. This example has absolutely no redeeming features.

The wow and flutter results are really pretty poor, and it's not surprising that this bane of cheap cassette players is audible with the *3100*. It isn't the worst in the bunch, but comes close if you take the 2+ per cent speed error into account. The frequency response is nearly 5dB up between 50 and 100Hz, so some tone control tweaking may come in handy with pre-recorded tapes; otherwise it's reasonably clean and flat.

## CONCLUSIONS

This pretty smart machine is let down by mediocre sound quality and dubious quality control. At the price it really needs to come up with cleaner results to warrant our recommendation.

## TEST RESULTS

### Amplifier

Power output (4ohms, 13.8V) 8W/9dBW  
Noise (residual) –53dB

Radio AM stereo FM (mono)

Distortion 24%/8% (2.4%)

AGC range 50-93dB/μV n/a

Signal/noise (ultimate) 46dB 50dB (52dB)

Sensitivity (ultimate) 50μV 1000μV (70μV)

Frequency response (corrected):

AM: 2.2kHz: –0.3dB; 4.7kHz: –11.2dB; 9kHz: –45dB

FM: 2.2kHz: 0.1dB; 4.7kHz: 0.8dB; 10kHz: –0.4dB;  
15kHz: –2.2dB

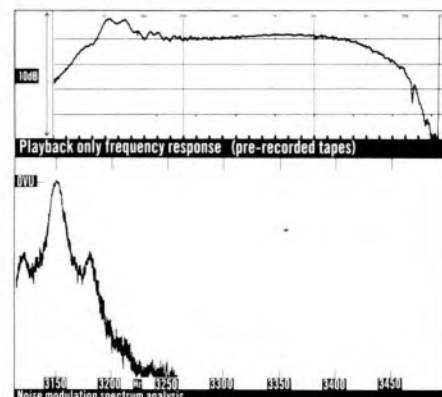
### Cassette

Wow & Flutter (pk. DIN wtd.) 0.29%

Wow/Flutter (pk. DIN wtd.) 0.17%/0.54%

Speed error +2.43%

Typical Retail Price £180



# SANSUI RX-5100L

SANSUI (UK) LTD., UNIT 10a, LYON INDUSTRIAL ESTATE, ROCKWARE AVENUE, GREENFORD, MIDDX. TEL: (01) 575 1133.

RECOMMENDED



The *RX-5100L* is a meatier, chunkier, altogether more serious contender than the *3100*. Needless to say it also costs more, and hits our £250 price ceiling. An outer shell attaches to the car allowing the unit to be pulled out or slotted in at will – probably the most effective anti-theft device around if you discipline yourself to use it. But the unit has only one pair of speaker cables, plus a pair of phono sockets on flying leads marked 'pre-out rear' – a second amplifier is required for extra speakers.

Like baby brother, the rather stiff treble and bass controls are a bit too close to the chunky volume knob for easy adjustment. But the presets are rationally laid out with backlit numerals for easy identification, as are the AM and FM switches which have solid dividers for differentiation by feel. The small secondary function switches have illuminated legends to make them easy to find, but the manual tuning button doubles up as the mono switch and could easily be left on by mistake.

## RECEIVER

The amplifier controls are much the same as on the *3100* – separate bass and treble knobs and a front to rear fader.

The tuner is a bit more sophisticated. Although it doesn't store as many AM stations as the *3100*, it memorises 12 FM stations plus four on Medium and two on Long wave, and the presets may be scanned by pressing the volume knob. Tuning can be carried out manually in 25kHz steps or automatically in either local or distance mode, waiting at each signal for five seconds and then moving on if not stopped. According to the manual the presetting button designated 'intro memory system' "enables stations to be stored while they are being tuned successively", which in practice means that as a station comes up on the screen one has to hit an appropriate preset key for it to be memorised: clever but not wicked. One unusual feature is a tuner monitor function which allows five seconds of the tuned station to interrupt tape playback.

Synthesiser whine apart, classical music sounded very nice on FM radio, giving good depth and power to kettle drums and pre-

sented orchestral crescendos with some of the weight and attack due to them. Some Steely Dan on Capitol Radio sounded a bit bass forward and lacking in sparkle, but was enjoyable nonetheless.

## CASSETTE

The conventional autoreverse tape deck uses rotating LCD circles on the display to indicate direction of play; a bit gimmicky and difficult to interpret, an arrow might have been more useful. There is also a noise reduction system of sorts which could be handy.

Pre-recorded classical tapes appreciated the reasonably effective noise reduction system. An oboe piece sounded slightly fluttery but not at all bad, although a Haydn work seemed quite distorted. The Talk Talk and Sade tracks sounded hard in a positive sense, with plenty of information and kick.

## LAB REPORT

Power output is a fairly generous 12.5W, using the usual 'bridged' output stage. FM actually sounded better than expected considering the measured (mostly second harmonic) distortion and synthesiser whine at only –42dB – clearly audible on Radio 3, if not with pop music sources. The frequency response reveals as much bass lift as treble cut, but little more than the usual plus or minus 3dB. The set has a very clever system for rolling off noise on weak signals, although in my experience such devices tend to make weak and choppy FM signals sound like mangled tape!

It was on AM that this set really shone. The selectivity curve is within 6dB of optimum, which is really going some, and the distortion figures set the standard for others to follow. The set took a frightening 1.4V of signal before breaking up, while maintaining very satisfactory noise floors and sensitivity. If they could just broaden the selectivity a little, fit a 9kHz audio notch, and do something about that dreadful whine on FM, this would be quite some radio.

The wow and flutter figures look very healthy indeed – in fact they're the best in the group. However, the speed error is the worst, which came as a surprise as this didn't really

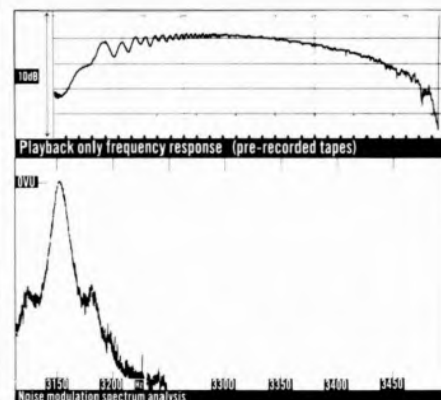
show up on audition. The frequency response illustrates a rather early treble rolloff – down by 3.5dB at 5kHz.

## CONCLUSIONS

This is obviously one of the better machines in the group, giving good performance on AM as well as FM and even playing tapes quite well (except for the speed error which is hopefully a sample fault). Recommendation is mandatory.

## TEST RESULTS

| Amplifier  |             |                  |
|--|-------------|------------------|
| Power output (4ohms, 13.8V)                                      |             | 12.5W/11dBW      |
| Noise (residual)   |             | –47dB            |
| Radio  |             |                  |
|  | AM          | stereo FM (mono) |
| Distortion   | 1.6%/0.8%   | (1.2%)           |
| AGC range  | 40-123dB/μV | n/a              |
| Signal/noise (ultimate)  | 59dB        | 42dB (42dB)*     |
| Sensitivity (ultimate)   | 30μV        | 1500μV (300μV)   |
| Frequency response (corrected):                                  |             |                  |
| AM: 2.2kHz: –0.1dB, 4.7kHz: –5.7dB, 9kHz: –6.8dB                 |             |                  |
| FM: 2.2kHz: –2.4dB, 4.7kHz: –3.4dB, 10kHz: –5.4dB, 15kHz: –6.7dB |             |                  |
| Cassette   |             |                  |
| Wow & Flutter (pk. DIN wtd.)                                     |             | 0.13%            |
| Wow/Flutter (pk. DIN wtd.)                                       |             | 0.08%/0.24%      |
| Speed error  |             | +3.1%            |
| Typical Retail Price   |             | £250             |
| *synthesiser noise, see text                                     |             |                  |



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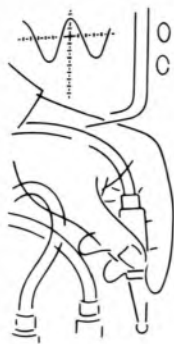
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# IN-CAR ENTERTAINMENT TECH TALK

*Our reviews of in-car players included complete laboratory analysis as well as thorough auditioning of each unit. Here Jason Kennedy and Norman McLeod explain the technical tests.*

## CASSETTE MEASUREMENTS

In order to playback a pre-recorded cassette without audible distortion, the player must be able to transport the tape over the head at a constant speed of 4.75 cms/second. If the mechanics of a player are poor, and/or the power supply is not very clean the result will be a slight jerking of the tape over the heads which can be heard as flutter.

If the capstan, pulling the tape across the head by pressing against a pinch wheel, is not perfectly straight and round, it will create short term speed fluctuations known as wow.

Peak DIN weighted tests were carried out for wow and flutter, both individually and as a combination. The results obtained for the various players are printed at the end of each review, but for comparison purposes a group average was calculated as follows: wow and flutter – 0.32 per cent; wow – 0.23 per cent; flutter – 0.44 per cent. Also included is an indication of absolute speed accuracy.

The noise modulation spectrogram was created by playing 3kHz test tone tape in each machine and passing the output to a spectrum analyser, albeit with less resolution than the similar test used in *Choice's* cassette deck reviews.

Out of interest a playback only frequency response graph was made with each unit to get an idea of the tonal balance that the player delivers to the loudspeaker when using prerecorded tapes. The majority of them came out showing considerable bass emphasis with fairly distinct treble roll-off, which although unsuitable for reasonably neutral domestic hi-fi loudspeakers is quite

appropriate for the majority of car speakers which are limited in bass output. At the high end of in-car entertainment there is now a trend towards good quality transducers from the likes of B&W, Infinity and KEF, but inevitably price tends to preclude their use with units such as those we've tested here.

## RADIO MEASUREMENTS

### Power output

The first test loads the receiver's amplifier section with a 40hm loudspeaker, using an oscilloscope to measure the peak-to-peak amplitude of the signal available across the speaker before visible clipping sets in.

Many dubious claims are often made for power output from car radios. Figures are often quoted for a 14.4V supply, 20 per cent above the nominal battery voltage, and for horrendous amounts of distortion.

Our figures are quoted for a more realistic 13.8V supply. Most of the receivers tested used a 'bridged' output stage, which in theory is capable of developing twice the battery supply voltage across the load. This would correspond to 27.6V peak to peak, or 23.8W. (Anyone claiming more than this for a bridged output stage without an inverter is fibbing!)

In practice, voltage losses and current limitations in the output stages are quite significant, and the most we recorded from a set was just over 15W. Single-ended output stages have a maximum theoretical power yield of just under 6W from a 13.8V supply, and in practice 3 or 4W is more realistic.

### Residual noise

Residual noise from the output stage can be audible in quiet

musical passages with the engine stopped, and so this is measured with a PPM in dB relative to 77mV and CCIR weighting (unity gain at 1kHz) with the volume control at minimum.

### Demodulation distortion

Distortion on AM was measured at 1kHz and 100Hz at 90 per cent modulation with a 30mV input. A rise in distortion at the bass end (first figure) indicates poor AGC loop design, and can make the sound very muddy and unpleasant, particularly with strong inputs.

FM distortion was measured with a 1kHz audio signal at 100 per cent modulation in mono mode (75kHz p-p deviation). The output signal was taken across the loudspeaker terminals, so any distortion in the audio output stage is included in the FM figure.

### AGC range/overload point

The AGC range is the range of input signal over which the AM audio output level is held level by automatic gain control to within 1dB. The overload point is the minimum signal which causes the receiver to distort, and figures of less than 100dB/ $\mu$ V will give problems close to powerful transmitters.

### Ultimate signal-to-noise ratio

The ultimate signal-to-noise ratio shows how good the S/N performance is when the signal is as strong as it ever needs to be. Figures are CCIR weighted, peak relative to 90 per cent modulation, and the signal strength required for a noise floor within 1dB of ultimate quieting is shown in microvolts.

It is interesting to note that in some cases the AM figures are better than the FM results, which in part reflects the wider bandwidth of FM responses.

### Useful sensitivity

Sensitivity figures relate to more modest S/N performances of 40dB on AM and 50dB on FM, mono and stereo. These are measured by varying the signal input while observing the noise floor. Various cunning mechanisms come into play to obscure stereo noise as the signal falls, but these lead to strange blurring of the stereo effect in weak signal areas. FM is probably better received in mono unless the signal is very reliable.

### Frequency responses

The significance of the frequency responses should be carefully noted. AM responses (with the exception of the 9kHz figure) are corrected for a double 50 $\mu$ s de-emphasis curve – 10dB down at 4.7kHz rel. 330Hz, which is felt to be an appropriate weighting for AM broadcasts. Most stations transmit a far-from-flat response these days to combat appalling receiver standards.

The ideal corrected response would be level (0dB) at 2.2 and 4.7kHz, while the 9kHz rejection figure should be as great as possible – at least 70dB down is not difficult to engineer. 9kHz is the AM 'intercarrier' frequency, and is heard as a whistle between stations at night unless carefully filtered out.

While AM standards suffer from a complete lack of standardisation, at least the FM curve is known in advance. However, many in-car receivers prefer to create a far from flat response, as can be seen from the figures. Like the AM response, the FM response is measured relative to 330Hz, keeping the reference frequency completely outside the pre-emphasis characteristic.

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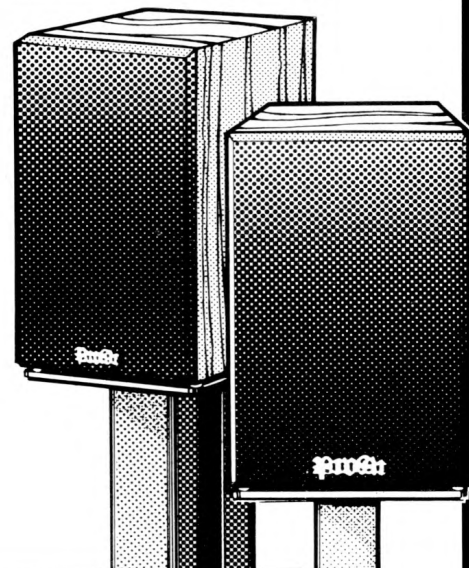
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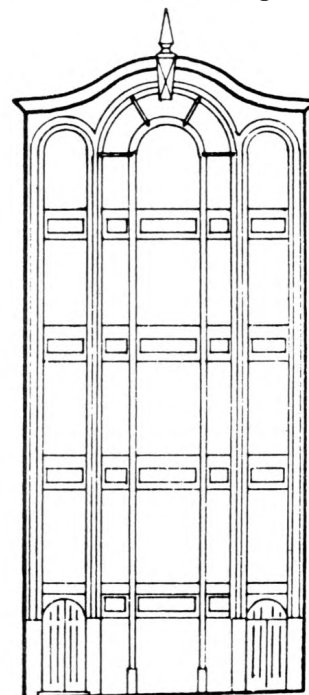
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# IN-CAR ENTERTAINMENT: CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS

*Jason Kennedy sums up this month's in-car players. Ten more machines are already on the test bench – reviews coming up in next month's issue.*

Listening to this selection of in-car music sources we were surprised at the variation in sound quality they delivered. If you took a group of hi-fi quality amplifiers in the same price band, the differences between them would be much more subtle. The in-car units tested this month did display certain consistencies, the most obvious being a tendency towards bass overkill – presumably to overcome the limitation of car speakers which on the whole have very limited low frequency extension.

All tuners had digital, switch operated tuning devices, which are fine if you're able to concentrate on the display, but manual tuning is almost impossible otherwise – the demise of the analogue knob and dial being missed in this respect. They do of course all have some form of automatic search tuning system which is handy once mastered, units with switchable sensitivity being particularly helpful. Some form of signal tracking would also have been a great help with regard to the varying signal strengths encountered on the road, but this may be asking a bit much at the price. A preset system is also a boon especially when it's possible to identify the buttons using tactile rather than visual information. Under the circumstances it's not asking the earth to have a machine that a blind person could operate.

The various anti-theft devices fitted to the more expensive models on test don't seem to take into account the likely mentality of your average car radio thief, who, unless well versed in the art, is unlikely to notice the little stickers advising of the security code system fitted to the machine. Especially, one supposes, as thieves are more likely to operate at night. The ability to slide the player into and out of the car would seem a much more effective system – assuming you remember to remove it, of

course.

The majority of the cassette players were sparsely equipped. This is good for ergonomics, but not so wonderful if you have a large collection of chrome or metal cassettes, as only a few machines had the facility to change equalisation – and only one did it automatically.

One feature many users may consider essential is some form of noise reduction system. Not all the units we tried incorporated this, though several did. These often unbranded devices proved quite worthwhile for the replay of Dolby encoded classical musicassettes, though home made rock tapes usually sounded better without – mainly due to the lack of quiet passages.

Variations in speed error were quite poor, a three per cent error on a £200 plus machine being unacceptable in our view. These are not just figures either; errors of over one-and-a-half per cent are easily detectable on familiar material.

## BEST BUYS

### **Goodmans GCE 229 (£150)**

Despite a rather weak performance in the lab, the 229 managed to sound quite good. It has a formidable array of features for the price, including Dolby NR, metal/chrome eq'ing and a music search system – which is a rarity.

## RECOMMENDATIONS

### **Philips DC-553 (£120)**

This relatively inexpensive Philips model is not particularly glamorous or that easy to use but it does give reasonable sound quality and turned in fair lab test results. However, its tonal balance may not suit some speakers.

### **Philips DC-680 (£180)**

With its clever anti-theft system the 680 is a reasonably sophisticated machine at the price. The cassette player sounded quite subtle, aided no doubt by the minimal speed error found on test. Its only shortcoming is limited power and

a horrid volume knob.

### **Pioneer KEH-5080B (£230)**

While not the most refined player on test, the 5080 is an attractive and powerful machine. Fitted with a security code anti-theft system and a noise reduction circuit, it had a relaxed 'west coast' sound that was quite seductive.

### **Alpine 7282L (£250)**

This was about the best machine in the bunch as far as sound quality goes and is extremely attractive to boot. Lab results weren't that good but show a reasonable amplifier which is this player's strength.

### **Clarion 946HP (£250)**

Another nicely built machine, the 946 has been well designed and gave an excellent FM performance and reasonable tape replay. AM, like most of the machines tested, was pretty poor but this was generally one of the better units on test.

### **Sansui RX-5100L (£250)**

There are several clever little gimmicks on this tuner which turned in a remarkable AM performance and won the day for our radio consultant. A worse than average speed error stood in the way of the cassette player's absolute sound quality, but this was hopefully a sample fault.

## COMING NEXT

Next month we will be investigating the following ten in-car units:

**Aiwa CT-23500YL** (£199)

**Blaupunkt Paris SQR48** (£253)

**Blaupunkt Windsor SQR38** (£275)

**Hitachi CSK 402** (£249)

**JVC RX-318** (£200)

**JVC RX-418** (£250)

**Nakamichi TD-400E/PA-300 II** (£450/£275)

**Panasonic CQ-497** (£117)

**Sharp RG-F816E** (£200)

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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 £150, 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, and future CD applications under development 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.

## 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 acrylic '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 new format. And considerable extra disc production capacity just coming on stream should help bring prices down somewhat.

From the general consumer's point of view, price will still be 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 '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 £200 and going up to around £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.

Keeping pace with the constant flow of new models appearing on the market is a full time job these days. The major Japanese manufacturers typically quote the product life cycle of a CD player as being just nine months – compared with two years for other system components such as amplifiers and tuners. Consequently, although it was only as recently as the May issue in which we reviewed in-depth some 40 CD players, we've had Alvin Gold (aided by Chris Bryant in the test lab) auditioning ten more machines. Some of these – like the Sony CDP337 and Onkyo DX2500 — are hot off the production lines, others (like Technics' SLP 770, for example) we've simply not got around to testing before. Five of these reviews are in this issue, the other five will be published next month, along with our conclusions and a round-up of the machines we currently rate as recommended.

Next month's reviews: Akai CD73, Kenwood DP660SG, Marantz CD75DX, NAD 5220, Philips CD373.

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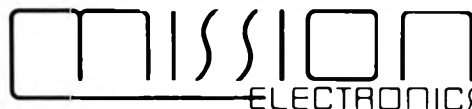
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# DENON DCD-600

HAYDEN LABORATORIES LTD., HAYDEN HOUSE, CHILTERN HILL, CHALFONT ST. PETER, BUCKS. TEL: (0753) 888447.



Second cheapest in the Denon hierarchy, this recently released full width model is one step up from the true budget area of the market. Although it's no great beauty – in fact styling is uninspired and stereotyped – it seeks to earn its keep in other ways.

The headphone socket lacks a volume control, and gives a rather high output, easily driving a handy pair of Sennheiser *HD480* headphones into distortion on peaks. This is going to be a problem with the majority of modern headphones, though not with earlier generations of lower sensitivity, high impedance Sennheisers.

The control systems held no surprises, but the display does, by including a full 20 track calendar style display in addition to the standard running time and track number indications and a range of spelt out function labels. The quality of the display doesn't compete with that on some more expensive players, but it's good enough and, after all, everything's there. There's even a sign that indicates the status of the de-emphasis circuit. For those who operate in lazy mode, the remote control provides access to all key functions, not excluding a random access track number keypad – tracks can only be summoned up sequentially on the player itself. The Denon has a programmable memory with a 15 track capacity.

## LAB REPORT

The *DCD-600* uses Denon's Super Linear Converter, designed to reduce zero cross distortion. It also has an extra sample and hold circuit to counter phase shifts at high frequencies, implicit in the use of a single Burr Brown PCM56P time shared 2x oversampled DAC.

Physically, the Denon is of basic plastic construction, though the manufacturer can point to some useful steps which have been taken to make the structure less micropho-

nic. Inside, a large single printed circuit board is loaded with mostly standard quality components.

Output impedance is a little high, which could have implications in systems with long interconnects or where (especially in the case of a power amplifier wired direct) the input load impedance is low. The player has substantial filter ripple, the de-emphasis circuit is not the most accurate of its kind, and noise levels are high by CD standards. Low level linearity is a full bit out at  $-90\text{dB}$ , though the required waveform, 'dithered' by system noise, is accurately reproduced. Distortion figures aren't the best either, but will serve, as will channel separation. Track access times are slow, but tracking ability on marked discs was surprisingly good which implies that the converter is at least working with a clean datastream.

## SOUND QUALITY

Musically the Denon promised much but delivered only in part. Bass power and definition were good, and the midband was sufficiently responsive and capable for some quite 'hot' recordings (the *Dies irae* section from Previn's *Britten War Requiem* on EMI is as good an example as any) to come across with some force and conviction, albeit with rather restricted stereo perspectives.

However, the Denon also had a faintly wooden quality, a problem most obviously associated with the treble. And unless it was so obvious you would be in danger of tripping over it, ambient cues tended to sound rather subtle – and occasionally not really sound much at all. A combination of factors seems to be responsible, including some loss of focus in the treble, but a more generalised lack of low level detail appears to be the prime culprit. At the price, it would have been reasonable to expect a little more, especially in view of Denon's mostly excellent

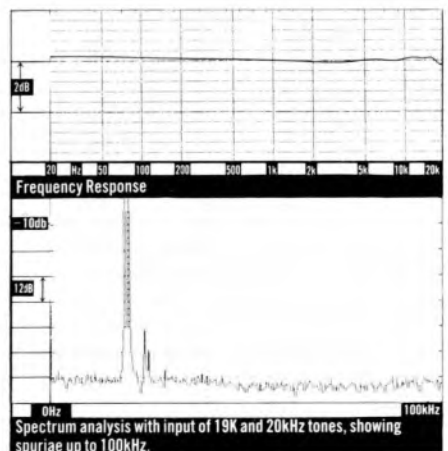
reputation in this field.

## CONCLUSIONS

The omens are good. Denon have a fine track record, and the *DCD-600* is a purposeful design, reasonably priced and attractively equipped. It's not without technical interest either but in the end sound quality, though far from unacceptable, doesn't shine – mainly because it is on the crude, uninformative side of neutral.

## TEST RESULTS

|  | 20Hz                          | 1kHz   | 20kHz   |
|--|-------------------------------|--------|---------|
| Channel balance  | 0.06dB                        | 0.07dB | 0.04dB  |
| Stereo separation  | 90dB                          | 89dB   | 80dB    |
| Channel phase difference                                 | 0°                            | 0°     | 2°      |
| Total harmonic dist, 0dB                                 | -92dB                         | -90dB  | -84dB   |
| Total harmonic dist, -10dB                               | —                             | -80dB  | —       |
| Total harmonic dist, -60dB                               | —                             | -37dB  | —       |
| Total harmonic dist, -80dB                               | —                             | -15dB  | —       |
| Intermodulation, 19kHz/20kHz, 0dB                        | —                             | —      | -81dB   |
| Intermodulation, 19kHz/20kHz, -10dB                      | —                             | —      | -91dB   |
| Frequency response, left channel                         | 0.18dB                        | 0      | -0.24dB |
| Frequency response, right channel                        | 0.18dB                        | 0      | -0.15dB |
| Signal-to-noise, 20Hz-20kHz unweighted                   | 94/97dB with/without emphasis |        |         |
| Signal-to-noise, CCIR/ARM, 1kHz ref                      | 88/90dB with/without emphasis |        |         |
| Output level, 0dB, left/right                            | 1.95V                         |        |         |
| Output impedance   | 1kohm                         |        |         |
| De-emphasis 1kHz, -0.23dB, 5kHz, -4.50dB, 16kHz, -9.07dB |                               |        |         |
| Track access time  | 4 secs                        |        |         |
| Error correction capability                              | >900µm gap, >800µm dot        |        |         |
| Mechanical noise   | low                           |        |         |
| Spuriae up to 100kHz                                     | -103dB                        |        |         |
| Resolution at -90dB                                      | -84.0dB/-83.1dB               |        |         |
| Headphone socket   | yes 100ohms                   |        |         |
| Dimensions (w x d x h)                                   | 43.4 x 32 x 9.7cm             |        |         |
| Estimated typical purchase price                         | £250                          |        |         |



# ONKYO DX-2500

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



Price is the story here. At £250 or even a little more, nobody would bat an eyelid at this player. But it costs only £200, and if measured solely against the features count would have few competitors...

The basics of the *DX-2500* are that it is a full size and well finished player with a multitude of (mostly) well disposed controls. The most important of them is a 11-digit keypad for random access track selection, a facility which is repeated on the remote control. Memory play is available for sequences of up to 16 tracks, and can be repeated at will. Headphones can be connected with the level adjustable by a volume control, and on the rear a digital output is fitted, providing an upgrade path in the future, for example by plugging into something like the Arcam *Black Box* outboard D-to-A converter.

The only part of the player that obviously betrays its price is the display, and even here the amount of data presented is not exactly minimal. Two clocks can be used to show various timings simultaneously, for example time from the start of the disc and from the start of the current track. Up to six tracks in a memorised sequence can be displayed along with various other items of status type data (play, etc), but the layout of the panel is mannered, the effect is gimmicky and to an extent its utility is suspect.

The player feels slick and well oiled, and is clearly well above prevailing standards of external build quality at this price. The laser servo and its associated transport is well sorted too, tracking ability being well above average. The remote control covers all normal facilities and can also control an Onkyo cassette deck.

## LAB REPORT

In technology terms, this is a basic player. It is built on a simple undamped pressed steel case, and has an alloy front panel. The trans-

port is equally unprepossessing, being based on pressed steel and plastic parts, albeit reasonably well decoupled. The circuit is contained on a single board with a modest shared power supply. The DAC is a Burr Brown PCM56P, time-shared with 2x oversampling rate using a Sony digital filter and very ordinary audio grade parts. The digital output is the solitary concession to luxury. The main audio output is inverting, so speaker polarity should be switched when making comparisons – about 95 per cent of players are non-inverting.

Distortion levels are higher than usual at all levels, and midband de-emphasis is incorrect. Linearity below –60dB is compressed, the result being an estimated sub-14-bit resolution, which is extremely poor. Intermodulation is poorer than the numbers suggest, and output filtering is anything but linear phase. Track access times are also poor.

## SOUND QUALITY

If low price and a super-abundance of features sounds like a sure-fire recipe for audio disaster, that's how I figured it too. I was wrong though, and the Onkyo's detractors are going to have to think again. For the most part, I was happy with the sound of this player.

Specifically, the Onkyo has a pleasing, euphonious character with a warm bass and an easy midband, relatively expansive stereo and the kind of open articulate feel that makes music sound comfortable from the outset. It sounds indefinably 'right' for most of the time, and that impression remained over the period allowed for the test – this despite the fact that many of the numbers were 'wrong'.

It is not unimprovable of course. The Onkyo is neither the most detailed nor the most dynamic CD player around, even at £200, and stereo imagery doesn't have quite

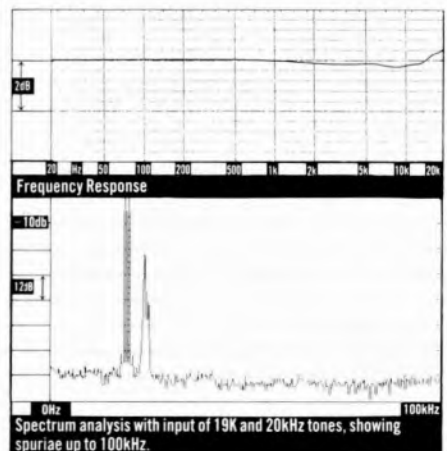
the natural breadth and depth of the very best. But I would judge that its failings are either innocuous or well concealed, and in a way that's the essence of good budget design.

## CONCLUSIONS

Clearly recommendable material, the Onkyo is well finished, even better equipped and is extremely pleasing to listen to, with music making of a type that will attract those who are generally uneasy with CD sound quality. To an extent, it could be said to err on the side of niceness rather than goodness.

## TEST RESULTS

|  | 20Hz                          | 1kHz   | 20kHz  |
|--|-------------------------------|--------|--------|
| Channel balance  | 0.07dB                        | 0.04dB | 0.31dB |
| Stereo separation  | 89dB                          | 89dB   | 76dB   |
| Channel phase difference                                 | 0°                            | 2°     | 42°    |
| Total harmonic dist, 0dB                                 | –85dB                         | –86dB  | –82dB  |
| Total harmonic dist, –10dB                               | —                             | –77dB  | —      |
| Total harmonic dist, –60dB                               | —                             | –27dB  | —      |
| Total harmonic dist, –80dB                               | —                             | –10dB  | —      |
| Intermodulation, 19kHz/20kHz, 0dB                        | —                             | —      | –87dB  |
| Intermodulation, 19kHz/20kHz, –10dB                      | —                             | —      | –92dB  |
| Frequency response,                                      |                               |        |        |
| left channel   | —                             | 0dB    | —      |
| Frequency response,                                      |                               |        |        |
| right channel  | —                             | 0dB    | —      |
| Signal-to-noise, 20Hz–20kHz unweighted                   | 94/99dB with/without emphasis |        |        |
| Signal-to-noise, CCIR/ARM, 1kHz ref                      | 87/93dB with/without emphasis |        |        |
| Output level, 0dB, left/right                            | 2/2V                          |        |        |
| Output impedance   | 370ohms                       |        |        |
| De-emphasis 1kHz, –0.55dB, 5kHz, –5.58dB, 16kHz, –9.03dB |                               |        |        |
| Track access time  | 4 secs                        |        |        |
| Error correction capability                              | >900µm gap, >800µm dot        |        |        |
| Mechanical noise   | yes, variable 100ohm          |        |        |
| Spuriae up to 100kHz                                     | –101dB                        |        |        |
| Resolution at –90dB                                      | –76.2dB/–76.5dB               |        |        |
| Headphone socket   | yes, variable 100ohm          |        |        |
| Dimensions (w x d x h)                                   | 43.5 x 36 x 9.0cm             |        |        |
| Estimated typical purchase price                         | £200                          |        |        |





# PIONEER PD-91

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

RECOMMENDED



An imposing player with an overhanging mains transformer at the back, Pioneer's flagship PD-91 is dressed to kill in very Japanese home market style – flowing typefaces on the fascia, wood end cheeks made to look like real plastic, shiny trim, and so on. Predictably well endowed, features include optical and electrical digital outputs, a 20 track calendar readout and 24 track memory, index search, random access track on the player and the remote handset, phrase repeat, auto-space, various tape editing aids and many, many more. There is no volume control on the output except on the headphone line, but it is possible to switch either digital or analogue sections off where appropriate, and also the display, in the cause of improved sonics.

## LAB REPORT

The PD-91 is a sophisticated beast. Starting with the physical aspects, real efforts have been made to reduce microphony and deal effectively with electrical and magnetic interference. The transformer is decoupled on anti-vibration mountings, while the chassis is copper plated and the base strengthened by being pressed in a honeycomb shape. The top plate is damped too. The 91 also has quite extensive internal screening, and transport metalwork is copper plated – as are the various screws used to hold the unit together. Although a single PCB is used for all circuit functions, the audio section is divided off with its own power supplies and mains output filter. The output sockets are of good quality, and optical coupling is used where appropriate.

The Pioneer is fitted with two new type Burr Brown PCM65P DACs, one per channel. Conversion is true 18-bit with 8x oversampling – not, it seems, the range switching type pseudo-18 bit conversion used elsewhere. The anti-aliasing filters are low order

analogue networks using high grade components rather than the higher order digital networks that inevitably adversely affect sound quality.

The DACs can be trimmed for linearity to improve low level resolution, which measures almost perfectly on both numerical and waveshape grounds. Other circuitry comes mainly from Pioneer and Sony. It's nearly all good stuff, with plenty of good quality electrolytics and film caps, including copper foil polystyrenes. Muting and de-emphasis are controlled by solid state switching, which on the face of it is not a wonderful idea.

Lab test results were state of the art with the exception of full level intermodulation which rates just plain 'good'. Output voltage is quite high but source impedance only moderate, which could affect installations using long interconnects. Tracking ability was good on the official test discs but less so on some naturally marked discs where the ability to stay with the music was if anything slightly below average.

## SOUND QUALITY

This is a player that actually lives up to its billing and genuinely is state of the art – or close to it. The player has tremendous class – it is poised, refined and gives a large, positive image of the music, but with first class control and definition. I was particularly impressed by the frequency extremes, the bass for its tunefulness and the ease with which individual bass lines could be followed, and the top end for its clarity and cleanliness. In a more general way, I was impressed by the sheer amount of detail that was pulled off disc, and the quality of organisation, the way the detail was presented and held together in a neutral and believable manner. The only obvious failing, if it can be called that, is in the upper midband which by the best standards was inclined to sound a

touch strident, or at least obvious.

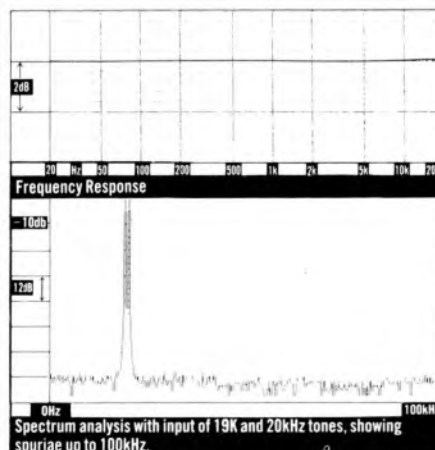
Shutting off the display had a surprisingly beneficial effect, reducing a trace of low frequency 'waffle' and sharpening up the precision with which the images of individual instruments were placed in the arc between the loudspeakers.

## CONCLUSIONS

This is a very impressive product, and a flagship CD player Pioneer can be proud of. It is even quite good value for money when judged on a sound-per-pound basis. Recommended.

## TEST RESULTS

|  | 20Hz                            | 1kHz   | 20kHz   |
|--|---------------------------------|--------|---------|
| Channel balance  | 0.20dB                          | 0.22dB | 0.14dB  |
| Stereo separation  | 130dB                           | 128dB  | 114dB   |
| Channel phase difference                                 | 0°                              | 0°     | 0°      |
| Total harmonic dist, 0dB                                 | -104dB                          | -102dB | -85dB   |
| Total harmonic dist, -10dB                               | —                               | -89dB  | —       |
| Total harmonic dist, -60dB                               | —                               | -49dB  | —       |
| Total harmonic dist, -80dB                               | —                               | -29dB  | —       |
| Intermodulation, 19kHz/20kHz, 0dB                        | —                               | —      | -87dB   |
| Intermodulation, 19kHz/20kHz, -10dB                      | —                               | —      | -93dB   |
| Frequency response,                                      |                                 |        |         |
| left channel   | -0.02dB                         | 0dB    | 0.02dB  |
| Frequency response,                                      |                                 |        |         |
| right channel  | -0.02dB                         | 0dB    | -0.04dB |
| Signal-to-noise, 20Hz-20kHz unweighted                   | 110/112dB with/without emphasis |        |         |
| Signal-to-noise, CCIR/ARM, 1kHz ref                      | 106/109dB with/without emphasis |        |         |
| Output level, 0dB, left/right                            | 2.31V                           |        |         |
| Output impedance   | 460ohms                         |        |         |
| De-emphasis 1kHz, -0.38dB; 5kHz, -4.52dB; 16kHz, -8.50dB |                                 |        |         |
| Track access time  | 1.5 secs                        |        |         |
| Error correction capability                              | >900µm gap, >800µm dot          |        |         |
| Mechanical noise   | very low                        |        |         |
| Spuriae up to 100kHz                                     | -106dB                          |        |         |
| Resolution at -90dB                                      | -90.2dB/90.1dB                  |        |         |
| Headphone socket   | yes, variable - 120ohm          |        |         |
| Dimensions (w x d x h)                                   | 46 x 43 x 12.6cm                |        |         |
| Estimated typical purchase price                         | £800                            |        |         |



# SONY CDP-337ESD

SONY UK LTD., SONY HOUSE, SOUTH STREET, STAINES, MIDDX. TEL: (0784) 67000.



In due course (or in other words, when the warehouse clears all existing stocks) the *CDP-337* will replace the *CDP-333*, and at a lower price. Broadly speaking it follows in the heels of the Recommended *333*, but there are important technical and operational differences.

Sony's first commercial CD player, the *CDP-101*, set the pattern for ergonomic design through to the present day. More recently, Sony have popularised the calendar style track display. And now, in the *CDP-337ESD*, Sony introduce some new ideas, based on Philips' FTS (Favourite Track Selection) feature, but extended with additional capabilities - much more powerful post editing of memory contents and a larger memory capacity - 8kbytes against Philips' 2kbytes.

One of these features allows 10 digit alpha-numeric labels to be assigned to individual discs, and with another, up to 6 index points can be programmed per disc, with play from any such point, or between two of them. Another feature, is nothing less than FTS itself, the ability to memorise sequences of up to 20 tracks per disc. All data is stored in semi-permanent memory. Up to 226 discs can be programmed, individual discs being automatically remembered on insertion.

The other features are as much as you'd expect from a modern upmarket machine, including calendar style displays, index search, random play and random track access, the latter both on the player and the remote control. Two analogue outputs are available, one wired through an analogue volume pot (generally better sounding than digital ones) which can be accessed from the remote control. Naturally the player is superbly built and disc handling is a dream.

## LAB REPORT

This is a 16-bit player with 8x oversampling.

The *337* uses not one but two Philips TDA1541 twin channel 16-bit DACs, presumably (it's difficult to tell from the bewildering Sony literature) to achieve the desired resolution not available from the TDA1541 used on its own and probably to eliminate zero cross distortion as well. But although the  $-90\text{dB}$  waveshape was quite good, and certainly better than Philips' norm, there was a substantial residual error of  $4\text{dB}$  at  $-90\text{dB}$ , corresponding to half a bit or so. De-emphasis and muting are relay controlled, and the op-amps are JRC5532s. There are many regulators liberally sprinkled around. The *337* has an excellent transport with a linear motor; panels have some damping and the main chassis is a variant of the G (Gibraltar) low resonance type.

On the face of it this is a well sorted design, with very good lab performance. Only linearity was slightly disappointing, the unit failing by half a bit or so to achieve 16-bit resolution. Distortion is well suppressed, and response shape is very well engineered with a just perceptible rolloff at the high end of the passband. Tracking performance is of a high order.

## SOUND QUALITY

A few months ago, the *CDP-337* would have been all but unbeatable the right side of £1000. However, its edge is narrower now, although even in today's competitive environment it can stake as good a claim as most at the price. The new player has the same basic attributes as its forebear, notably in the vivid, colourful tonal quality, open mouth presentation (almost literally on vocals) and its natural but articulate mid/top. Bass weight has been increased, however, and was sufficient to add a touch of heavy handedness with some music, at times only just stopping short of sounding muddled.

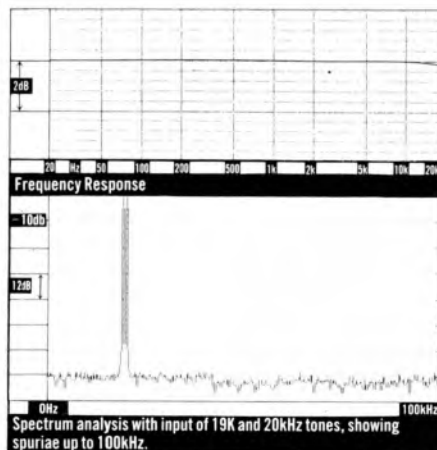
The treble area is laid back, even reticent, but the effect is natural and relaxed, the player as a whole having many of the more desirable attributes of a good analogue turntable. In common with other good players, imaging is explicit in depth as well as in width, and resolving power is high.

## CONCLUSIONS

The *337* is a first class up-market addition to the market, with some ingenious features. Battleship build and articulate sound are the main strengths though - Recommended.

## TEST RESULTS

|  | 20Hz                            | 1kHz    | 20kHz   |
|--|---------------------------------|---------|---------|
| Channel balance  | 0.04dB                          | 0.04dB  | 0.03dB  |
| Stereo separation  | 128dB                           | 121dB   | 108dB   |
| Channel phase difference                                 | 0°                              | 0°      | 0°      |
| Total harmonic dist, 0dB                                 | -99dB                           | -97dB   | -87dB   |
| Total harmonic dist, -10dB                               | —                               | -84dB   | —       |
| Total harmonic dist, -60dB                               | —                               | -43.5dB | —       |
| Total harmonic dist, -80dB                               | —                               | -23.5dB | —       |
| Intermodulation, 19kHz/20kHz, 0dB                        | —                               | —       | -96dB   |
| Intermodulation, 19kHz/20kHz, -10dB                      | —                               | —       | -90dB   |
| Frequency response, left channel                         | -0.02dB                         | 0dB     | -0.23dB |
| Frequency response, right channel                        | -0.22dB                         | 0dB     | -0.22dB |
| Signal-to-noise, 20Hz-20kHz unweighted                   | 113/113dB with/without emphasis |         |         |
| Signal-to-noise, CCIR/ARM, 1kHz ref                      | 108/110dB with/without emphasis |         |         |
| Output level, 0dB, left/right                            | 2.2V                            |         |         |
| Output impedance   | 200ohm                          |         |         |
| De-emphasis 1kHz, -0.34dB; 5kHz, -4.45dB; 16kHz, -9.28dB |                                 |         |         |
| Track access time  | 1.5 secs                        |         |         |
| Error correction capability                              | >900µm gap, >800µm dot          |         |         |
| Mechanical noise   | very low                        |         |         |
| Spuriae up to 100kHz                                     | -103dB                          |         |         |
| Resolution at -90dB                                      | -86dB/-86dB                     |         |         |
| Headphone socket   | yes, variable                   |         |         |
| Dimensions (w x d x h)                                   | 43 x 38 x 13cm                  |         |         |
| Estimated typical purchase price                         | £550                            |         |         |



# TECHNICS SL-P770

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RECOMMENDED



The SL-P770 is heir to much of the technology of the top Technics models, not least the 18-bit 4 DAC converter section (see Lab Report), but also in key visible features like the rotary cue wheel. This last is a refugee from the studio field: tracks can be cued and searched manually by spinning the cueing wheel, one complete rotation corresponding to either 25 seconds or one second playing time.

The fluorescent display is an enormously comprehensive panel with full bar graph level or play time meters, either of which can be shown alongside the time, track and calendar readouts. The only missing feature here is an 'off' switch! Extensive assistance to home tapers is retained in the 770 – just tell the player the length of tape you're using, and it will activate appropriate end of side measures. It will even search for the loudest section on disc. All the main features are accessible from the remote control and the disc tray now accommodates CD singles.

From the outside, differences between the 770 and the more expensive 990 are restricted to the omission from the former of minor features like Programme Memory Play when in timer mode. The real differences however, are largely concealed: the simpler anti-resonance measures, the elimination of separate transformers for the digital and analogue circuits and so on. The reduction in weight from 8.1 to 6.5kg tells more of the story than any other single statistic.

## LAB REPORT

The converter operates at 18-bit level except within 12dB of peak level, and with 4x oversampling. Technics are not claiming more than is available from disc (they conspicuously fail to note that correlated music signal can be retrieved well into noise on a correctly dithered disc), simply a closer approximation to true 16-bit resolution.

And that is how it turns out. The  $-90\text{dB}$  waveform is correctly resolved into a step function, consisting of the bottom three bits recorded on disc. The use of two DACs (from Burr Brown) per channel, one each for the positive and the negative going half cycles of the music waveform, helps eliminate 'zero cross' distortion where summing errors produce high order products akin to Class B crossover distortion. Digital filtering is used.

The 770 has a single board circuit which shows evidence of audiophile thinking in the choice of components and is very well made. Digital electrical and optical outputs are fitted.

Lab bench performance is exceptional all round, the only mild point of concern being de-emphasis which is slightly adrift. Output voltage is quite high and impedance low.

## SOUND QUALITY

Findings on audition largely mirrored Martin Colloms' earlier test of the SL-P990, which is rather more acceptable at the 770's price than with the more expensive model. The 770 is particularly good at reproducing low level information off disc. The clarity of the sound is always good and frequently breathtaking in the way very fine ambient detail is resolved and placed within a three dimensional context. Yet the player does have problems. It doesn't respond convincingly to recorded dynamics, tending to sound spatially flattened and tonally a little hard when the music becomes loud and complex. Fine detail then becomes difficult to follow, and stereo soundstaging polarises around the loudspeakers.

I don't wish to make too much of these failings. What is written is based on careful listening over protracted periods, and at worst were subtle effects and not always easy to identify. Most of the time the player was sweet and pure in tone, and the exquisite

sense of detail overrides many objections.

## CONCLUSIONS

The SL-P770 is extremely fully equipped and may prove daunting to some, though control grouping is mostly good. On sound quality, the supreme clarity of the design is partly offset by a rather cluttered presentation at the *fff* end of the dynamic range envelope. It would be perverse to withhold recommendation, but it is given with caution to a player that may be considered to lack essential balance.

## TEST RESULTS

|                                     | 20Hz           | 1kHz                  | 20kHz                  |
|-------------------------------------|----------------|-----------------------|------------------------|
| Channel balance                     | 0.04dB         | 0.01dB                | 0.02dB                 |
| Stereo separation                   | 120dB          | 116dB                 | 94/106dB               |
| Channel phase difference            | 0°             | 0°                    | 0°                     |
| Total harmonic dist, 0dB            | -95dB          | -95dB                 | -85dB                  |
| Total harmonic dist, -10dB          | —              | -85dB                 | —                      |
| Total harmonic dist, -60dB          | —              | -53dB                 | —                      |
| Total harmonic dist, -80dB          | —              | -25.5dB               | —                      |
| Intermodulation, 19kHz/20kHz, 0dB   | —              | —                     | -92dB                  |
| Intermodulation, 19kHz/20kHz, -10dB | —              | —                     | -101dB                 |
| Frequency response,                 |                |                       |                        |
| left channel                        | —              | 0                     | —                      |
| Frequency response,                 |                |                       |                        |
| right channel                       | —              | 0                     | —                      |
| Signal-to-noise, 20Hz-20kHz         |                |                       |                        |
| unweighted                          | 109/112dB      | with/without emphasis |                        |
| Signal-to-noise, CCIR/ARM,          |                |                       |                        |
| 1kHz ref                            | 107/108dB      | with/without emphasis |                        |
| Output level, 0dB, left/right       |                |                       | 2.6V                   |
| Output impedance                    |                |                       | 560ohms                |
| De-emphasis                         | 1kHz, -0.27dB; | 5kHz, -4.35dB;        | 16kHz, -8.77dB         |
| Track access time                   |                |                       | 2.0 secs               |
| Error correction capability         |                |                       | >900µm gap, >800µm dot |
| Mechanical noise                    |                |                       | very low               |
| Spuriae up to 100kHz                |                |                       | -103dB                 |
| Resolution at -90dB                 |                |                       | -89dB/-89dB            |
| Headphone socket                    |                |                       | yes, variable - 30ohm  |
| Dimensions (w x d x h)              |                |                       | 43 x 32.5 x 116cm      |
| Estimated typical purchase price    |                |                       | £350                   |



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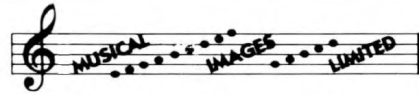
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# THE DIRECTORY

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 meritworthy. The Best Buy tag means that a product not only offers good sound quality but is reasonably priced as well. With source components a price

limit of approximately £300 is usually used as a guide. Recommended means that either the performance of a product is particularly good irrespective of price or, alternatively that a good value standard is achieved but overall attainment falls short of Best Buy classification. 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.

## 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<br>PRICE                             | LAB<br>SOUND                                     | COMMENTS  | FEATURES<br>ARM EFF. MASS  | VALUE    | BACK ISSUE<br>FULL REVIEW |
|---|--|---|--|----------|---------------------------|
| Acoustic Research EB101<br>£230           | Good<br>Good                                     | This genuine high fidelity product offers an impressive package at a competitive price  | Subchassis, manual, 13.5g  | BB       | 48                        |
| Alphason Sonata/HR-100S-MCS<br>£695/£412  | Excellent<br>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<br>£140                    | Good<br>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       | 55                        |
| Ariston RD60<br>£219                      | Good<br>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 RD40 Q/Enigma<br>£388             | Average +<br>Good                                | Worth considering for stylish appearance and decent performance, but undermined by RD60 in value for money terms  | Man/electronic, belt drive, subchassis, 11.5g                      |          | 48                        |
| Bang and Olufsen TX2<br>£288              | Average +<br>Average +                           | Fully automatic, it can interface to B&O's remote control system, is attractively styled and even sounds respectable!   | Automatic, belt drive, subchassis, 6g (B&O carts. only)            |          | 48 (Summary)              |
| Dual CS503-1<br>£125                      | Poor<br>Average                                  | Stated 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 CS5000<br>£200                       | Average<br>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<br>£4,000                    | Very Good<br>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<br>£279/£249 | Average<br>Good +                                | A gradual process of informed evolution and a sensibly designed arm combine to make this a good sounding middle of the road package. Well supported by dealers  | Manual subchassis motor with arm, belt drive, 14g                  | R        | 55                        |
| Kuzma Stabi t'able/Stogi arm<br>£575/£349 | Average +<br>Stabi: Good;<br>Stogi:<br>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<br>£345                         | Good +<br>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/Coil                   |

## TO ORDER BACK ISSUES OF HI-FI CHOICE SEE PAGE 50

# THE DIRECTORY

## INTEGRATED TURNTABLES

| NAME<br>PRICE                                 | LAB<br>SOUND           | COMMENTS   | FEATURES<br>ARM EFF. MASS  | VALUE | BACK ISSUE<br>FULL REVIEW |
|---|------------------------|--|--|-------|---------------------------|
| Linn Sodek/Ittok (Troika)<br>£509/£429 (£625) | Excellent<br>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<br>£300/£330 (Arm)           | Good+<br>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                   |
| NAD 5120<br>£90                               | Average<br>Average—    | Offering near hi-fi quality on a suspended sub-chassis deck fitted with an Ortofon OM10 cartridge can't be bad at this price   | Semi-automatic, subchassis, 9g   | BB    | 48                        |
| Oak/Moth<br>£175                              | Average—<br>Average—   | Despite the excellent Moth tonearm, motor vibration on the Oak makes for a sonically poor performer  | Solid, manual, 12g   |       | 48                        |
| Omega Point Silver/Black<br>£895/£295         | Good<br>Good+          | An awedly 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 'welle' | Manual, solid, belt drive, unipivot, 11g                                       |       | 55                        |
| Rega Planar 2<br>£135                         | Average+<br>Good       | A remarkable product at the price, surprisingly articulate and confident   | Integrated turntable, manual, 11.5g  | BB    | 48                        |
| Rega Planar 3<br>£188                         | Good<br>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                        |
| Revox B291<br>£759                            | Average—<br>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                        |
| Rotel RP-830<br>£160                          | Average<br>Average     | Reasonable sound, but nothing to get excited about. Bass quality not well integrated, but control OK, mid/top are fine   | Manual, integrated, belt drive, solid, inc cartridge                           | R     | 55                        |
| Source/Odyssey RP1<br>From £1,908             | 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 II<br>£199                          | Good+<br>Good          | Rating above average for its price the II sounded open and clear, if a bit soft in the bass  | Manual/electronic, belt drive, subchassis, 15g                                 | BB    | 48                        |
| Systemdek IIX<br>£199                         | Good+<br>Good          | The more conventional appearance of the IIX has made it popular, performing competently, but essentially sounding similar to the II  | Manual/electronic, subchassis, 15g   | BB    | 48                        |
| Technics SLBD-22<br>£90                       | Average—<br>Average—   | Not bad for the price and a great improvement on the L20, it performs reasonably when not stretched  | Semi automatic, solid plinth, electronic, 6g P-mount                           | R     | 48                        |
| Technics SL-DD33<br>£110                      | Average<br>Average     | As with the DD33 though better value   | Automatic, direct drive, solid plinth, 7.5g, P-mount                           | BB    | 48                        |
| Technics SL-L20<br>£115                       | Poor<br>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<br>£140                      | Average<br>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<br>£159                         | Average<br>Average     | Not impressive in the context of other Thorens models. The sound was considered lively if somewhat coarse and brash  | Electronic, solid plinth, 12.5g  |       | 48                        |
| Thorens TD166III<br>£179                      | Good<br>Good           | Old turntables never die, this revived 166 yet again takes its place near the top of its class   | Auto lift, subchassis, 7g  | BB    | 48                        |
| Thorens TD316<br>£219                         | Good<br>Good           | A competent, well built if not dynamic sounding machine, ably holding its own in its price category  | Electronic, subchassis, 4.5g   | R     | 48                        |
| Thorens TD320<br>£319                         | Good+<br>Good          | The top of the range and a solid performer providing a stable focused sound, and not critical of siting  | Electronic, subchassis, 7g (available without arm)                             | R     | 48                        |

## MOTOR UNITS

| NAME<br>PRICE                               | LAB<br>SOUND           | COMMENTS  | FEATURES  | VALUE | BACK ISSUE<br>FULL REVIEW |
|---|------------------------|---|---|-------|---------------------------|
| Ariston RD90 Superior<br>£900               | Good+<br>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<br>£2,560              | Good+<br>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<br>£2,350                   | Very Good<br>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                        |
| Logic Gemini<br>£700                        | Good<br>Average+       | Innovative twin-motor design but insufficiently developed. Rates good overall but sounds a bit slow and lacking authority   | Subchassis, electronic  |       | 48                        |
| Michell Synchro<br>£235                     | Good<br>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     | 55                        |
| Michell Gyrodec<br>£595                     | Good<br>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<br>£499                       | Average<br>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 only, belt drive subchassis, integral stand, 33 1/3rpm                 |       | 60                        |
| Oracle Delphi III<br>£1500                  | Very Good<br>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<br>£1955 | Very Good<br>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<br>£539                | Very Good<br>Very Good | A substantial improvement on its predecessor, the T00's new outboard power supply and motor gave a neutral sound with fine depth and detail   | Electronic, subchassis  | R     | 48/Coll                   |
| Roksan Xerxes<br>£595                       | Excellent<br>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     | This                      |
| SEE Revolver<br>£127                        | Average<br>Average     | Nicely balanced, but unimpressive timing and lightweight bass made this deck rather average for the price. Manufacturer has since made several changes, but not re-submitted for review | Manual, belt drive, solid plinth  |       | 48                        |
| Systemdek IV<br>£448                        | Good+<br>Good+         | Clarity and definition in the midrange and treble were outstanding. It was better for firm support; less happy on floor tables  | Electronic, belt drive subchassis   | R     | 43                        |
| Thorens TD160S Mk IV<br>£225                | Average<br>Average+    | Good value suspended sub-chassis turntable which doesn't need specialist setting up, and which performs consistently and well. Bass is a little over-warm                               | Manual, belt drive, subchassis motor unit                                     | R     | 55                        |
| Thorens TD521<br>£625                       | Average<br>Average+    | Nice product. Unexciting, rather undynamic and insubstantial sound quality, but facilities compensate   | Manual, belt, suspended motor unit, 78rpm, pitch control, 12" arm/16" records |       | 55                        |
| Townshend Rock<br>£450                      | Good<br>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, but dry balance                     | Manual, belt drive, solid, arm damping, various optional extras               | R     | 55                        |

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# THE DIRECTORY

## TONEARMS

| NAME<br>PRICE                 | LAB<br>SOUND           | COMMENTS  | ARM EFF. MAS    | VALUE | BACK ISSUE<br>FULL REVIEW |
|-------------------------------|------------------------|---|-----------------|-------|---------------------------|
| Airtangent II<br>£1998        | n/a<br>Excellent       | A complex but superbly built arm for high quality systems, giving excellent stereo and resolution                                       | 7.5g (vertical) | R     | 60                        |
| Alphason Opal<br>£110         | Good<br>Average        | This is a straightforward adequate sounding low cost arm, priced just above where it rightly belongs                                    | 10g             |       | 55                        |
| Alphason Delta<br>£165        | Good<br>Average+       | A highly competent design from Alphason gives good sound quality but with slight blurring and treble fizz                               | 16g             | R     | 48                        |
| Alphason Xenon<br>£210        | Good<br>Good+          | A trimmed down HR100S, the Xenon has inferior bearings and a simpler finish, but sounds crisp and coherent. Fits any Linn outout        | 12.75g          | R     | 55                        |
| Alphason HR100S<br>£395       | Good+<br>Very Good     | This S-shaped arm sounds smooth, but nevertheless reproduces transients with fine attack  | 10g             | R     | 48/Coil                   |
| Ariston Enigma<br>£99         | Average<br>Average+    | Good but not the best in its class: mid-band sounds a little uneven, treble a trifle "brash"  | 11.5g           |       | 48                        |
| Audio Technica AT1120<br>£132 | Good<br>Average+       | This low effective mass (5g) arm suits fairly high compliance MM cartridges, gives pleasant tonal balance with good stereo imagery      | 5g              |       | 35                        |
| Decca International<br>£49    | Average+<br>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<br>£960    | Good+<br>Good+         | One of the best sounding tonearms around, the linear tracking Eminent delivers impressive stereo imagery, focus and transparent sound   | 9g (vertical)   | R     | 48/Coil                   |
| Goldmund T3F arm<br>£3850     | Excellent<br>Excellent | This complex parallel tracker created an "ear-opening" experience when tested with a (since updated) Goldmund Studio turntable          | 16.5g           | R     | Coil 2                    |
| Grace G707<br>£299            | Good<br>Good+          | This venerable is still capable, if not competitive with modern alternatives  | 7g              |       | 48                        |
| Helius Orion 2<br>£490        | Very Good<br>Very Good | Very expensive but with a performance that merits recommendation  | 12g             | R     | 48                        |
| Linn LV Plus<br>£129          | Good+<br>Good          | The fixed headshell provides an improvement over the LVX resulting in better clarity, detail and punch                                  | 13g             | BB    | 48                        |
| Linn Ittok LVII<br>£429       | Very Good<br>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/Coil                   |
| Logic Datum 2<br>£230         | Very Good<br>Good+     | Rated sonically very good with fine depth focus and transparency, good air and life, albeit slightly 'untidy'                           | 15g             | R     | 48/Coil                   |
| Mission Mechanic<br>£700      | Good<br>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<br>£65               | Good<br>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<br>£90             | Good+<br>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                        |
| SME 3009 Series IIS<br>£156   | Good<br>Average+       | A simplified less flexible (as regards adjustment) Series III with a similarly 'soft' sonic character                                   | 5g              |       | 48                        |
| SME 3009 Series III<br>£216   | Good<br>Average+       | Comprehensively adjustable and very well made, suited to MM and high compliance MC cartridges   | 5g              |       | 48                        |
| SME 3009R<br>£272             | Average+<br>Average+   | A higher mass version of the Series III designed for low compliance MC cartridges   | 12g             |       | 48                        |
| SME Series IV<br>£675         | Excellent<br>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<br>£1138         | Excellent<br>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<br>£850    | Average<br>Good        | A unique parallel tracking arm that makes up for what it lacks sonically in its unusual appearance                                      | 3-4g            |       | 48                        |
| Well Tempered Arm<br>£545     | Good+<br>Good+         | The overall performance of this arm "grows" on the listener, justifying the possible mounting complications and radical styling         | 6.8g            | R     | 48/Coil                   |

## 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<br>PRICE            | LAB<br>SOUND         | COMMENTS   | ARM<br>AMP MATCHING             | VALUE | BACK ISSUE<br>FULL REVIEW |
|--------------------------|----------------------|--|---------------------------------|-------|---------------------------|
| A&R C77<br>£20           | Average+<br>Average+ | A sensible moving magnet package with good bounce at a competitive price   | 6-16g<br>Normal                 | BB    | 48                        |
| A&R E77Mg<br>£47         | Average<br>Average   | Our sample had a disappointing stylus, but gave a coherent, rich and laid back sound, with good 'scale'  | 3-8g<br>Normal                  | R     | 48                        |
| A&R P77Mg<br>£57         | Average+<br>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<br>Normal                  | R     | 48                        |
| ADC TRX1<br>£49.90       | Average<br>Average   | Sounding bright and "tinkly" but with a rich bass this model may endear itself to those who like canaries and gongs. Now quite competitively priced  | 6-15g<br>Normal                 |       | 38                        |
| ADC TRX II<br>£69.60     | Average<br>Average+  | Comments like "fiercely exciting" treble and "plummy" bass made this cartridge seem overpriced, though price reductions now make it more competitive | 6-15g<br>Normal                 |       | 38 (Summary)              |
| Audionote 102VDH<br>£795 | Good<br>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<br>Very low (transformer) |       | 43                        |
| Audioquest MC5<br>£200   | Average<br>Average   | Offers high-output benefits but the drooping frequency response and severe VTA error preclude recommendation   | 10-20g<br>Normal                |       | 54                        |

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# THE DIRECTORY

## CARTRIDGES

| NAME<br>PRICE                                | LAB<br>SOUND          | COMMENTS   | ARM<br>AMP MATCHING | VALUE | BACK ISSUE<br>FULL REVIEW |
|--|-----------------------|--|---------------------|-------|---------------------------|
| Audio Technica AT 105<br>£13.95              | Average<br>Average    | Tight budget people may enjoy this cartridge whose "overall performance was very good for the price"   | 6-16g<br>Normal     |       | 43                        |
| Audio Technica AT95E<br>£14.95               | Average—<br>Average   | Clear, dynamic if richly balanced, the magnetic '95E is a definite Best Buy  | 8-14g<br>Normal     | BB    | 48                        |
| Audio Technica AT 115E<br>£27.95             | Average<br>Average    | Clear and detailed sound quality although a bit on the "heavy" side. Sonically lagged the cheaper 110E!  | 5-16g<br>Normal     |       | 43                        |
| Audio Technica AT3200XE1<br>£42.95           | Average+<br>Average   | This high output MC sounds better than it looks, with a decent 'laid back' sound quality   | 6-18g<br>Normal     | R     | 43                        |
| Audio Technica ATF30CC<br>£70                | Good<br>Good          | Slight generator asymmetry but low overall distortion and broad arm matching, plus a lively balanced sound   | 8-18g<br>Low        | BB    | 54                        |
| Audio Technica AT 140ML<br>£99.95            | Average<br>Average    | Pricey product this. Prefers low-medium mass arms and low capacitance loading, and is sonically unremarkable   | 6-12g<br>Normal     |       | 43                        |
| Audio Technica ATF50CC<br>£100               | Average+<br>Good      | Decent output, good channel balance and a thoroughly refined sound sets the standard at £100   | 9-20g<br>Low        | BB    | 54                        |
| Audio Technica AT33ML<br>£238.95             | Average+<br>Good      | A little expensive but technically competent, and sonically pretty good; low output MC with rather garish gilt finish  | 6-16g<br>Low        |       | 43                        |
| Audio Technica ATOC7<br>£245                 | Good+<br>Good+        | Technically and subjectively this cartridge represents a new dawn for AT, in the twilight of analogue audio  | 6-13g<br>Low        | R     | 54                        |
| Audio Technica AT-0C9<br>£400                | Average+<br>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<br>Low        | R     | This                      |
| Azden YMTDVE<br>£12.50                       | Average<br>Average—   | A good tracker. Sounds rather bunched-up but not totally incoherent – for very basic systems only  | 5-15g<br>Normal     |       | 54                        |
| Azden GM1E<br>£30                            | Average—<br>Average—  | Of academic interest only, this high o/p mc is seriously flawed in sonic terms   | 8-18g<br>Low/normal |       | 54                        |
| Azden GMP5L<br>£99                           | Average+<br>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<br>Low        | R     | 54                        |
| B&O MMC5<br>£21                              | Average+<br>Average+  | Cheapest in the family – smooth treble and good focus, but the bass was left in the wings  | 5-15g<br>Normal     |       | 38 (Summary)              |
| B&O MMC4<br>£33                              | Good<br>Average+      | Solid and well balanced in the midrange, the '4 lacks bass impact  | 5-15g<br>Normal     |       | 48                        |
| B&O MMC3<br>£50                              | Good<br>Average       | Slightly "laid back" sound quality but a good performer for the price. Best suited to B&O equipment  | 5-15g<br>Normal     |       | 48                        |
| B&O MMC2<br>£75                              | Good<br>Average+      | Only a modest improvement on its cheaper brothers (and sisters)  | 5-15g<br>Normal     |       | 48                        |
| B&O MMC1<br>£97                              | Very Good<br>Good     | Great clarity and detail at high frequencies but a slightly plodding bass. It may appeal more to the classical enthusiast  | 5-13g<br>Normal     |       | 48                        |
| Cello Chorale<br>£799                        | Good<br>Very Good     | Looking like a piece of NASA gadgetry the Chorale's transparent treble delicacy was without equal. A serious audiophile choice   | 4-10g<br>Low o/p    | R     | 48/Coil                   |
| Clear Audio Gamma<br>£285                    | Average<br>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<br>Low        |       | 54                        |
| Clear Audio Delta<br>£450                    | Average+<br>Good      | Midway between the Gamma and exotic Pradikat, the Delta sounds like neither! Nevertheless, it delivers the goods   | 6-17g<br>Low        | R     | 54                        |
| Clear Audio Pradikat<br>£1225                | Average+<br>Very Good | Sounded absolutely glorious, creating a full sense of scale and a large well-focused soundstage – but watch for record wear  | 8-18g               |       | Coil                      |
| Clear Audio Accurate<br>£2,000               | Good<br>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<br>Low        | R     | 60                        |
| Denon DL110<br>£60                           | Good<br>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<br>Normal     | BB    | 48                        |
| Denon DL160<br>£80                           | Average+<br>Good      | Although listeners just preferred the 110 its brother here proved a twin in lab tests and is still "thoroughly competent"  | 6-16g<br>Low        |       | 43                        |
| Denon DL 103<br>£90                          | Average<br>Good       | This classic spherical stylus model gives a lively sound with powerful bass, and is popular in broadcast studios   | 6-16g<br>Low        | R     | 48                        |
| Dynavector DV-50X<br>£60                     | Good<br>Average       | A high-output MC model with impressive lab performance, but whose tip and sound quality both disappointed  | 6-14g<br>Normal     |       | 48                        |
| Dynavector DV10X IV<br>£60                   | Average<br>Average+   | Fine sounding and realistically priced, damping is recommended to ensure successful tracking ability   | 8-18g<br>Normal     | R     | 48                        |
| Dynavector DV23RS<br>£150                    | Average+<br>Good      | Sound quality was described as "shut-in", lacking energy and sparkle but with some "edginess" in high frequencies  | 10-22g<br>Low       |       | 28                        |
| Dynavector DV XX-1<br>£360                   | Good<br>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<br>Normal     |       | 60                        |
| Glanz MFG 110EX<br>£24                       | Average<br>Average    | A little bright but giving detailed bass and clear treble this was competitive at the price  | 6-16g<br>Normal     | R     | Systems                   |
| Glanz GMC20E<br>£129                         | Average<br>Average    | You could try haggling but we thought the makers of this number were demanding too much lucre for their product  | 3-6g<br>Low         |       | 48                        |
| Goldmund Clearaudio<br>£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<br>Low        |       | This                      |
| Goldring Epic<br>£18                         | Average—<br>Average   | An unpretentious "punchy" partner to a budget system, giving decent dynamics and focus   | 6-14g<br>Normal     | R     | 48                        |
| Goldring G1010<br>£34                        | Average<br>Average    | A bit fiddly to set-up but rewarding once accomplished. The big and bouncy sound belies its price. Sensitive to amp loading  | 10-20g<br>Normal    | BB    | 54                        |
| Goldring G1020<br>£49.95                     | Average+<br>Average—  | This one strutted finely onto stage but couldn't project to the "gods"   | 8-16g<br>Normal     |       | 43                        |
| Goldring G1040<br>£74.95                     | Average+<br>Average—  | High frequency extension was improved by the van den Hul tip, nice looking model – no great actress  | 8-16g<br>Normal     |       | 48                        |
| Goldring Eroica L<br>£91                     | Average<br>Average+   | Open and relaxed sounding, the L version is just that bit more refined than its high output brother  | 7-18g<br>Low        | R     | 54                        |
| Goldring Electro II<br>£135 complete         | Average<br>Average+   | A pretty decent allrounder that did not excel sufficiently to warrant recommendation   | 8-16g<br>Normal     |       | 43                        |
| Goldring Electro 11LZ Boron<br>£199 complete | Average<br>Average+   | Well balanced sound but lacking low frequency authority, midrange focus and "punch"  | 12-20g<br>Low       |       | 38 (Summary)              |

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| NAME<br>PRICE                       | LAB<br>SOUND           | COMMENTS  | ARM<br>AMP MATCHING        | VALUE | BACK ISSUE<br>FULL REVIEW |
|-------------------------------------|------------------------|---|----------------------------|-------|---------------------------|
| Grace F9E II<br>£240                | Good<br>Good           | For lively presentation, excellent separation and generally satisfactory sonic delivery – consider this model   | 5-10g<br>Normal            |       | 48                        |
| Grado XTE + 1<br>£20                | Average –<br>Average   | Bass and treble are a trifle coloured but the midband proved highly enjoyable. Ideal for budget systems   | 6-13g (damping)<br>Normal  | R     | 54                        |
| Grado XF3E +<br>£45                 | Average –<br>Average   | Downtilting balance disguises the brightness of this cartridge; bit of a mixed bag at this price  | 9-20g (damping)<br>Normal  |       | 54                        |
| Highphonic MCA3<br>£360             | Very Good<br>Good +    | Exquisitely crafted by a group of ex-Denon engineers, this superb tracker had a sweet and seductive (if rather bright) treble   | 5-12g<br>Low               |       | 43                        |
| Kiseki Blue Silver Spot<br>£395     | Average +<br>Good      | Solid performance from a very solid cartridge but lacks some of the magic of other Kisekis. Compliance too high   | 5-12g<br>Low               |       | 54                        |
| Kiseki Purpleheart Sapphire<br>£695 | Good +<br>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<br>Low               |       | Collection                |
| Kiseki Blackheart<br>£1595          | Good<br>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<br>Low               |       | 60                        |
| Kiseki Lapis Lazuli<br>£3500        | Good<br>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<br>Low               |       | 60                        |
| Koetsu Black K<br>£550              | Good +<br>Good +       | Impressive in scale and dynamics but with some criticism of bass muddling and high treble fizz. Listen before deciding  | 6-18g<br>Low               | R     | 48/Coil                   |
| Koetsu Red<br>£896                  | Good +<br>Very Good    | Named like a rare, and perhaps dangerous, little oriental fish this famous cartridge sounded "almost larger than life"  | 10-25g<br>Low              | R     | 48/Coil                   |
| Koetsu Red Signature<br>£1300       | Good<br>Excellent      | Technically this cartridge suffers no faults whilst on a subjective level it offers rare musical insight  | 10-21g<br>Low              | R     | 60                        |
| Linn Basik<br>£19.50                | Average –<br>Average   | This goes much further in delivering the goods than its price tag might indicate  | 6-14g<br>Normal            | BB    | 48/Systems                |
| Linn K9<br>£69                      | Average<br>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<br>Normal            | BB    | 48/Coil                   |
| Linn Asaka<br>£279                  | Good +<br>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<br>Low               | R     | 48/Coil                   |
| Linn Karma<br>£435                  | Very Good<br>Very Good | A specialist which is strongly recommended for Linn-based systems; results may be less predictable in more general application  | 9-18g<br>Low               | R     | 48/Coil                   |
| Linn Troika<br>£625                 | N/A<br>Very Good       | Ex-Karma users have been seen with glazed expressions indicating smug self-indulgence the morning after fitting a Troika  | 8-18g<br>Low               |       | Coil                      |
| London Maroon<br>£109               | Poor<br>Average +      | Utterly different from other cartridges, the Maroon combines Heaven and Hell with good bass and midband but poor top-end control  | 8-16g + damping<br>Normal  |       | 48                        |
| London Super Gold<br>£248           | Average –<br>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<br>Normal  | R     | 48/Coil                   |
| Madrigal Carnegie One<br>£685       | Average +<br>Good      | Looks like a duck but sounds much better, certainly worth auditioning. Compliance too high  | 5-11g<br>Low               |       | 54                        |
| Milltek Aurora<br>£198              | Good +<br>Good +       | An overall feeling of relaxed ease characterised this clear and atmospheric Kiseki-built cartridge  | 8-16g<br>Normal            | R     | 48/Coil                   |
| Milltek Olympia<br>£298             | Average +<br>Good +    | Warm and detailed sound – packs the punch of the best m-cs with high output as a bonus  | 12-20g (damping)<br>Normal | R     | 54                        |
| Mission 773HC<br>£150               | Good<br>Good           | A sufficiently well-balanced and competitively priced "old-timer" which still warrants recommendation   | 6-16g<br>Low               | R     | 38                        |
| Monster Alpha 2<br>£479             | Good<br>Good +         | In the final analysis this fine allrounder is insufficiently exceptional in any specific respect to justify fully its high price  | 6-14g<br>Low               |       | Collection                |
| NAD 9100<br>£12                     | Average –<br>Average   | Clearly a Best Buy model for rock music fans, opera and choral music lovers might do better to avoid its tracking (in)abilities   | 10-20g<br>Normal           | BB    | 38                        |
| NAD 9200<br>£26                     | Average –<br>Average – | Although competent in many respects, overall the 9200 must be considered an undistinguished contender   | 6-19g<br>Normal            |       | 28                        |
| Nagaoka mm4<br>£8                   | Average –<br>Average – | Clear punchy sound that delivers the rudiments of a good performance  | 6-16g<br>Normal            | R     | 54                        |
| Nagaoka MP10<br>£17                 | Average<br>Average     | High frequencies sounded "shut-in" with this spherical-stylus model, but mid and mass were energetic, bouncy and punchy   | 5-13g<br>Normal            | R     | 48                        |
| Nagaoka MP11 Boron<br>£38           | Average<br>Average +   | Responding well overall in PM's equipment and listening room, this model was mildly criticised for low level and dynamic limitations                                    | 5-13g<br>Normal            | BB    | 48                        |
| Nagaoka MP10SB<br>£40               | Average<br>Average +   | Stilton's mods have improved the fine detail resolution of this popular budget model  | 5-15g<br>Normal            | R     | 54                        |
| Nagaoka MP11 Gold<br>£45            | Average –<br>Average + | There were mild criticisms directed at most areas, but in general the sound was clear, open and even  | 3-8g<br>Normal             | R     | 48                        |
| Nagaoka MP11 Gold SB<br>£70         | Average –<br>Average   | Excessive price loading for a blob of aluminium   | 2-6g<br>Normal             |       | 54                        |
| Ortofon OM5E<br>£12                 | Average –<br>Average – | The OM10 is a hi-fi cartridge – the OM5E is not   | 5-16g<br>Normal            |       | 43                        |
| Ortofon VMS5E II<br>£14             | Average<br>Average     | Sound quality was thought fair for the price, though a little 'untidy'  | 8-18g<br>Normal            |       | 38 (Summary)              |
| Ortofon OM10<br>£15                 | Average<br>Average     | One of the leading "cheapies", this gives a fine level of sound quality for the price, with good matching compatibility   | 5-15g<br>Normal            | BB    | 48                        |
| Ortofon VMS 10E II<br>£21           | Average –<br>Average – | Some of its stablemates fared rather better, and showed less evidence of tracking problems to boot  | Normal                     |       | 38                        |
| Ortofon VMS20E II<br>£35            | Average<br>Average     | One of the most popular cartridges ever, sound quality was a bit laid-back and tracking could have been better  | 3-10g<br>Normal            |       | 48                        |
| Ortofon OM20<br>£45                 | Average<br>Average +   | This turned out to be the listening panel's favourite among Ortofon's moving magnet models  | 5-16g<br>Normal            | R     | 48                        |
| Ortofon X1<br>£50                   | Average<br>Average     | The cheaper X1 scored higher marks with our listening panel than the X3, but both were a disappointment   | 6-15g<br>Normal            |       | 48                        |
| Ortofon VMS30E II<br>£52            | Average +<br>Average   | Rather an old soldier in relation to turntable technology, it will perform undemandingly in demanding circumstances   | 5-13g<br>Normal            |       | 38                        |
| Ortofon MC10 Super<br>£65           | Average<br>Good        | "What a delightfully sweet-sounding cartridge this is..." we said   | 5-15g<br>Low               | BB    | 48                        |
| Ortofon OM40<br>£75                 | Average<br>Average +   | Highly competent engineering, secure tracking and decent sound quality are major strengths. But it's a little cold, a little polite                                     | 3-8g<br>Normal             |       | 48                        |

SUBSCRIBE TO HI-FI CHOICE SEE PAGE 50

# THE DIRECTORY

## CARTRIDGES

| NAME<br>PRICE                  | LAB<br>SOUND           | COMMENTS  | ARM<br>AMP MATCHING | VALUE | BACK ISSUE<br>FULL REVIEW |
|--------------------------------|------------------------|---|---------------------|-------|---------------------------|
| Ortofon X3<br>£75              | Average<br>Average     | A lack of bass power, definition and a "zitty" top end makes this competent but uninvolving   | 5-15g<br>Normal     |       | 48                        |
| Ortofon MC20 Super<br>£139     | Average +<br>Good +    | An "inviting" sound quality; polite rather than exciting it approaches much more expensive models, but does not better them                       | 6-15g<br>Low        | R     | 48/Coil                   |
| Ortofon MC30 Super<br>£199     | Very Good<br>Good +    | Beautifully engineered and well-balanced, it was slightly criticised as bland, though some may appreciate the lack of rough edges                 | 5-14g<br>Low        |       | Coil                      |
| Ortofon MC3000<br>£800         | Good<br>Excellent      | Quite simply, the most accurate transcription device yet created – not one for the faint hearted  | 6-16g<br>V. Low     | R     | 60                        |
| RATA RP20<br>£22               | Average –<br>Average   | Good integration, a clear dynamic midrange and the beginnings of fine stereo imagery merits clear recommendation                                  | 6-14g               | R     | 48                        |
| RATA RP40<br>£44               | Average<br>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<br>Normal     | R     | 48                        |
| RATA RP70<br>£77*              | Average<br>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<br>Normal     |       | 43                        |
| Rega RB100<br>£38              | Average<br>Average +   | Remarkable mechanical performance in the right system context, but "try before you buy"   | 5-12g<br>Normal     | R     | 48                        |
| Shure M92E<br>£15              | Average –<br>Average   | Though lacking depth, the overall sound quality was competent, but treble was not its forte   | 10-15g<br>Normal    |       | 43                        |
| Shure M99E<br>£26              | Average –<br>Average – | Sister to the 92E this is a solid but not particularly exciting cartridge   | 5-10g<br>Normal     |       | 38 (Summary)              |
| Shure ME75ED<br>£24            | Average<br>Average –   | Rather bright and splashy in the high frequencies but nevertheless a competent model  | 5-10g<br>Normal     |       | 38                        |
| Shure M104E<br>£32             | Average –<br>Average   | Capable in many ways, but giving no substantial improvement over the 92E in our view  | 5-15g<br>Normal     |       | 38                        |
| Shure ME97HE<br>£44            | Average<br>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<br>Normal     | R     | 48                        |
| Shure M105E<br>£45             | Average<br>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<br>Normal     |       | 38 (Summary)              |
| Shure M110HE<br>£55            | Average<br>Average     | Sound quality was thought eminently presentable, but not exciting; smooth clear high frequencies, but a loss of bass definition                   | 5-10g<br>Normal     |       | 38 (Summary)              |
| Shure M111HE<br>£67            | Average<br>Average     | Early reviews of this cartridge complained principally of the price – which has since come down   | 5-10g<br>Normal     |       | 38 (Summary)              |
| Shure ML120HE<br>£95           | Average +<br>Average + | Quite decent sound quality and a generally fine balanced performance  | 6-18g<br>Normal     |       | 48                        |
| Shure ML140HE<br>£120          | Average +<br>Good      | Qualitatively the treble of this well-balanced moving magnet model was a match for many moving coil cartridges                                    | 6-16g<br>Normal     |       | 43                        |
| Shure V15 VMR<br>£195          | Good<br>Average +      | Initial listening gave promising results, but extended familiarity gave the feeling of a lack of energy and a "shut-in" sound                     | 5-12g<br>Normal     |       | 38                        |
| Shure Ultra 500<br>£452        | Good<br>Good           | There was no doubting the accomplishments of what could well be the finest moving magnet cartridge around   | 6-14g<br>Normal     |       | 48                        |
| Supex SM100E<br>£115           | Average<br>Average +   | Delivers as much musical information as many moving coils – the bass in particular having an attractive bounce                                    | 6-15g<br>Normal     |       | 38                        |
| Supex SD900IV<br>£350          | Average +<br>Good +    | The 900 is an inherently fine cartridge, but despite a recent update it is beginning to show its age  | 10-18g<br>Low       |       | 48/Coil                   |
| Supex SD901IV<br>£375          | Average +<br>Good +    | This high output model delivered sufficient subjective and objective performance, plus good compatibility, to justify its price tag               | 8-18g<br>Normal     | R     | 48                        |
| Supex SDX2000<br>£651 L £721 H | Good<br>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 top designs                   | 6-16g<br>Either     |       | 48                        |
| Van Den Hul MC10<br>£699       | Good<br>Good +         | A neutral balanced performer giving transparent midrange, fine depth and focus with firm extended bass. Gosh!                                     | 5-10g<br>Low        | R     | 60                        |
| Van Den Hul MC One<br>£799     | Good<br>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<br>Low        | 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<br>PRICE                     | LAB<br>SOUND           | COMMENTS  | FEATURES                                   | VALUE | BACK ISSUE<br>FULL REVIEW |
|-----------------------------------|------------------------|---|--|-------|---------------------------|
| A&R Arcam Alpha<br>£150           | Average +<br>Fair      | This good all-rounder sounds musical if slightly softened. Good build and presentation  | 5 inputs hdhp MM/MC tone controls<br>30W   | R     | 50                        |
| A&R Arcam Delta 90<br>£330        | Good<br>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<br>£649 pr.      | Good +<br>Good +       | Unusually styled transistor monoblok power amplifiers reintroduced with improved performance and sound quality. Needs good warm-up for best sweetness and clarity | 40W<br>Power amp only                      | R     | 56                        |
| Audio Research SP9<br>£1700       | Very Good<br>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 SP8<br>£1998       | Very Good<br>Good +    | The sound from this valve pre-amp was good enough to do justice to the finest ancillaries   | 5 inputs MM                                | R     | 39                        |
| Audio Research M100<br>£2850 each | Good +<br>Excellent    | These high end valve monoblok power amps justify their cost by providing near state of the art sound quality. Our reviewer was so excited he bought them          | 100W                                       | R     | 60                        |
| Audio Research SP11 II<br>£5350   | Very Good<br>Excellent | Current state of the valve pre-amp art. A reference point   | Straight line MM/MC Disc + phase<br>invert | R     | 60                        |

# THE DIRECTORY

## AMPLIFIERS

| NAME<br>PRICE                                  | LAB<br>SOUND                  | COMMENTS   | FEATURES                                      | VALUE | BACK ISSUE<br>FULL REVIEW |
|--|-------------------------------|--|---|-------|---------------------------|
| <b>Audiolab 8000C</b><br>£300                  | Very Good<br>Good+            | Bettering the high standard set by the integrated 8000A this pre-amp sounds more tidy and refined, if a little clinical and cold   | 5 inputs MM/MC Disc hdph tone controls        | R     | 50                        |
| <b>Audiolab 8000A</b><br>£325                  | Very Good<br>Good+            | A strong contender using high grade circuitry and providing good sound quality on all inputs. Hard to fault at the price   | 5 inputs MM/MC disc 50W hdph tone controls    | BB    | 50                        |
| <b>Audiolab 8000P</b><br>£465                  | Very Good<br>Good+            | A gutsy performer providing high levels into both 8 and 4ohm loads. A power amp to keep the competition worried  | 100W  | R     | 50                        |
| <b>Beard 506</b><br>£1195                      | Good+<br>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                                | R     | 50                        |
| <b>Beard M70</b><br>£1995 pair                 | Good<br>Good+                 | A substantial British monoblok power amplifier, but not a great deal more impressive than the P35 at half the price  | 70W   | R     | 50                        |
| <b>Burmester 838</b><br>£1490                  | Very Good<br>Good             | A disc-only minimalist pre-amp, strong points include excellent build, extreme neutrality, dry clean bass and notably sharp stereo focusing  | MC only, MM option                            |       | Collection                |
| <b>Burmester 846</b><br>£1599                  | Very Good<br>Good+            | Usually coupled with the 838 this high-level pre-amp provides many and versatile input facilities  | 6 inputs                                      | R     | Collection                |
| <b>Burmester 850</b><br>£3995                  | Good+<br>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  | R     | Collection                |
| <b>Cambridge Audio P40</b><br>£200             | Good<br>Good+                 | A very fine sounding integrated amplifier with simple facilities and MC cartridge capability   | 5 inputs 40W MM/MC straight line              | BB    | 50                        |
| <b>Cambridge Audio C75</b><br>£279             | Good+<br>Good+                | Whilst not quite on par with its A75 companion this pre-amp provided excellent stereo imagery but was a touch "heavy" in character   | MM/MC disc                                    | R     | 50                        |
| <b>Cambridge Audio A75</b><br>£299             | Very Good<br>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                        |
| <b>Cello Audio Suite</b><br>£5280              | Excellent<br>V Good/Excellent | Cello's pre-amp represents a whole new ball game in flexibility and sound quality (or war of attrition on your wallet)   | Optional inputs MC etc                        | R     | 50                        |
| <b>Conrad Johnson PV7</b><br>£799              | Very Good<br>Good             | This beautifully finished quality preamplifier performed well, delivering a musically relaxed sound though not offering especial value for money   | 5 inputs, MM disc                             |       | 57                        |
| <b>Conrad Johnson MV50</b><br>£1795            | Good+<br>Good+                | Coupled with the PV5, this CJ power amp performed well on audition   | 50W   | R     | Coll                      |
| <b>Conrad Johnson PV5</b><br>£2010             | Good+<br>Good+                | The PV5 is a classy sounding valve pre-amp, and natural partner to the MV50  | 5 inputs MM                                   | R     | Coll                      |
| <b>Conrad Johnson Motif MC-8</b><br>£2500      | Very Good<br>Very Good        | A cheaper alternative to the '77, this pre-amp is an undoubted success in maintaining the Motif sound but does not compare on sound quality  | MM/MC   | R     | 50                        |
| <b>Conrad Johnson Premier Three</b><br>£3775   | Good+<br>Very Good            | The Three is a musically accurate and graceful pre-amp which proved versatile on a wide range of inputs  | 5 inputs MM/MC                                |       | Coll                      |
| <b>Conrad Johnson Premier Four</b><br>£3900    | Good+<br>Very Good            | Ambience was the Four's forte – this power amp proved exceptionally revealing of instrumental locations  | 100W  |       | Coll                      |
| <b>Copland Pre and power amps</b><br>£649 each | Good+<br>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                        |
| <b>Counterpoint SA7</b><br>£747                | Average+<br>Good              | Simple valve Californian pre-amp offering inspiring transparency for the price   | 4 inputs straight line MM/MC                  | R     | Coll                      |
| <b>Counterpoint SA12</b><br>£1250              | Good+<br>Good+                | A real power-house power amp, beefy and load-tolerant although like the SA7 a trifle untidy at frequency extremes  | 100W  | R     | Coll                      |
| <b>Creek 4040</b><br>£145                      | Average+<br>Fair              | This simple integrated model had a controversial sound, liked by some, plus an acceptable lab performance  | 4 inputs MM 12W                               | R     | 50                        |
| <b>Creek CAS 4140</b><br>£219                  | Good+<br>Good                 | Redesigned for '88, this is a fine allrounder with good moving-coil input, plain presentation  | 40W MM/MC 3 line inputs                       | BB    | 56                        |
| <b>Croft Micro</b><br>£150                     | Average+<br>Good              | A real upsetter, this excellent valve pre-amp put the cat among the pigeons proving good sounds can be made at budget price levels   | 4 inputs MM straight line                     | R     | Coll                      |
| <b>Croft Super Micro A</b><br>£500             | Average+<br>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                        |
| <b>Croft Series IV(S)</b><br>£730              | Good<br>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                        |
| <b>Croft Series IVSA</b><br>£1000              | Good<br>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                        |
| <b>DBX CX3/DX3</b><br>£1500                    | Good<br>Fairly Good           | Versatile separates majoring on 4-channel surround sound and high power. Garish presentation and unexceptional sound   | 125W MM/MC 7 inputs, tone, 4-channel surround |       | 56                        |
| <b>Deltec DPA 100S</b><br>£2200                | Very Good<br>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                        |
| <b>Denon POA-6600</b><br>£1,000/pair           | Excellent<br>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                        |
| <b>DNM 3</b><br>£1000                          | Good+<br>Good+                | The DNM3 in its acrylic case is a remarkably revealing and neutral state of the art pre-amp  | 5 inputs MM/MC twin vol controls              | R     | 44                        |
| <b>E.A.R.</b><br>£3,000/pair                   | Very Good<br>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                        |
| <b>Exposure VIII</b><br>£340                   | Very Good<br>Good+            | This power amplifier created a good impression of speed and power, but was a trifle fierce in the treble   | 50W   | R     | 50                        |
| <b>Exposure VII</b><br>£360                    | Very Good<br>Good             | A double mono transistor pre-amp with a notably dynamic and punchy character, though not suited to all tastes  | 3 inputs MM/MC                                | R     | 50                        |
| <b>Goldmund Mimesis 6</b><br>£2,500            | Very Good<br>Excellent        | 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                        |
| <b>Grant G60AMS</b><br>£948 pr                 | Good<br>Very Good             | This neat and compact 60W valve monoblok gave good sound on the 8ohm tap, better still on 4ohms. The midrange was particularly natural   | 60W monoblocks 41 8ohms                       | R     | 57                        |
| <b>Haffler DH120 kit form</b><br>£295          | Fair                          | We didn't build one; see below   | 60W   |       | 44                        |
| <b>Haffler DH120 assembled</b><br>£360         | Very Good<br>Fair             | Sound quality results were decent enough, but this power amp won't set the world on fire at this price   | 60W   |       | 44                        |
| <b>Harman Kardon 640 Vxi</b><br>£225           | Good+<br>Good                 | Moderately priced but built to HK's high standards; good value and good load tolerance   | 50W MM, 5 line inputs tone controls           | R     | 56                        |
| <b>Harman Kardon 655 Vxi</b><br>£449           | Very Good<br>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        | R     | 56                        |
| <b>Harman Kardon PM665Vxi</b><br>£699          | Good<br>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                        |

TO ORDER BACK ISSUES OF HI-FI CHOICE SEE PAGE 50

# Uxbridge Audio

A W Kleiser  
Uxbridge Audio Ltd  
278 High Street  
Uxbridge  
Middlesex  
UB8 1LX  
England

Dear Sir/Madam

During the arduous, daunting, and sometimes hazardous task of system selection, both myself and my wife were most impressed with the professionalism and patience of your sales staff. I cannot, unfortunately, recall the sales assistants' name, but his selling and presentation skills, as well as his perseverance were superb. How else can I explain the fact that after a 3 hour demonstration it was my wife talking me into buying a Linn Sondek!

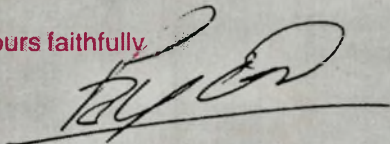
Your after sales service was also impressive. The system was delivered to my (previous) home in Camberley and was set up with courtesy, patience and understanding.

I was originally recommended to your shop by a friend. How right that advice has turned out to be. I in return commend your staff and their attitude and would have no hesitation in making an unequivocal recommendation should the situation ever arise. Indeed, please feel free to quote from part or all of this letter.

Once again my sincere thanks for the way in which you have handled this matter. I wish your company continued success in the future.

Best regards from a very satisfied customer.

Yours faithfully,



Paul R Byatt

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# THE DIRECTORY

## AMPLIFIERS

| NAME<br>PRICE                            | LAB<br>SOUND            | COMMENTS   | FEATURES   | VALUE | BACK ISSUE<br>FULL REVIEW |
|--|-------------------------|--|--|-------|---------------------------|
| Hitachi HA007<br>£150                    | Good+<br>Fair           | Decent but unexceptional performance and sound quality, plus good facilities, represents a worthwhile improvement from Hitachi   | 75W MM 6 line inputs tone controls                     |       | 56                        |
| Inca Tech Dirk<br>£215                   | Good+<br>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<br>£345               | Good+<br>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                        |
| Jadis JP30/JA30<br>£6,790                | Fair<br>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                        |
| Krell PAM5<br>£1589                      | Very Good<br>Good       | Superbly built, the Pam 5 pre-amp gave good definition throughout the frequency range with a good measure of excitement  | MM/MC  | R     | 50                        |
| Krell KSA50 Mk2<br>£2540                 | Very Good<br>Good+      | This power amp still holds its own with good depth and ambience and excellent stereo focus   | 50W  | R     | 50                        |
| Le Tube<br>£585                          | Good+<br>Good           | If moving coil sensitivity is not required then this pre-amplifier will offer a clean view with very good stereo   | 3 inputs MM  | R     | 44                        |
| LFD<br>£2,500+                           | Very Good<br>Excellent  | Can set the subjective standards that others merely aspire to, but this outstanding if unconventional multi-box pre-amp needs careful matching to ancillary components (cartridge, power amp)  | MC (with care), passive line extra                     | R     | 60                        |
| Linn LK2<br>£440                         | Good+<br>Fair           | This pre-amp was marginally less successful than the LK1 but the pair (of Linn's) worked well together and are well worth considering. Recent modifications as yet unchecked   | 5 inputs MM/MC   | *     | 50                        |
| Linn LK1<br>£459                         | Good+<br>Fair           | A durable tolerant power amp, setting a respectable standard on both lab test and audition   | 60W  |       | 50                        |
| Linn Stratos<br>£999                     | Good+<br>Good           | Facing strong competition in the UK this New Zealand pre-/power combination gives good sound quality... but not exceptional at the price   | 120W MM/MC straight line                               |       | 50                        |
| Luxman LV100<br>£205                     | Good<br>Fair            | Nicely finished modern integrated amplifier, generally competent though not exceptional  | 45W MM 4 line inputs tone controls                     |       | 56                        |
| Luxman LV-105<br>£599                    | Very Good<br>Fair       | Superbly finished and built, in a sense this model managed to capture the "valve" sound with an easy musical quality and good bass register  | 85W MM/MC  |       | 44                        |
| Luxman LV105u<br>£685                    | Very Good<br>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<br>£1995 pair                | Good+ +<br>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   | R     | 50                        |
| Marantz PM35<br>£170                     | Very Good<br>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                  | R     | 56                        |
| Marantz PM45<br>£200                     | Good+<br>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                                | R     | 50                        |
| Marantz PM94<br>£1,000                   | Very Good<br>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<br>£550/£395 each       | Very Good<br>Good+      | A fine pre-amp 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     | 56                        |
| Mission Cyrus One<br>£150                | Good<br>Good            | A reference standard amplifier for its price category the Cyrus 1 attained a high sonic standard. A stylish neutral performer  | 5 inputs MM - medium MC 30W straight line              | BB    | 50                        |
| Mission Cyrus Two<br>£300                | Good+<br>Good+          | A significant improvement on the already competent 'One', the 'Two remained neutral and confident over the whole frequency range   | 50W 5 inputs MM/MC Disc straight line                  | BB    | 50                        |
| Mission Cyrus Two with PSX<br>£500       | Good+<br>Good+          | Although making the 'Two more powerful, the PSX power supply does not offer significantly better sound quality   | A power supply, see above                              |       | 50                        |
| Musical Fidelity A1<br>£249              | Good<br>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<br>£299            | Very Good<br>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    | 56                        |
| Musical Fidelity A100<br>£439            | Good+<br>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     | 56                        |
| Musical Fidelity Pre 3/P140<br>£299/£299 | Very Good<br>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 P170<br>£499            | Very Good<br>Very Good  | Acquitted itself well, later samples showing steadily increasing refinements   | 85W  | R     | 50                        |
| Musical Fidelity MVT Mk 3<br>£1199       | Very Good<br>Excellent  | The MVT pre-amp was "simply a knockout in its class", providing competition for £2000-plus amplifier systems   | MM/MC 5 inputs   | R     | 50                        |
| Musical Fidelity P270<br>£1199           | Very Good<br>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<br>£2,000           | Very Good<br>Excellent  | Soundwise this pre-amp puts Musical Fidelity on terms with much more expensive exotics, with top class transparency, focus and dynamics  | MM/MC, phase invert                                    | R     | 60                        |
| Musical Fidelity A370<br>£2199           | Very Good<br>Excellent  | Arguably the finest sounding power-amplifier manufactured in the UK  | 185W   | R     | 50                        |
| NAD 3020e<br>£110                        | Good<br>Fair            | A little light in balance and "weight" but superior to run-of-the-mill budget amplifiers   | 20W MM/MC 4 inputs                                     | BB    | 50                        |
| NAD 2200<br>£339                         | Good+ +<br>Fair         | Not recommended on grounds of sound quality, but worth serious consideration for its exceptional power output  | 100W   |       | 44                        |
| Naim NAIT 2<br>£322                      | Average+<br>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<br>£560-c£8,000           | Very Good<br>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 CA7E/PA7E<br>£2500/£1700       | Very good<br>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                        |
| Nikko NA700<br>£189                      | Good+ +<br>Poor         | Disappointing sound quality at an above budget price. Inescapably old fashioned  | 60W MM/MC 4 line inputs tone filters                   |       | 56                        |
| Nuance<br>£795                           | Very Good<br>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  | R     | 50                        |
| Orell SA-040<br>£359                     | Good<br>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                        |
| Perreux SA3<br>£690                      | Very Good<br>Fair       | This exotic New Zealand-built pre-amp did not really offer the sort of sound quality expected at the price   | 4 inputs MM/MC   |       | 44                        |

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

# THE DIRECTORY

## AMPLIFIERS

| NAME<br>PRICE                     | LAB<br>SOUND                | COMMENTS  | FEATURES                                     | VALUE | BACK ISSUE<br>FULL REVIEW |
|-----------------------------------|-----------------------------|---|--|-------|---------------------------|
| Perreux 1850<br>£990              | Very Good<br>Fair           | This power amp's musical qualities were disappointing, though powerfully delivered. Build and finish were exemplary.  | 180W   |       | 44                        |
| Philips FA860<br>£249             | Very Good<br>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<br>£299             | Very Good<br>Good           | Japanese built high quality integrated model with versatile features and plenty of power.   | 110W MM/MC 8 line inputs tone controls       |       | 56                        |
| Plenitude<br>£795                 | Very Good<br>Good+          | Rating slightly higher than its Nuance partner, this power amp provided a tight, controlled sound, if somewhat lacking in scale and grace.  | 80W  | R     | 50                        |
| PS Audio PS4.5<br>£696            | Very Good<br>Good+          | Sonically the best pre-amp in its class, but on the bright side, so purchasers should try it with their prospective equipment.  | MM/MC  | R     | 50                        |
| QED A240 CD II<br>£169            | Good+<br>Good               | Latest 240CD is fine value for CD and has competent MM disc input as well.  | 45W MM 5 line inputs straight line           | BB    | 56                        |
| QED A240 SA II<br>£219            | Good+ +<br>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    | 56                        |
| Quad 34<br>£269                   | Very Good<br>Fair           | This well-built durable pre-amp 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<br>£329                  | Very Good<br>Fair           | Not an impressive power amp but easy on the ear if not pushed and very reliable.  | 100W   |       | 44                        |
| Quicksilver Mono<br>£1495         | Good<br>Good+               | Moderately improved for '88 the Quicksilver still rates well despite up and coming competition.   | 60W monoblok 4/8ohms                         |       | 57                        |
| Radford SC25<br>£598              | Very Good<br>Very Good      | A very fair price for a solid, well built valve pre-amp, combining good allround performance and a neutral sound.   | 5 inputs, MM, straight line                  | R     | 57                        |
| Radford MA75<br>£776              | Good<br>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<br>£897 | Good<br>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 B250<br>£1128               | Very Good<br>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<br>£987       | Very Good<br>Good           | Here is a neat little power amp (60W) you can fit and forget; it proved most satisfying over long listening sessions.   | 60W  |       | Coll                      |
| Rotel RA820A<br>£130              | Good+ +<br>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<br>£140/£119       | Good+ +<br>Good+            | Quality separate pre- and power amplifiers at near budget integrated amplifier prices. A notable achievement.   | 60W MM/MC 4 line inputs tone controls        | R     | 56                        |
| Rotel RA870BX<br>£325             | Very Good<br>Good+          | A powerful blockbuster with solid and well focused sound, good versatility and fine load tolerance.   | 85W MM/MC 7 line inputs tone controls        | BB    | 56                        |
| Sansui AU-G11X<br>£139            | Good+<br>Fair               | Tightly controlled if somewhat congested and lightweight, but a reasonable compromise between features and sound quality.   | 25W MM hdph 4 inputs, tone controls          | R     | 50                        |
| Sansui AU-G30X<br>£199            | Good+ +<br>Fair             | A very competent amp with no glaring faults, performing well with phono and compact disc inputs.  | 4 inputs MM 45W tone controls Hdph           | R     | 50                        |
| Sansui B2301<br>£1880             | Very Good<br>Good+          | Rating better than the pre-amp and providing generous power output, this amp could not be considered competitive in its price bracket.  | 300W   |       | Coll                      |
| Sansui C2301<br>£2306             | Excellent<br>Good           | Sansui's flagship pre-amp did not really rate well given its price, but is not short on features.   | All facilities                               |       | Coll                      |
| Sony TAF 500ES<br>£349            | Good+<br>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<br>£500            | Good+ +<br>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+<br>£1,200              | Very Good<br>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<br>£1713            | Very Good<br>Good           | A "muscle" power amp, capable of impressive levels into difficult loads while remaining quite subtle and revealing.   | 250W   | R     | 50                        |
| Vacuum State FVP<br>£999          | Good<br>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                        |
| VTL Minimal<br>£340               | Good<br>Good                | Providing decent sound quality at the price, this basic pre-amp sounded open and clear in mid and treble.   | 3 inputs (MM)                                | R     | 50                        |
| VTL 50W<br>£1150                  | Good<br>Good                | Rating good on audition and providing complementary characteristics to the minimal pre-amp, these monoblok power amps sounded a little slow and unrevealing.                              | 50W 3 inputs                                 | R     | 50                        |
| Yamaha AX-300<br>£120             | Good<br>Fair                | A lively and dynamic performer, offering a credible if bright sound at a competitive price.   | 30W hdph tone controls (MM)                  | R     | 50                        |
| Yamaha AX500<br>£200              | Very Good<br>Good           | A well built versatile performer with generous power, decent sound.   | 90W MM/MC 5 line inputs tone, var loudness   | R     | 56                        |
| YBA 2 pre & pwr<br>£1395/£1695    | Good+ +<br>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                        |

## 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<br>PRICE                | LAB<br>SOUND        | COMMENTS  | SIZE<br>PLACEMENT                            | SENSITIVITY<br>BASS FROM | VALUE | BACK ISSUE<br>FULL REVIEW |
|-------------------------------|---------------------|---|--|--------------------------|-------|---------------------------|
| Acoustic Energy AE1<br>£700   | Good<br>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 Research BBX<br>£100 | Average<br>Average- | Spacious and informative sound quality with bass well under control. Not that there was much bass to control. | 40 x 25 x 19cm shelf or 50cm stand near wall | 88.5dB/W 70Hz            |       | 53                        |

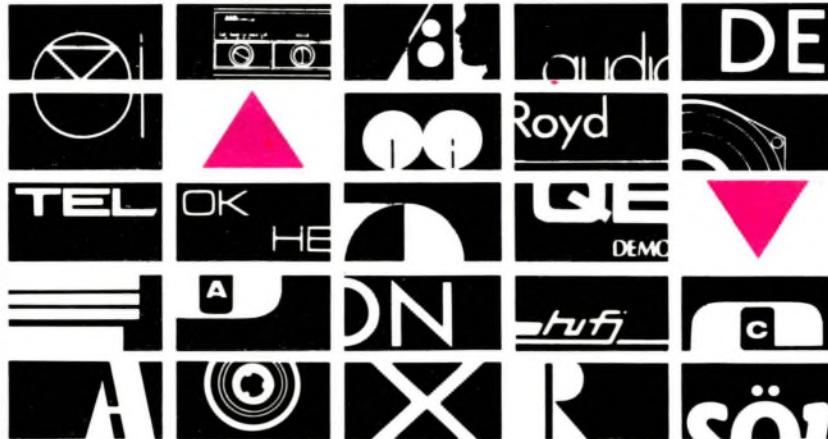


# THE DIRECTORY

## LOUDSPEAKERS

| MODEL<br>PRICE                      | LAB<br>SOUND                   | COMMENTS  | SIZE<br>PLACEMENT   | SENSITIVITY<br>BASS FROM | VALUE | BACK ISSUE<br>FULL REVIEW |
|-------------------------------------|--------------------------------|---|---|--------------------------|-------|---------------------------|
| Acoustic Research 22BX<br>£170      | Average<br>Average             | Basically well-engineered with sound "nicely out of the box". Some of our "ears" were less enthusiastic   | 47 x 29 x 22cm shelf or 50cm stand near wall                    | 89.5dB/W<br>55Hz         | R     | 59                        |
| Acoustic Research 35BX<br>£200      | Average<br>Average—            | This is quite loud, with some boom and fizz, making it suitable for supine strummers of imaginary guitars perhaps   | 58 x 26 x 27cm free space on 40cm stands                        | 91.5dB/W<br>55Hz         |       | 53                        |
| Apogee Caliper<br>£2550             | n/a<br>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<br>n/a               | R     | 60                        |
| Apogee Scintilla<br>£4990           | Good<br>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<br>20Hz           | R     | 46/Coll                   |
| A&R Arcam Three<br>£150             | Average+<br>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<br>95Hz         |       | 53                        |
| A&R Arcam Two<br>£250               | Good<br>Average                | Most things to most men this compact is unlikely to disappoint with its lively "bally" character though lacking weight... a bit   | 38 x 23 x 28cm near wall shelf or 40cm stands                   | 88dB/W<br>55Hz           |       | 59                        |
| A&R Arcam One Plus<br>£359          | Good<br>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<br>60Hz         |       | 59                        |
| Ariston QLN1<br>£350                | Very Good<br>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<br>65Hz         | R     | 59                        |
| Audiostatic ES200<br>£1495          | Average<br>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<br>45Hz           |       | 46                        |
| Audiostatic ES300<br>£1995          | Average+<br>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                                     | 82.5dB/W<br>30Hz         |       | 46                        |
| Avance 120<br>£279                  | Average+<br>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<br>60Hz         |       | 53                        |
| Avance Concrete 2000<br>£970        | Below Average<br>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<br>40Hz           |       | 60                        |
| B&W DM100i<br>£120                  | Good<br>Average                | Not universally liked on test, but the consensus view was positive, the best feature being a sharp, clear midband.  | 37 x 22 x 22.6cm free space or near wall, on stand              | 88.5dB/W<br>90Hz         | R     | 59                        |
| B&W DM110i<br>£159                  | Very Good<br>Average           | On the hard and aggressive side of neutral, this is a tactile and detailed transducer that remains musically adequate, if slightly intrusive.   | 48.7 x 26 x 27cm open space, on high stands                     | 88dB/W<br>60Hz           |       | 59                        |
| B&W LM1 Mk II<br>£249               | Average+<br>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<br>80Hz         | *     | 31                        |
| B&W DM1600<br>£399                  | Good<br>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<br>60Hz         | R     | 59                        |
| B&W Matrix 1E<br>£595               | Very Good<br>Good+             | There was enthusiastic and consistent praise for these speakers with their "revealing and seductive" midrange   | 41 x 23 x 32cm free space on 35cm stands                        | 85.5dB/W<br>50Hz         | R     | 53                        |
| BBC LS3/5A<br>£265                  | Good+<br>Average+              | As a working tool it does its job but as a piece of value engineering this old-timer is beginning to look a bit grey-haired (recent revisions not yet checked)  | 30 x 18.5 x 16cm open stands, free space                        | 81.5dB/W<br>57Hz         | R*    | Coll                      |
| BLQ Q2<br>£275                      | Average—<br>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<br>70Hz         |       | 59                        |
| Bose 6.2<br>£570                    | Average—<br>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<br>55Hz         |       | 59                        |
| Boston A4011<br>£110                | Average<br>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<br>63Hz         |       | 41                        |
| Castle Clyde<br>£139                | Average+<br>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<br>64Hz         | R     | 46                        |
| Castle Durham<br>£189               | Average+<br>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<br>67Hz           | R     | 46                        |
| Castle Pembroke<br>£289             | Good<br>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<br>46Hz           | R     | 31                        |
| Celestion DL6 Series Two<br>£149    | Good<br>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<br>65Hz           |       | 59                        |
| Celestion DL8<br>£199               | Very Good<br>Good              | A refined middle market speaker has a smooth but slightly dull quality, with good definition and deep, if slightly lumpy bass   | 50 x 27.5 x 27.8cm open, stands                                 | 87.5dB/W<br>60Hz         | R     | 59                        |
| Celestion SL6S<br>£350              | Good<br>Good+                  | A luxury compact speaker that gives a sweet treble sound with fine musical detail   | 37.5 x 20 x 27cm free space on 40cm stands                      | 84dB/W<br>50Hz           | R     | 46                        |
| Celestion SL600<br>£700             | Good<br>Good++                 | Clearly an exceptional device in terms of design and transparent sound quality. An audiophile miniature   | 37 x 20 x 25.5cm open space on stands                           | 83dB/W<br>55Hz           | R     | 46                        |
| Celestion SL700<br>£1220 inc stands | Good<br>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<br>45Hz           |       | 60                        |
| Celestion 6000<br>£1470             | Very Good<br>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<br>£349               | Average—<br>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<br>75Hz         |       | 59                        |
| dbx 1000<br>£450                    | Average—<br>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<br>60Hz           |       | 59                        |
| Diesis Sapphire<br>£329             | Average—<br>Average—           | Poor driver integration and a thin, wispy treble spoil this otherwise neat and solid sounding design  | 35 x 20 x 24cm open space, on high stands                       | 90dB/W<br>90Hz           |       | 59                        |
| Gale 301<br>£279                    | Average<br>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<br>63Hz         |       | 46                        |
| Gale GS402<br>£699                  | Average+<br>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<br>48Hz           | *     | 46                        |
| Goodmans Maxim Two<br>£80           | Average+<br>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<br>85Hz           | BB    | 59                        |

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## RUSS SHAKES THE FOUNDATIONS

### Torlyte Loudspeaker Stands

Although it can be demonstrated that increasing the mass of a loudspeaker seems to work - increasing stability and damping the higher resonances of the metal - it actually stores energy, giving a resonant 'hump' in the low frequency response of the loudspeaker. This 'hump' limits the natural low frequency extension of the speaker and gives a tight, powerful - but totally false - one-note thump to the bass. The effects of stored energy do not stop there, however; mid-range and treble are degraded in clarity, smoothness and information. The three-dimensional stereo image suffers badly, too.

Torlyte is uniquely well-suited to the requirements of the ideal loudspeaker stand. It is ultra light, very rigid and has very good acoustic properties. Torlyte has a low-Q, broadband response, which means that it stores little energy at any one frequency. As a result, it contributes almost no character of its own to the overall response of the system.

The benefits of a well designed Torlyte loudspeaker stand are, of course, the inverse of my criticism of the heavy, metal stand: Clean, extended, tuneful bass; more 'real' mid-range (especially on voices); less 'splash' but more information in the treble (cymbals reveal this well); and the improvement in three dimensional stereo image. The front-to-back depth snaps into focus, the recording acoustic becomes much easier to discern and those subtle, mysterious sounds made by the musicians can be identified with ease.

You may well ask why it has taken us so long to develop this obvious Torlyte product. A very good question to which there are two main answers: First and foremost, we've been rather preoccupied with setting up our own Torlyte manufacturing facility here on our Torlyte manufacturing facility here on our own premises, and putting all our existing products into production again (and improving them in the process). Second, my early work (pre-Torlyte days) on metal and metal stands clearly seemed to show that loading them with mass improved their performance. This 'experience' prejudiced me to put a low priority on Torlyte speaker stand development. The first prototype Torlyte speaker stand quickly showed me that I had been

barking up the wrong tree! I am suitably embarrassed and must wholeheartedly thank those Torlyte enthusiasts who pushed me into getting on with the job.

The stands are available in a number of sizes, including a version specifically designed for the Linn Isobarik. All have spiked top platforms, with three adjustable, carpet-piercing spikes on the base. The stands are, like all Torlyte products, supplied flat-pack for home assembly and finished in a fetching hue of matt black.



| model | height | top(w x d) | price |
|-------|--------|------------|-------|
| TSS2  | 230mm  | 380 x 415  | £199  |
| TSS3  | 360mm  | 240 x 210  | £185  |
| TSS4  | 450mm  | 200 x 200  | £190  |
| TSS6  | 600mm  | 200 x 200  | £195  |
| TSS7  | 700mm  | 200 x 200  | £199  |

TSS2 is designed for the Linn Isobarik with a base platform 500mm wide x 520mm deep. All others have bases 400 wide x 300 deep. All sizes in mm. Prices include VAT. Other sizes available to special order.

The loudspeaker stands are available now, direct or through retailers. Stop Press: London Torlyte Centre at KJ Leisuresound, 26 New Cavendish Street (01 486 8262).

Russ Andrews Turntable Accessories Ltd, Edge Bank House, Skelsmergh, Kendal, Cumbria, LA8 9AS. Telephone: 0539 83247.

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## THE DIRECTORY

## LOUDSPEAKERS

| MODEL<br>PRICE                                       | LAB<br>SOUND           | COMMENTS  | SIZE<br>PLACEMENT                                    | SENSITIVITY<br>BASS FROM | VALUE | BACK ISSUE<br>FULL REVIEW |
|--|------------------------|---|--|--------------------------|-------|---------------------------|
| <b>Goodmans Point 3</b><br>£90                       | Average+<br>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/<br>high stand near wall        | 90dB/W<br>80Hz           | R     | 53                        |
| <b>Goodmans Point 7</b><br>£170                      | Average+<br>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<br>space on 35cm stand           | 89dB/W<br>47Hz           |       | 53                        |
| <b>Harbeth HL Compact</b><br>From £455               | Very Good<br>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<br>space, on high stands     | 87.5dB/W<br>65Hz         |       | 59                        |
| <b>Harbeth HL Mk 4</b><br>£525                       | Good+<br>Good+         | Recommended for the good results at its price, and only mildly criticised for heavy bass and a mild 'chestiness'  | 64 x 33 x 30cm free<br>space on 46cm stand           | 89dB/W<br>40Hz           | R     | 53                        |
| <b>Heybrook Point Five</b><br>£139                   | Average<br>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<br>wall, on matching stands    | 86dB/W<br>65Hz           |       | 59                        |
| <b>Heybrook HB1</b><br>£189                          | Good<br>Average+       | No longer an over-bright character, a strikingly clear sound and fine transient performance now merits recommendation   | 47 x 29 x 23cm<br>on stands near wall                | 88dB/W<br>61Hz           | R     | 46                        |
| <b>Infinity RS2000</b><br>£130                       | Good<br>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<br>rear wall, high stands    | 91.5dB/W<br>70Hz         | BB    | 59                        |
| <b>JBL TLX-3 GI</b><br>£130                          | Average<br>Average-    | Lively and punchy but also untidy this little speaker may have deviated from the Hi-Fi standard but cannot be summarily dismissed   | 38 x 25.5 x 22cm free<br>space on stands             | 87dB/W<br>55Hz           |       | 46                        |
| <b>JBL L 60T</b><br>£399                             | Good+<br>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<br>stands or floor            | 88dB/W<br>40Hz           | R     | 46                        |
| <b>JBL L80T</b><br>£549                              | Good<br>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<br>floorstanding, open space    | 89.5dB/W<br>55Hz         |       | 59                        |
| <b>JBL 18Ti</b><br>£599                              | Good+<br>Good          | Beautifully engineered, well finished miniature with many good points, but unexceptional overall. Try the cheaper L20T  | 34 x 24 x 22.5cm 50cm<br>from wall on rigid stands   | 85.5dB/W<br>53Hz         |       | 46                        |
| <b>JBL 250Ti</b><br>£3599                            | Good+<br>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<br>space on floor               | 89dB/W<br>53Hz           |       | 46                        |
| <b>JPW P1</b><br>£125                                | Good<br>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<br>space on stands           | 89dB/W<br>60Hz           | R     | 59                        |
| <b>JPW AP2</b><br>£145                               | Good<br>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<br>from wall on 45cm stands      | 89dB/W<br>65Hz           | R     | 53                        |
| <b>JPW AP3</b><br>£210                               | Good<br>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<br>wall on stands              | 90dB/W<br>57Hz           | R     | 46                        |
| <b>KEF C10</b><br>£94                                | Good<br>Average-       | Listening panelists gave this a poor reception  | 30 x 20.5 x 17.5cm<br>stand near wall                | 87.5dB/W<br>75Hz         |       | 46                        |
| <b>KEF C40</b><br>£209                               | Average+<br>Average-   | Criticisms were made of a lack of fine detail and loss of depth and transparency, but it could handle power well  | 65 x 24.5 x 26.5cm free<br>space on stands           | 90dB/W<br>55Hz           |       | 46                        |
| <b>KEF R102</b><br>£335                              | Very Good<br>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<br>wall or open on stands    | 89.5dB/W<br>60Hz         | R     | 59                        |
| <b>KEF 103/3</b><br>£630                             | Good+<br>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<br>stands free space         | 90-95dB/W<br>35Hz        |       | 53                        |
| <b>KEF 104/2 (inc KUBE equaliser)</b><br>£806 (£905) | Very Good<br>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<br>standing in free space     | 92dB/W<br>50Hz           | R     | 60                        |
| <b>KEF 107</b><br>£1890                              | Very Good<br>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<br>floor in free space          | 87.5dB/W<br>20Hz         | R     | 60                        |
| <b>Linn Nexus</b><br>£350                            | Good<br>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<br>rear wall supplied stands | 89dB/W<br>60Hz           |       | 59                        |
| <b>Linn Sara</b><br>£729                             | Good<br>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<br>stand mounting, near wall      | 88dB/W<br>50Hz           | R     | 60                        |
| <b>Linn Isobarik</b><br>£1695                        | Good<br>Good+ +        | Exceptional capabilities in the dynamic range and bass performance; demands serious consideration as a state of the art contender, but odd stereo   | 76 x 33 x 41.5cm low<br>stands against rear wall     |                          | R*    | Coll II                   |
| <b>Magneplanar SMGa</b><br>£697                      | Average-<br>Average    | Tonally 'rich', in the right room it proved a satisfactory musical experience   | 122 x 48 x 4.5cm on floor<br>clear of wall           | 85dB/W<br>56Hz           |       | 46                        |
| <b>Magneplanar MG2.5R</b><br>£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<br>Open space                       | 83-85dB/W<br>35Hz        |       | 60                        |
| <b>Magneplanar MG11a</b><br>£2650                    | Good<br>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<br>clear of walls               | 84-86dB/W<br>35Hz        |       | 46                        |
| <b>Marantz LD20 DMS</b><br>£150                      | Average<br>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<br>space on 45cm stands          | 86.5dB/W<br>55Hz         |       | 53                        |
| <b>MB Quart 390</b><br>£499                          | Below Average<br>Poor  | An aggressive, messy sounding design whose uncouthness undermines the positive level of detail  | 52 x 31 x 30.5cm open<br>space, on stands            | 89.5dB/W<br>60Hz         |       | 59                        |
| <b>Meridian M30</b><br>£725                          | Average+<br>Average    | Pricy but easy on the ears and worth considering especially where space is at a premium   | 38.5 x 18 x 32cm free<br>space on stands             | Active<br>40Hz           |       | 46                        |
| <b>Mission 70 II</b><br>£110                         | Good<br>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<br>stands or shelf near wall       | 89dB/W<br>68Hz           | BB    | 46                        |
| <b>Mission 70BLE</b><br>£140                         | Good<br>Average        | Mission re-submitted this popular model and again got a positive review - which proclaims their (and our) consistency   | 38 x 21 x 21cm straight<br>ahead stand near wall     | 89dB/W<br>66Hz           | R     | 59                        |
| <b>Mission R737 Renaissance</b><br>£250              | Average<br>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<br>on dedicated low stands  | 88.5dB/W<br>60Hz         |       | 59                        |
| <b>Mission Argonaut</b><br>£700                      | Good<br>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-<br>standing near wall          | 91dB/W<br>40Hz           | R     | 60                        |
| <b>Monitor Audio R100</b><br>£139                    | Average+<br>Average-   | Tonally quite neutral, but with small box character, negligible low bass and a rather 'hard' midrange   | 40.5 x 25 x 21cm free<br>space on stands             | 87.5dB/W<br>70Hz         |       | 46                        |
| <b>Monitor Audio R252</b><br>£159                    | Average+<br>Average    | Rating well for its price this model displayed a rather rough top end and a generally dry character helped by good detail and focus   | 47 x 25 x 24cm stands<br>quite near rear wall        | 89dB/W<br>62Hz           | R     | 46                        |
| <b>Monitor Audio R352</b><br>£250                    | Good<br>Average        | Well-built and finished, 'sensitive' speaker which is easy to drive and capable of extracting good results from any good amplifier  | 64 x 25 x 32cm on stands<br>in free space            | 90dB/W<br>50Hz           | R     | 46                        |
| <b>Monitor Audio R700 MD</b><br>£269                 | Average+<br>Average+   | Lively and involving with good, punchy, if rolled off bass. The metal dome speaker gives a clean and open treble  | 32 x 21.5 x 25cm on<br>stands 0.4m from wall         | 87.5dB/W<br>62Hz         | R     | 46                        |
| <b>Monitor Audio R352 MD</b><br>£299                 | Good<br>Average+       | Better suited to CD than vinyl perhaps, this is clearly good value for money. But some found it coarse while others praised its cleanliness   | 64 x 25 x 32cm 25cm<br>stands in free space          | 89dB/W<br>42Hz           | BB    | 53                        |
| <b>Monitor Audio R452/MD</b><br>£350                 | Average<br>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<br>space, low stands           | 89dB/W<br>55Hz           |       | 59                        |

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## THE DIRECTORY

## LOUDSPEAKERS

| MODEL<br>PRICE                     | LAB<br>SOUND              | COMMENTS  | SIZE<br>PLACEMENT  | SENSITIVITY<br>BASS FROM | VALUE | BACK ISSUE<br>FULL REVIEW |
|------------------------------------|---------------------------|---|--|--------------------------|-------|---------------------------|
| Monitor Audio R652 MD<br>£369      | Average<br>Average+       | Mild bass and crossover weaknesses were criticised, but the sound was quite well liked and it is decently built   | 51 x 20 x 26cm free space on 40cm stands                   | 86.5dB/W<br>45Hz         |       | 53                        |
| Monitor Audio R852/MD<br>£380      | Good+<br>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<br>68Hz           | R     | 59                        |
| Mordaunt Short MS10 II<br>£90      | Average<br>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<br>75Hz           | R     | 53                        |
| Mordaunt Short MS100<br>£189       | Average+<br>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<br>80Hz           | R     | 46                        |
| Mordaunt Short 45Ti<br>£230        | Good<br>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<br>52Hz         |       | 53                        |
| Mordaunt Short MS300<br>£319       | Average+<br>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<br>65Hz           |       | 46                        |
| Mordaunt Short 442<br>£1150        | Good+<br>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<br>40Hz         | R     | 60                        |
| Musical Fidelity MC-2<br>£300      | Very Good<br>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<br>65Hz         | BB    | 59                        |
| Musical Fidelity MC-4<br>£499      | Very Good+<br>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<br>60Hz         | R     | 59                        |
| Quad ESL-63<br>£1459               | Good+<br>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<br>34Hz           | R     | 60                        |
| Rogers LS2<br>£170                 | Good<br>Average+          | A coherent and polite speaker considered more suited to classical music. Tonally well balanced, neutral and with good power handling                                | 36 x 23 x 22cm on stands near wall                         | 86.5dB/W<br>51Hz         | R     | 46                        |
| Rogers LS6<br>£240                 | Good+<br>Good             | Sonically fitting in between the LS2 and 7, the 6 was a consistent success on audition – well balanced with an open and informative nature                          | 51 x 27 x 28cm oper. stands, free space                    | 87.5dB/W<br>50Hz         | BB    | 46                        |
| Rogers LS7t<br>£360                | Good+<br>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<br>48Hz         | R     | 59                        |
| Roksan Darius<br>£1285 inc. stands | Average<br>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<br>50Hz           |       | 53                        |
| Rotel RL850 II<br>£120             | Average+<br>Average+      | Strongly recommended. Well-balanced, clear, with decent focus and fine stereo, but tenacity to 'heaviness' needs decent stands and space                            | 44 x 25 x 24cm free space on 40cm stands                   | 86.5dB/W<br>50Hz         | BB    | 59                        |
| Royd A7 Series 11<br>£99           | Average+<br>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<br>75Hz           | R     | 53                        |
| Royd A25<br>£100                   | Average+<br>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<br>52Hz           | R     | 46                        |
| SD Acoustics SD1<br>£1050          | Average<br>Good           | A large scale, airy and unusually detailed system with excellent dynamics. Balance is light and bright, and can upset some systems/listeners                        | 123.5 x 38.2 x 31.9cm free standing, away from walls       | 90dB/W<br>50Hz           | R     | 60                        |
| Sony APM 10ES<br>£100              | —<br>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<br>55Hz           | BB    | 59                        |
| Sony APM 22ES<br>£249              | Good+<br>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<br>46Hz         | R     | 46                        |
| Sony APM 66ES<br>£700              | Average+<br>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                    | 86dB/W<br>60Hz           |       | 59                        |
| Spendor Prelude II<br>£350         | Good+<br>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<br>52Hz           | R*    | 46                        |
| Spendor SP2<br>£450                | Very Good<br>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<br>45Hz           | R     | 59                        |
| Spendor SP1<br>£680                | Very Good<br>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<br>41Hz           | R     | 60                        |
| Spendor SA3 Passive<br>£1400       | —<br>Good+                | Same as Spendor SA3 active  | 85 x 38 x 46cm low   | 89dB/W<br>32Hz           | R     | 46                        |
| Spendor SA3 Active<br>£2708        | Good+<br>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<br>32Hz           | R     | 46                        |
| Spica TC-50<br>£595                | Average+<br>Good          | These American wedge-shaped-cabinet speakers just merit recommendation at their price and were detailed and clear   | 40 x 33 x 28cm free space on 50-60cm stands                | 85dB/W<br>48Hz           | R     | 59                        |
| Spica Angelus<br>£1195             | Good<br>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<br>50Hz         |       | 60                        |
| Tannoy Eclipse<br>£120             | Average+<br>Good          | Although a little bright, the 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<br>65Hz           | BB    | 59                        |
| Tannoy Mercury II<br>£160          | Good<br>Average+          | This genuine allrounder represents an exceptionally accurate free-space system for the money. Recent modifications as yet unchecked                                 | 50 x 25 x 23.5cm open space 45cm stands                    | 88dB/W<br>55Hz           | BB*   | 53                        |
| Tannoy Westminster<br>£3500        | n/a<br>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<br>(manuf.)       | R     | Coll                      |
| Technics SBC 250<br>£130           | Average+<br>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<br>60Hz           |       | 46                        |
| Technics SB-RX50<br>£500           | Very Good<br>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<br>40Hz           | R     | 46                        |
| Wharfedale Delta 30<br>£80         | Good<br>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<br>80Hz         | BB    | 59                        |
| Wharfedale Delta 50<br>£99         | Average+<br>Average—      | Given the price this was a mild disappointment – there is nothing obviously wrong but it just seemed a bit mundane  | 48 x 27 x 19cm near wall on 40cm stands                    | 88dB/W<br>55Hz           |       | 53                        |
| Wharfedale Diamond 111<br>£100     | Below Average<br>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<br>75Hz         |       | 59                        |
| Wharfedale 504<br>£139             | Average+<br>Average       | Acquitting itself well on audition, the 504 produced a clear, reasonably balanced sound with above average treble   | 21 x 18.5 x 20cm stands, near wall                         | 85dB/W<br>75Hz           | R     | 46                        |
| Wharfedale Super Diamond<br>£140   | Average<br>Average—       | Although there are improvements on the basic "legendary" model, listening panels did not get airborne about this upgrade  | 24 x 19 x 19cm close to wall at head height                | 88dB/W<br>57Hz           |       | 53                        |
| Wharfedale 510.2<br>£299           | Average<br>Average—       | Even in its 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<br>50Hz           |       | 59                        |
| Yamaha NS 1000M<br>£900            | Good<br>Good+             | Living up to its monitor label, and tonally well suited to digital material, the NS 1000M is superbly crafted and capable of high levels                            | 67.5 x 37.5 x 32.5cm 30cm from wall, stands                | 90dB/W<br>40Hz           | R     | 46                        |

\* rating refers to original, tested model.

# 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 dependant 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<br>PRICE                        | LAB<br>SOUND             | COMMENTS   | FEATURES   | VALUE | BACK ISSUE<br>FULL REVIEW |
|--------------------------------------|--------------------------|--|--|-------|---------------------------|
| <b>Aiwa AD-WX707</b><br>£180         | Poor<br>Average          | Not bad value for a twin deck, but marginal from the high fidelity viewpoint. The review sample was poorly set up.   | Dual deck, auto-reverse, Dolby B & C, bias adjust  |       | 57                        |
| <b>Aiwa AD-WX909</b><br>£400         | Good<br>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                             | BB    | 99                        |
| <b>Akai GX-52</b><br>£249            | Very Good<br>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 local features   | BB    | 57                        |
| <b>Akai GX-6</b><br>£350             | Good<br>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                        |
| <b>Denon DR-M07</b><br>£140          | Average+<br>Excellent    | Despite minor operational and measured shortcomings, sound quality is excellent for the price  | Dolby B, C, bias adjust  | R     | 52                        |
| <b>Denon DR-M12HX</b><br>£220        | Good<br>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     | 52                        |
| <b>Denon DR-M24HX</b><br>£290        | Good<br>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  | BB    | 60                        |
| <b>Denon DR-M44HX</b><br>£400        | Excellent<br>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                        |
| <b>Harman Kardon TD202BL</b><br>£249 | Average<br>Average       | A competent middle-ranking performer but lacks sonic incisiveness and is a bit expensive   | Dolby B, C, bias adjust  |       | 52                        |
| <b>Harman Kardon CD491</b><br>£695   | Good<br>Good+            | Excellent audio engineering and tremendous flexibility make this an audiophile cassette deck 'par excellence'  | Real-time counter, auto reverse, track search, Dolby B, C, HX Pro, bias adjust                           | R     | 52                        |
| <b>Hitachi D-003</b><br>£130         | Average—<br>Average—     | Dry, slightly 'wobbly' sound quality but suitable for many non-critical applications. The manual tape direction switch is poorly designed  | Dual deck, auto reverse, Dolby B   |       | 57                        |
| <b>Hitachi D-007</b><br>£180         | Average—<br>Poor         | This double 'dubbing' deck proved a mixed bag – good in parts but disappointing overall  | Dual deck, auto reverse, track search, Dolby B & C   |       | 52                        |
| <b>Kenwood KX550HX</b><br>£150       | Average<br>Average+      | This well-laid-out and attractive deck ultimately lacks the edge to stand out in a competitive field   | Track search, Dolby B, C, HX Pro   |       | 52                        |
| <b>Luxman K-100</b><br>£199          | Average+<br>Average+     | Poorly laid out but it fared quite well on metal tapes. Commercially recorded tapes sounded bright and cramped however   | Dolby B & C, remote control  |       | 52                        |
| <b>Luxman K-105</b><br>£349          | Average<br>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                        |
| <b>Luxman K-112</b><br>£349          | Average<br>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                        |
| <b>Marantz SD-35</b><br>£160         | Good<br>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   | BB    | 52                        |
| <b>Marantz SD-4511</b><br>£200       | Good+<br>Good+           | Well built and dynamic sounding player, working better as a recorder than with musicassettes   | Dolby B & C, bias adjust<br>Auto selection   | R     | 52                        |
| <b>Marantz CP230</b><br>£300         | Average<br>Average       | This is a competitively priced portable recorder though not suited to replay of musicassettes  | Dolby B, bias adjust   | R     | 52                        |
| <b>Marantz SD-55</b><br>£349         | Good<br>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                        |
| <b>Nakamichi CR-1E</b><br>£345       | Very Good<br>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                        |
| <b>Nakamichi CR-2E</b><br>£395       | Very Good<br>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                        |
| <b>Nakamichi CR-3E</b><br>£595       | Very Good<br>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                        |
| <b>Nakamichi CR-4E</b><br>£745       | Very Good+<br>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                        |
| <b>Nakamichi CR-7E</b><br>£1500      | Excellent<br>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                        |
| <b>Nakamichi Dragon</b><br>£1750     | Excellent<br>Excellent   | Previous to the birth of the CR-7E, this machine stood head and shoulders above the rest. It is still the ultimate for musiccassette replay  | Auto reverse, Dolby B & C, tape alignment adjust, bias adjust, remote                                    |       | 60                        |
| <b>Nikko D-8011</b><br>£309          | Average<br>Average       | Easy and rewarding to use (apart from the mannered aesthetics), but sound quality is below par for the price, especially with dbx  | Real-time counter, auto reverse, track search, Dolby B, C and dbx, bias adjust                           |       | 57                        |
| <b>Onkyo TA 2130</b><br>£140         | Average+<br>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   | R     | 52                        |
| <b>Philips FC566</b><br>£179         | Average+<br>Average+     | Mostly well equipped, though some tape search facilities fail to exploit the auto-reverse capability. Sounds clean and stable – with pre-recorded tapes too  | Auto reverse, track search, Dolby B & C  |       | 57                        |
| <b>Philips FC567</b><br>£279         | Average<br>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                        |
| <b>Proton AD-200</b><br>£140         | Poor<br>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                        |
| <b>Proton AD-300</b><br>£200         | Average—<br>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                        |
| <b>Revox B215</b><br>£1461           | Good<br>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                        |

# THE DIRECTORY

## CASSETTE DECKS

| NAME<br>PRICE                   | LAB<br>SOUND           | COMMENTS  | FEATURES   | VALUE | BACK ISSUE<br>FULL REVIEW |
|---------------------------------|------------------------|---|--|-------|---------------------------|
| Rotel RD-830<br>£110            | Average—<br>Poor       | A pretty fundamental if slightly dated design with little sonic merit but an attractive enough price  | Dolby B  |       | 52                        |
| SAE C102<br>£549                | Average+<br>Good       | Looking most unlike a cassette deck designed in the States and proving competitive in its price group. <b>Not sonically that outstanding, however</b>       | Real-time counter, track search, Dolby B & C   |       | 52                        |
| Sony TC-FX 150<br>£90           | Average+<br>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  | R     | 52                        |
| Sony TC-W250<br>£149            | Average—<br>Average—   | Rather rough and ready but a nonetheless honest and tolerably transparent sounding deck. Acceptable sound at the price                                      | Dual deck, Dolby B & C   |       | 57                        |
| Sony TC-R303<br>£179            | Good<br>Good           | Bright, detailed but not especially refined sound quality, makes excellent Dolby recordings, but has slightly suspect pitch stability                       | Auto reverse, Dolby B & C, remote control  |       | 57                        |
| Sony (WMD6C) ProWalkman<br>£249 | Good+<br>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-K700ES<br>£499          | Excellent<br>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                        |
| Tandberg 3014A<br>£1650         | Good<br>Very Good      | Very exactly engineered but excessively complex to use. Test sample had poor response for prerecorded tapes, but recordings were unusually stable and clean | Real-time counter, track search, Dolby B & C, bias adjust, remote control, 3 Head                  |       | 57                        |
| Teac V-200<br>£80               | Average—<br>Average+   | At this price you don't get fireworks, but it offers real value for money and sounds open and honest  | Dolby B  | R     | 52                        |
| Teac V-210C<br>£99              | Poor<br>Poor           | It could have been our sample but we found inadequate speed stability and a 'messy' sound   | Dolby B & C, bias adjust   |       | 52                        |
| Teac W300<br>£115               | Poor<br>Average—       | Sonically a mixed blessing, it does well with pre-recorded tapes but home-made recordings sound a little rough  | Dolby B  |       | 52                        |
| Teac W-310C<br>£129             | Average—<br>Average—   | Dubbing performance is poor, especially using the high speed mode but normal record and replay performance standards are not too bad                        | Real-time counter, Dolby B, C, Hx Pro, bias adjust   |       | 52                        |
| Teac R-515<br>£299              | Average+<br>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 V-970X<br>£499             | Very Good<br>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                        |
| Technics RS-B505<br>£160        | Average+<br>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<br>£180        | Good<br>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   | R     | 57                        |
| Technics RS-B705<br>£250        | Average<br>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<br>£350        | Good<br>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<br>£400        | Poor<br>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<br>£140           | Good—<br>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  | BB    | 52                        |
| Yamaha KX-300<br>£150           | Average+<br>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<br>£200           | Good<br>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<br>£210           | Very Good<br>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<br>£330           | Good<br>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<br>£500          | Excellent<br>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 control, track search, Dolby B, C, dbx, HX Pro, bias adjust, remote control              |       | 52                        |

## CD PLAYERS

This new all-digital music source is now 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 CD's 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 pre-amp, there are no problems connecting a player to a normal amplifier.

| MODEL<br>PRICE                  | LAB<br>SOUND      | COMMENTS  | FEATURES   | VALUE | BACK ISSUE<br>FULL REVIEW |
|---------------------------------|-------------------|---|--|-------|---------------------------|
| Acoustic Research CD-04<br>£290 | Good<br>Fair      | Stylish but basic player, based on Philips 14-bit 4 x oversampling with respectable sound and remote control  | Remote Control, headphones                                 |       | 51                        |
| ADC CD-250X<br>£230             | Good+<br>Fair     | Well made and engineered, and average soundwise; trumpets could sound 'thin' though violins were liked so it may prefer Stephan Grappelli to Miles Davis  | Skip and search, manual, repeat and 16-track programming   |       | 58                        |
| Arcam Delta Black Box<br>£249   | n/a<br>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<br>£500          | Good<br>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, headphones etc.                             | R     | 58                        |
| Aiwa CD-001<br>£300             | Good<br>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                        |

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# THE DIRECTORY

## CD PLAYERS

| MODEL<br>PRICE                      | LAB<br>SOUND               | COMMENTS  | FEATURES   | VALUE | BACK ISSUE<br>FULL REVIEW |
|-------------------------------------|----------------------------|---|--|-------|---------------------------|
| <b>Akai CD93</b><br>£700            | Good<br>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                        |
| <b>Cambridge Audio CD2</b><br>£600  | Fair<br>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                        |
| <b>Cambridge Audio CDI</b><br>£1500 | Good+<br>Excellent         | Advanced design and circuitry give this top class two-box machine exceptional performance, so the intrinsic qualities of CD, (eg. silent surfaces), make themselves felt  | No headphones, seven audio filters, skip and scan                          | R     | Coll                      |
| <b>dbx DX5</b><br>£640              | Good<br>Poor               | Sound quality proved a signal 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                        |
| <b>Denon DCD-600</b><br>£250        | Below Average<br>Average   | Slightly raw sound which lacks resolution. Bass and dynamics are good however and the player sounds pleasant on audition, even if it isn't quite the obvious first choice at the price.   | Remote track entry, calendar display, headphone out port (fixed)           |       | This                      |
| <b>Denon DCD-800</b><br>£300        | Good<br>Good               | A generally good subjective and objective performance, a comprehensive range of remote controllable facilities, plus Denon's good reputation for build quality and field reliability.   | Track entry remote, menu display etc.                                      | R     | 58                        |
| <b>Denon DCD-1500II</b><br>£500     | Very Good<br>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                        |
| <b>Denon DCD 1700</b><br>£650       | Good+<br>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, headphones, programmable                               | R     | 58                        |
| <b>Denon DCD-3300</b><br>£1200      | Good+ +<br>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 programmable, scan, search, headphones |       | 51                        |
| <b>Goodmans GCD-500S</b><br>£150    | Average –<br>Poor          | User-friendly but flimsy build quality and second class sonics make this poor value even at the price.  | Audible scan and track skip, programming                                   |       | 51/45                     |
| <b>Hitachi DA-7000</b><br>£180      | Good<br>Fair               | Generally competent, especially considering the price, this was well built and styled if lacking in some facilities – a good budget starter.  | Memory and repeat, plus the basics   | R     | 58                        |
| <b>Hitachi DA7200</b><br>£200       | Good<br>Fair               | Distinctly more competitive than the '009, the '7200 remains undistinguished in the current state of compact disc technology and sound quality.   | Simple remote etc.   |       | 58                        |
| <b>Hitachi DA007</b><br>£230        | Average<br>Fair            | Unusually fitted with wooden end cheeks and comprehensively kitted out, but only average in sound quality.  | Full remote control, adjustable headphone output keypad programming        |       | 51                        |
| <b>Hitachi 009</b><br>£300          | Good<br>Fair               | Despite a pretty clean bill of technical health and an extensive range of facilities, the 009 failed to inspire the subjective enthusiasm needed for recommendation at its £300 price level.                                    | Random, 'roulette' play, menu display, complex remote                      |       | 58                        |
| <b>Kenwood DP990SG</b><br>£400      | Very Good<br>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                        |
| <b>Kinergetics KCD-30</b><br>£1700  | Very Good<br>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                        |
| <b>Luxman D-90</b><br>£300          | Fair<br>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                        |
| <b>Luxman D-100</b><br>£399         | Average<br>Poor            | Sparsely equipped with a slightly old fashioned sonic character, offering little but physical weight for a quite high price.  | Remote control, skip, scan, headphones (variable)                          |       | 51                        |
| <b>Marantz CD273</b><br>£170        | Good<br>Good               | An ambitious machine at the price, offering pretty good sound quality but a slightly below average build standard.  | Skip, scan, programmable   | BB    | 51                        |
| <b>Marantz CD873</b><br>£200        | Good<br>Very Good          | Putting many 'audiophile' CDs 'to shame in terms of sound quality this proved another winner, though there was slight criticism of control accessibility at times.  | No remote control, but the usual skip, scan etc.                           | BB    | 53                        |
| <b>Marantz CD-273SE</b><br>£200     | Good+<br>Very Good         | The Euro-tweaked version of the standard 273, this model fulfils pretentions to audiophile standards at a budget price.   | Manual control, skip and scan (audible), 20 track programming, repeat      | BB    | 51                        |
| <b>Marantz CD873LE</b><br>£250      | Good<br>Excellent          | This is the outstanding sound quality bargain in the latest review project, with discreet if plasticky presentation and rather lightweight build.   | Manual repeat, skip, scan, programming                                     | BB    | 58                        |
| <b>Marantz CD94</b><br>£800         | Good+ +<br>Very Good       | Clearly the best Marantz CD player, with high build quality and good objective and subjective performance.  | 10 digit keypad, headphones, favourite track selection, remote             | R     | 58                        |
| <b>Marantz CD94/CDA94</b><br>£1600  | Very Good<br>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                        |
| <b>Meridian CD207</b><br>£950(+)    | Very Good<br>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     | 60                        |
| <b>Mission PCM7000</b><br>£400      | Good<br>Very Good          | Stylish with a large informative LCD display this deserves recommendation on the basis of sound quality alone.  | Remote volume control, digital filtering                                   | R     | 51/Coll                   |
| <b>Nakamichi OMS-1E</b><br>£400     | Good<br>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 sailing at an above average price.                                      | Simple remote etc.   |       | 58                        |
| <b>Nakamichi OMS-3E</b><br>£995     | Good<br>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, headphones                                  |       | 51                        |
| <b>Nakamichi OMS-4E</b><br>£1200    | Very Good<br>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, headphones  |       | 51                        |
| <b>Nakamichi OMS-5EII</b><br>£1500  | Good+<br>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                        |
| <b>Nakamichi OMS-7EII</b><br>£2000  | Good+<br>Good              | The only serious criticism here is of the price. And in our not always humble opinion you can get better sound quality for less elsewhere in Nakamichi's range.   | 10 digit track entry keypad programming, headphones                        |       | 51                        |
| <b>NEC CD610</b><br>£250            | Good<br>Very Good          | Although NEC's CD players may take a bit of hunting down, the sound/price/build equation comes down firmly in favour of the '610 despite unspectacular lab performance.   | Track entry remote, menu display etc.                                      | BB    | 58                        |
| <b>NEC CD810</b><br>£400            | Very Good<br>Very Good     | While the lab performance might have been better still, sound quality, ergonomics and build quality all point towards Recommendation for this rare but attractive example of the CD player maker's art.                         | Track entry remote, menu display etc.                                      | R     | 58                        |
| <b>Nikko CD200R</b><br>£250         | Fair<br>Fair               | This player delivers fair overall performance at what is presumably a fair price, but is insufficiently distinguished to warrant Recommendation.  | Simple remote, skip, scan, programming etc.                                |       | 58                        |
| <b>Onkyo DX-2500</b><br>£200        | Average –<br>Above Average | Attractive, easy on the ear sound quality at the cost of some loss of low level clarity and dynamics. Good tracking.  | Keypad remote, memory, headphone socket (variable)                         | R     | This                      |
| <b>Philips CD371</b><br>£150        | Fair<br>Good               | Though the build and presentation may not be to every taste, this is a fundamentally honest basic player that delivers more than enough of the sonic goods to merit a Best Buy rating.  | Skip, scan, programming  | BB    | 58                        |
| <b>Philips CD472</b><br>£200        | Fair<br>Good               | Once again one cannot argue with the fine sound quality Philips make available at a modest price – with remote control and extensive facilities besides.  | Simple remote, programming etc.  | BB    | 58                        |

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

## THE DIRECTORY

## CD PLAYERS

| MODEL<br>PRICE                 | LAB<br>SOUND           | COMMENTS   | FEATURES  | VALUE | BACK ISSUE<br>FULL REVIEW |
|--------------------------------|------------------------|--|---|-------|---------------------------|
| Philips CD473<br>£250          | Good<br>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 CD880<br>£500          | Very Good<br>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 PD-91<br>£800          | Excellent<br>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     | This                      |
| Revox B226<br>£756             | Good +<br>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 RCD820BX2<br>£300        | Good<br>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<br>£700               | Good<br>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                        |
| Sanyo CP17<br>£200             | Average -<br>Poor      | A no-frills midi-sized package, this was not up to the usual Sanyo sonic or technical standards but it was well built  | Skip, search, repeat, 16-track memory programmable                    |       | 53                        |
| Sanyo CP27<br>£220             | Fair<br>Fair           | System remote apart, the CP27 offers no improvement over the cheaper CP17 offers no improvement over the cheaper CP17, and neither of these systems-oriented players really are the subjective musical                       | LCD display, skip, scan, programming                                  |       | 58                        |
| Sharp DX-R700H<br>£225         | Average -<br>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<br>£495      | Average +<br>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)<br>£799 | Good<br>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<br>£170           | Fair<br>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-M55<br>£190           | Fair<br>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 D30<br>£230               | Average -<br>Poor      | At 50p per hour to run, the sound quality is poor compared to mains machines although reasonably competent overall for a Discman   | LCD display, skip, shuffle, and repeat, "in-ear" headphones           |       | 51                        |
| Sony CDP-M75<br>£230           | Good<br>Good           | This midi version of the '750 saves £20 on the price (see CDP-750 review).   | Track entry remote, menu display etc.                                 | BB    | 58                        |
| Sony CDP-310<br>£250           | Average + +<br>Fair    | Fine build, facilities and healthy enough sound quality - recommended, but look around the range   | Remote control (+ usual)  |       | 51                        |
| Sony CDP-750<br>£250           | Good<br>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.                                 |       | 58                        |
| Sony D100<br>£300              | Average<br>Poor        | The best all round portable tested, but also the most expensive, and still no substitute for a conventional player   | Skip, repeat, 21 track programming, headphones, LCD display           |       | 51                        |
| Sony CDP-222ES<br>£449         | Good<br>Fair           | Exceptional build quality and presentation plus respectably good sound quality but some of its kin were preferred  | Remote control, 20 digit keypad, track access, programming            |       | 51                        |
| Sony CDP-337ESD<br>£550        | Good<br>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     | This                      |
| Sony CDP-333ESD<br>£600        | Excellent<br>Excellent | Sony's new '333 represents a triumph for their development department, effectively bringing down the entry level price to 'high end' compact disc replay.  | Track entry remote, menu display etc.                                 | R     | This                      |
| Sony CDP 555es<br>£1000        | Very Good<br>Very Good | Extravagant build quality, sophisticated features and near state-of-the-art performance, it competes effectively with more expensive models  | Remote control, 20 digit keypad, track access, programming            | R     | 51                        |
| Tandberg 3015A<br>£1250        | Good<br>Fair           | Very classy presentation is not enough to compensate for subjectively and objectively faring no better than standard and modified Philips packages that cost a fraction of its price.  | Simple remote, skip, scan, programming etc.                           |       | 58                        |
| Teac PD135<br>£180             | Fair<br>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                        |
| Technics SL-XP5<br>£250        | Average -<br>Poor      | A contender for the "World's smallest" title, this beautifully crafted miniature falls short in terms of sound quality   | Headphones, "high cut" filter, skip, search                           |       | 51                        |
| Technics SL-P770<br>£350       | Excellent<br>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     | This                      |
| Technics SL-P990<br>£450       | Excellent<br>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<br>£800      | Good + +<br>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                        |

## 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 usually 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.

| NAME<br>PRICE           | LAB<br>SOUND           | COMMENTS  | FEATURES  | VALUE | BACK ISSUE<br>FULL REVIEW |
|-------------------------|------------------------|---|---|-------|---------------------------|
| A&R Arcam Alpha<br>£149 | Good<br>Average + +    | Attractively classic British analogue tuner with sound quality comfortably better than most                                 | FM/AM Analogue                                  | BB    | 50                        |
| A&R Arcam Delta<br>£270 | Very Good<br>Very Good | Hi-fi sound on FM, good on AM, a dependable British all-rounder   | 6AM, 6FM presets. FM/MW. LW display manual tune | BB    | 55                        |
| Creek CAS3140<br>£150   | Very Good<br>Very Good | A true front-rank tuner, excellent ergonomics and audiophile sound quality albeit with the minor handicap of having FM only | FM only   | BB    | 50                        |
| Denon TU 45DL<br>£130   | Average +<br>Average + | Poor AM sound quality may be a deterrent but the FM performance fully merits recommendation                                 | FM/AM Digital                                   | R     | 50                        |

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# THE DIRECTORY

## TUNERS

| NAME<br>PRICE                     | LAB<br>SOUND           | COMMENTS  | FEATURES  | VALUE | BACK ISSUE<br>FULL REVIEW |
|-----------------------------------|------------------------|---|---|-------|---------------------------|
| Harman Kardon TU920<br>£299       | Good<br>Average        | Rather weak sound quality for the price despite good lab test results   | 16 presets, AM/FM, digital auto scan, active tracking                   |       | 55                        |
| Harmon Kardon Citation 23<br>£559 | Good<br>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<br>16 presets remote control               | R     | This                      |
| Hitachi FT-MD 5500<br>£200        | Excellent<br>Good++    | A powerful, good sounding tuner with versatile facilities   | 16 presets, FM, AM, MW auto scan<br>digital, signal meter               | BB    | 55                        |
| Hitachi FT5500 II<br>£200         | Very Good<br>Good+     | Soundwise highly rated on FM, and on AM basically satisfactory – a versatile all-rounder  | Auto and manual tuning 16 presets                                       | R     | 44                        |
| Marantz ST35L<br>£125             | Good+<br>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<br>£495              | Good+<br>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 T1<br>£300       | Good+<br>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                        |
| MAD 4020B<br>£139                 | Good<br>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<br>£1098              | Very Good<br>Very Good | There may be better sounding tuners in the world, but we have yet to hear one   | No presets. Two box, flywheel tuning<br>FM only, Analogue               | R     | 50                        |
| Nakamichi ST-7E<br>£750           | Good++<br>Good+        | Exceptionally good for weak-signal areas, and good all round  | 16 AM/FM presets, Schottz enhanced sensitivity, auto time digital       |       | 55                        |
| Nikko NT-540<br>£154              | Good<br>Average        | Lab report was promising but the sound was rather dated   | 8 presets, AM/FM, digital auto scan                                     |       | 55                        |
| Onix B.W.D.1<br>£520              | Good++<br>Good         | Unexceptional sound despite the costly power supply option  | FM only, manual digital, variable bandwidth                             |       | 55                        |
| Pioneer F551L<br>£100             | Good+<br>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 F91<br>£350               | Excellent<br>Good++    | Easy to use, this model has excellent RF performance and scored very high ratings on the listening tests  | FM/AM 24 presets  | R     | 60                        |
| Quad FM4<br>£289                  | Very Good<br>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<br>£918                | Excellent<br>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<br>£110            | Good+<br>Good          | Fine sounding budget audiophile material, no frills, no fuss  | Manual dial analogue, FM, MW, LW  | BB    | 55                        |
| Rotel RT-850AL<br>£160            | Good+<br>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                        |
| Sansui TU-D99XL<br>£249           | Very Good<br>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 500ES<br>£200             | Good++<br>Average-     | Disappointing sound quality but good lab performance. (Includes long wave)  | 10 AM/FM presets, auto scan digital                                     |       | 55                        |
| Sony ST-S 700ES<br>£299           | Very Good<br>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                        |
| Tandberg 3001<br>£1295            | Excellent-<br>Good     | An enthusiast dx model, versatile performance and generally good sound; excellent build   | 8 presets, FM only, analogue, manual dial, var. bandwidth, signal meter |       | 55                        |
| Yamaha TX-L400<br>£130            | Good++<br>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<br>£150             | Average+<br>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                        |

## 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 self-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<br>PRICE                         | LAB<br>SOUND         | COMMENTS  | FEATURES   | VALUE | BACK ISSUE<br>FULL REVIEW |
|---------------------------------------|----------------------|---|--|-------|---------------------------|
| Aiwa V1500DX<br>£999                  | Good<br>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                        |
| Binatone Laser CD System 2000<br>£270 | Bad<br>Bad           | A bit of a disaster even at the price. Built to extremely low standard with an appalling turntable. CD and loudspeakers OK, but let down by amp                                 | Twin cassette  |       | Systems                   |
| Ferguson HF03<br>£400                 | Average+<br>Good     | An all round success with British built speakers and all sources achieving a reasonable standard. Compact disc was weak compared to other units                                 | Twin cassette  | BB    | Systems                   |
| Fidelity MS202<br>£340                | Bad<br>Bad-          | Very cheap and poorly finished. Thin, raw sound to match appearance and build   | Twin cassette, one-piece system                                  |       | 54                        |
| Fisher Midi System M46CD<br>£500      | Average<br>Average   | Somewhat overpriced, the M46 is let down by a poor amplifier and worse speakers. Other elements perform reasonably, CD being its strongest point                                | Twin transport   |       | Systems                   |
| Fisher Midi System M56CD<br>£580      | Average<br>Average   | Fitted with a pretty good amp, but dire loudspeakers; otherwise a competent combination including a pretty fair cassette deck   | Twin cassette, 5-band graphic equaliser                          |       | Systems                   |
| Fisher 2400<br>£600                   | Average<br>Average   | An ambitious and competent package with a strong amplifier and CD player. Given its new lower price it would have merited recommendation if the loudspeakers hadn't let it down | Twin deck, Graphic eq, 5-band                                    |       | Systems                   |
| Goodmans 5100<br>£350                 | Poor-<br>Bad         | A combined electronics package, with performance standards only too typical of the breed. Speakers good for type but don't compensate   | Twin cassette, one-piece system                                  |       | 54                        |
| Goodmans 5200<br>£459                 | Average+<br>Average+ | Offering possibly the best speakers around in this midi system market, the Goodmans wins on a fair standard for the price, though the turntable was not too hot                 | 12 Band Graphic Eq, Twin deck                                    | BB    | Systems                   |
| Goodmans Maxim-Midi System<br>£520    | Average<br>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                        |

# THE DIRECTORY

## CD MIDI SYSTEMS

| NAME<br>PRICE                   | LAB<br>SOUND         | COMMENTS  | FEATURES   | VALUE | BACK ISSUE<br>FULL REVIEW |
|---------------------------------|----------------------|---|--|-------|---------------------------|
| Marantz MX673CD System<br>£900  | Average+<br>Average  | Tremendously flexible audio/visual system. Sound quality is satisfactory at best and ergonomics a mess  | Various A/V inputs, remote, speakers optional                    | R     | 54                        |
| Mitsubishi CD51<br>£429         | Average<br>Average-  | In some ways a well balanced system, in that the amp and speakers smooth the rougher edges of some sources, but not very satisfactory on the whole                                      | Remote, twin deck  |       | Systems                   |
| Mitsubishi E602CD<br>£500       | Poor-<br>Poor-       | Totem-pole aesthetics match the mixed constructional quality. Sound quality is already poor, but featured synthesised bass can make matters worse still                                 | Spare in/output set, twin cassette                               |       | 54                        |
| Mitsubishi 100R<br>£650         | Average<br>Average+  | A pretty good package, flawed by 'tinny' loudspeakers, but having a fair turntable - a rarity in this category of equipment   | Remote, Multidisc CD, Twin                                       | R     | Systems                   |
| Sanyo W40CD<br>£380             | Average<br>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                        |
| Sharp SA-CD800H<br>£700         | Average<br>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 510<br>£599        | Average+<br>Average+ | Very good control layout. Shabby loudspeakers not up to otherwise uniformly good system   | Remote, twin cassette  | R     | 54                        |
| Sony Compact 610<br>£700        | Average<br>Average-  | Inconsistent. Same turntable used in much cheaper Sonys gave 'iffy' record reproduction. Cassette likewise  | Remote, 'shuffle' play CD, twin cassette                         |       | 54                        |
| Sony FH1215CD<br>£800           | Average<br>Average+  | Probably the ultimate miniature system. The CD player is particularly good. Best to chuck the speakers away though  | Miniature, transportable (AC only). Single auto-reverse cassette | R     | 54                        |
| Sony Compact 710<br>£999        | Good<br>Good         | Typically well built and presented but complicated to use except via remote. Record deck poor but remainder good, including speakers  | Full remote, auto T/T, twin auto reverse cassette                | R     | 54                        |
| Sony Compact Series 90<br>£1500 | Good<br>Good+        | The best of a not too wonderful bunch, the excellent compact disc player and pretty good speakers make for reasonable sound quality, though the tuner wasn't of quite the same standard | Twin deck, auto reverse, timer, extra tape socket                | BB    | Systems                   |
| Toshiba V17CD<br>£399           | Average<br>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                        |

## 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<br>PRICE   | SOUND<br>COMFORT       | COMMENTS  | TYPE                                      | VALUE | BACK ISSUE<br>FULL REVIEW |
|---|------------------------|---|---|-------|---------------------------|
| Audio Technica ATH 909<br>£54.95                          | Average<br>Average     | Quite impressive in the treble though a bit bass shy, the 909s worked well at highish levels  | Circumaural, semi-open, dynamic           |       | 55                        |
| Audio Technica ATH 910<br>£64.95                          | Good<br>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                        |
| Beyer DT330 Mk II<br>£45                                  | Poor<br>Good           | Not the most revealing 'phones encountered, the 330s were nevertheless enjoyable and rarely offended  | Circumaural, semi-open, dynamic           |       | 55                        |
| Beyer DT550<br>£69  | Good<br>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 DT990<br>£130                                       | Very Good<br>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<br>£79                            | Very Good<br>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 Electrostatic<br>£399                       | Excellent<br>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                        |
| Quart PMB 25II<br>£40                                     | Good<br>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 PMB 65<br>£69.90                                    | Good<br>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                        |
| Sennheiser HD30<br>£13.50                                 | Poor<br>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 HD410SL<br>£26                                 | Good<br>Good           | The 410s have a tight clear presentation underlined by a slightly forward top end, and can be a bit raw with less than adequate sources                           | Supra-aural, open-back, dynamic           | BB    | 55                        |
| Sennheiser HD420SL<br>£47                                 | Good<br>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<br>£160                         | Very Good<br>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-E272EX<br>£30                                    | Average<br>Poor        | These in-ear 'fontopid' type phones are intended for upmarket personal stereos, and sound reasonably good for their size, but are plagued by hiss                 | Intra-aural, 'open-air', dynamic          |       | 55                        |
| Sony MDR-A60<br>£40                                       | Poor<br>Poor           | Unusual lightweight intra-aural types, the A60s are pretty stylish but failed to deliver the goods sonically  | Intra-aural, 'open-air', dynamic          |       | 55                        |
| Sony MDR V4<br>£50  | Fair<br>Good           | These folding closed-back phones are nicely made but didn't sound too great, the tonal balance being on the 'cold' side   | Supra-aural, closed-back, dynamic         |       | 55                        |
| Sony MDR V6<br>£70  | Good<br>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                        |
| Stax SR34<br>£140   | Very Good<br>Fair      | The least expensive Stax headphones around, the SR34s are lively and rhythmic with good light bass and a sweet midrange   | Supra-aural, open-back, electret          |       | 55                        |
| Stax SR Gamma<br>£199<br>(SRD-6 Adaptor £100)             | Very Good<br>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<br>£360<br>(SRD-7SB Mk 2 Adaptor £185) | Excellent<br>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                        |

# THE DIRECTORY

## PERSONAL STEREO

Whilst not exactly hi-fi components, personal stereos probably play more music to more ears than CDs and LPs combined and as such should not be ignored. Since the introduction of the Sony Walkman in the early eighties, more and more people have adopted these diminutive machines and consequently the market has become saturated with a vast assortment of players. This is obviously good for competitive pricing but bewildering if one is trying to select a reasonable machine. Prices start incredibly low (around £10) and wind themselves up

to close on £300, although the sub-£50 sector is the most popular.

There seems to be almost no end to the features that appear on personals; some of them have specifications like a midi system! Graphic equalisers are very popular, for what they're worth, and Dolby is fairly common on the £40 plus models, though the quality of noise reduction systems seems to be pretty poor. You can expect more useful features such as autoreverse and ferric/chrome-metal tape type compatibility on many machines and

some even record, but usually only from a microphone or built in radio where it exists.

The sound quality available tends, not surprisingly, to increase with the price of the machines but even quite expensive players are prone to wow with critical material, so if classical piano music is your bag then steer clear of the cheaper (sub £50) players.

Note that our value judgements relate to the personals group as a whole, and are not comparable with separate hi-fi ratings.

| MODEL NAME<br>PRICE           | LAB<br>SOUND           | COMMENTS   | FEATURES   | VALUE | BACK ISSUE<br>FULL REVIEW |
|-------------------------------|------------------------|--|--|-------|---------------------------|
| Aiwa HS-G35 MkII<br>£30       | Poor<br>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<br>£89            | Good—<br>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<br>£149         | Average—<br>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<br>£35          | Very Poor<br>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<br>£30          | Very Poor<br>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<br>£40           | Poor<br>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<br>£35           | Very Poor<br>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<br>£50           | Very Poor<br>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<br>£50         | Average+<br>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<br>£100           | Poor<br>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<br>£40             | Poor<br>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<br>£100           | Average—<br>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<br>£249-£289 | Good+<br>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, var-speed | BB    | 52/56                     |
| Toshiba KT-4027<br>£35        | Very Poor<br>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<br>£60        | Average<br>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                        |

## 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<br>PRICE             | SOUND    | COMMENTS  | FEATURES  | VALUE | BACK ISSUE<br>FULL REVIEW |
|----------------------------|----------|---|---|-------|---------------------------|
| Ferguson RCD02<br>£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<br>£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<br>£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<br>£280    | Average  | A little bit tacky, the Memorex put in a plausible if unenthralling performance, and will work with external speakers                         | Spare input   |       | 53                        |
| Panasonic RX-FD80L<br>£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<br>£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<br>£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<br>£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                        |

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# THE DIRECTORY

## 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<br>PRICE                                    | TYPE<br>FINISH       | COMMENTS   | TOP PLATE SIZE<br>HEIGHT           | VALUE | BACK ISSUE<br>FULL REVIEW |
|---|----------------------|--|------------------------------------|-------|---------------------------|
| <b>Appolo AB20</b><br>£40                         | 4 leg<br>Fair        | A light open-framed budget design slightly lacking in rigidity and subjectively superceded by other stands costing £10 more.   | 19 x 19cm<br>53cm                  |       | 58                        |
| <b>Appolo A10</b><br>£47.25                       | 4 leg<br>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<br>44cm                  | R     | 58                        |
| <b>Foundation Fred</b><br>£65                     | 2 leg<br>Average     | With sand filling the Freds made speakers sound tight and coherent with a more even balance.   | 19 x 19cm<br>36/43/59cm            |       | 58                        |
| <b>Foundation Maggi</b><br>£159                   | Pair<br>Very Good    | Made for Magneplanar and other similar panel speakers they seem to have a healthy effect on the sound quality thereof.   | 50 x 2cm<br>2cm                    | R     | 58                        |
| <b>Foundation Pi</b><br>£250                      | 2 leg<br>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<br>25/38/46/53cm         | R     | 58                        |
| <b>Heybrook Point 5</b><br>£50                    | 3 leg<br>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<br>47cm                | BB    | 58                        |
| <b>Heybrook HBS1</b><br>£75                       | 4 leg<br>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<br>47cm                  | R     | 58                        |
| <b>Linn Kan II</b><br>£74                         | 4 leg<br>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<br>59cm                  |       | 58                        |
| <b>Linn Sara</b><br>£80                           | 4 leg<br>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<br>53cm                  |       | 58                        |
| <b>Monotrak Engineering M1</b><br>£58             | 1 leg<br>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<br>48cm                |       | 58                        |
| <b>Monotrak Engineering M4</b><br>£58             | 4 leg<br>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<br>53cm                | R     | 58                        |
| <b>Monotrak Engineering M4S</b><br>£58            | 4 leg<br>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<br>53cm                |       | 58                        |
| <b>Mordaunt-Short ISI II</b><br>£45               | 3 leg<br>Good        | Suited to low mass speakers, preferably using spikes to effect coupling, they sounded slightly 'jazzed up' but the overall sound was quite unmodified.                             | 18 x 15cm<br>56cm                  | R     | 58                        |
| <b>Origin Live</b><br>£117                        | 3 leg<br>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<br>52cm | R     | 58                        |
| <b>Partington PP4</b><br>£50                      | 1 leg<br>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<br>48cm                |       | 58                        |
| <b>Partington Dreadnought II</b><br>£120 (filled) | 1 leg<br>Very Good   | Ideal for systems on the light/bright side of neutral, the Dreadnought IIs nevertheless still need some careful re-examination by Partington.                                      | 17.5 x 16.5cm<br>63cm              |       | 58                        |
| <b>QED TS22 Tristand</b><br>£50                   | 3 leg<br>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<br>45/50/58cm            | BB    | 58                        |
| <b>RATA Torlyte</b><br>£190                       | 2 panel<br>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<br>48cm                  | R     | 58                        |
| <b>Target HS20</b><br>£53                         | 1 leg<br>Excellent   | This monopod stand can be used either filled or unfilled and encourages different characteristics in the sound accordingly.  | 19 x 16.5cm<br>53cm                |       | 58                        |
| <b>Target HI15/3</b><br>£83                       | 3 leg<br>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<br>40cm                  | R     | 58                        |

### EQUIPMENT SUPPORTS

| MODEL<br>PRICE                                | TYPE<br>FINISH        | COMMENTS  | SIZE (H x W x D)       | VALUE | BACK ISSUE<br>FULL REVIEW |
|---|-----------------------|---|------------------------|-------|---------------------------|
| <b>Appolo CT2</b><br>£38                      | Shelf<br>Fair         | A sturdy 18 x 37mm rectangular section frame with four adjustable spikes supports a dual coloured board.                              | 20 x 45.5 x 38cm       |       | 57                        |
| <b>Appolo AT1</b><br>£50                      | Table<br>Fair         | This two-layer table didn't quite make the grade on sonic grounds and build quality could be improved.                                | 46.3 x 45.5 x 38cm     |       | 57                        |
| <b>Audioquest Sorbothane Feet</b><br>£10 each | Feet<br>Good          | These large gumdrops are very useful for damping vibrations in amplifiers and especially CD players.                                  | 6.5 x 2.5cm (circular) | R     | 57                        |
| <b>Cornflake TCS5</b><br>£50                  | Table<br>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                        |
| <b>Cornflake TCS6</b><br>£50                  | Shelf<br>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                        |
| <b>Deftec Isolation Base</b><br>£135          | Platform<br>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                        |
| <b>RATA Model A</b><br>£125                   | Table<br>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                        |
| <b>RATA Amplat</b><br>£40.25                  | Platform<br>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                        |
| <b>Sound Organisation Table</b><br>£55        | Table<br>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                        |
| <b>Sound Organisation Wall Stand</b><br>£40   | Shelf<br>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                        |
| <b>Target TT1</b><br>£46.50                   | Shelf<br>Excellent    | This rigidly braced shelf offers both good sound quality and material value for money.  | 26 x 46.5 x 35.5cm     | BB    | 57                        |

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# THE DIRECTORY

## EQUIPMENT SUPPORTS

| MODEL<br>PRICE                    | TYPE<br>FINISH     | COMMENTS   | SIZE (H x W x D)   | VALUE | BACK ISSUE<br>FULL REVIEW |
|-----------------------------------|--------------------|--|--------------------|-------|---------------------------|
| Target TT2<br>£47.50              | Table<br>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<br>£145 | Platform<br>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.

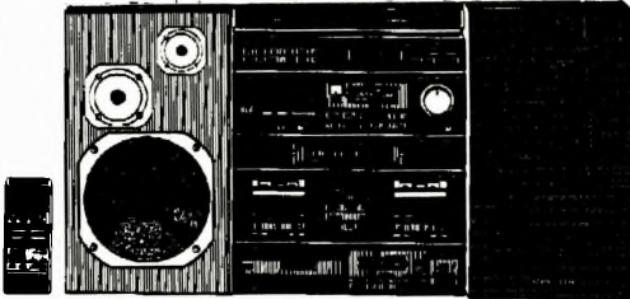
## INTERCONNECT CABLES

| MODEL<br>PRICE (per metre)            | LAB<br>SOUND           | COMMENTS  | FEATURES   | VALUE | BACK ISSUE<br>FULL REVIEW |
|---------------------------------------|------------------------|---|--|-------|---------------------------|
| Apature LSD<br>N/A in UK              | Poor<br>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<br>£29         | Good<br>Fair           | Ultimately Reference 2 simply damped much of the atmosphere and emotional charge of a musical performance.  | OFC copper                                       |       | 59                        |
| Audioquest Livewire Topaz<br>£29      | Good<br>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<br>£45       | Fair<br>Good           | Smother 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<br>£65     | Good<br>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<br>£50          | Very Good<br>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                        |
| Audionote Copper ANC<br>£35           | Fair<br>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<br>£85  | Fair<br>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<br>£140          | Poor<br>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<br>N/A in UK         | Poor<br>Good           | This cable enjoyed an open and transparent midband and sounded remarkably neutral and faithful to the source.   | OFC copper PTFE dielectric                       | R     | 59                        |
| Budget Patch Cords<br>see text        | Fair<br>Poor           | As thrown in gratis with cassette decks and the like – frequency extremes were restricted and performances were veiled.                                   | Thin coaxial                                     |       | 59                        |
| Budget OFC<br>circa £7                | Fair<br>Fair           | Subjectively, this cable did lift much of the aural fog experienced with scrawny standard hook-up leads.  | OFC  |       | 59                        |
| Deltec Slink<br>£32                   | Good<br>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<br>PTFE dielectric   | BB    | 59                        |
| Deltec Black Slink<br>£152            | Excellent<br>Excellent | Inherently neutral the cable faithfully reproduced broad and deep stereo soundstages with precise focus and a sense of locality.                          | 8 silver plated OFC strands<br>PTFE dielectric   | R     | 59                        |
| Denon LC-OFC<br>N/A separately        | Very Good<br>Fair      | Supplied with Denon's dearer CD players this cable introduced a peculiar 'twangy' coloration at high frequencies, and a slightly soft bass.               | LC-OFC, non-magnetic gold plated plugs           |       | 59                        |
| DNM Solid-core<br>£15-£25             | Fair<br>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<br>£32               | Very Good<br>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<br>£47              | Very Good<br>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<br>£375            | Good<br>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<br>£10.95            | Good<br>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<br>£75                 | Fair<br>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<br>£193            | Poor<br>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<br>£17             | Good<br>Fair           | There is more than a hint of instrumental mudding 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<br>£30          | Good<br>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<br>£44           | Fair<br>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<br>£88    | Good<br>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<br>£15.60                     | Fair<br>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<br>£60    | Good<br>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<br>£14.95           | Good<br>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 GP1 Gold<br>£18.95 | Fair<br>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-C31DES<br>£40                 | Excellent<br>Good      | Possessing deep firm bass and a sparkling top end it offers a balanced perspective with negligible coloration.  | Coaxial LC-OFC                                   | R     | 59                        |

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# THE DIRECTORY

## INTERCONNECT CABLES

| MODEL<br>PRICE (per metre)      | LAB<br>SOUND      | COMMENTS   | FEATURES   | VALUE | BACK ISSUE<br>FULL REVIEW |
|---------------------------------|-------------------|--|--|-------|---------------------------|
| Sterling<br>£250                | Fair<br>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<br>£50          | Good<br>Fair      | Performance is undermined by a slightly coarse and splashy treble, not necessarily bright, simply rather confused – and fine detail lacks resolution.                      | Silver-plated OFC, coaxial                         |       | 59                        |
| Van den Hul MC-D300II<br>£59    | Poor<br>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<br>£69    | Good<br>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<br>£77      | Fair<br>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<br>£147 | Good<br>Fair      | Thunderline essentially parallels the sonic performance of the cheaper D102 HF is occasionally tainted by a 'lizzy' 'coarseness', bass is tight and dry.                   | Silver plated 'matched copper'                     |       | 59                        |
| Van den Hul MC-Gold<br>£247     | Fair<br>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<br>£747   | Good<br>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<br>£49             | Very Good<br>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-0FC signal & screen                             | R     | 59                        |

## 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 there is a wide variety of in-car machines to choose from, some of

them offering practically every gadget or feature under the sun. 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<br>PRICE            | LAB<br>SOUND           | COMMENTS   | FEATURES  | VALUE | BACK ISSUE<br>FULL REVIEW |
|---------------------------|------------------------|--|---|-------|---------------------------|
| Alpine 7282<br>£250       | Good<br>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     | This                      |
| Clarion 916MP<br>£160     | Good<br>Average        | With its rubbery buttons and touches of white this is a modest looking player let down by a weak cassette.                       | Bass/treble controls, tuning 5 FM/5 AM presets 9W                       |       | This                      |
| Clarion 946HP<br>£250     | Very Good<br>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     | This                      |
| Goodmans GCE229<br>£150   | Fair<br>Average        | If knobs, switches and legends are your bag then the GCE229 is the one for you – a lot of gizmo's for the price.                 | Bass/treble controls, 6 FM/6 AM presets. Chrome eq., clock, MSS, 10.1W  | BB    | This                      |
| Philips 553<br>£120       | Average<br>Average     | Not the most ergonomic player on test but sound quality was quite refined for the price. Presets are a bit <u>gauche</u> .       | 4 FM/4 AM presets uni-direction cassette 3.1W                           |       | This                      |
| Philips DC680<br>£180     | Average<br>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     | This                      |
| Pioneer KE-3030<br>£150   | Poor<br>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   |       | This                      |
| Pioneer KEH-5080B<br>£230 | Fair<br>Good           | A chunky and neatly styled player with healthy power output and an easy relaxed sound. Just the thing for pumping up the volume. | Bass/treble controls, 18 FM/6 AM presets, Anti-theft device, slot-in 9W | R     | This                      |
| Sansui RX-3100L<br>£180   | Poor<br>Fair           | Quite flash looking with a reasonable feature count but FM sound and cassette replay could be a bit stronger at the price.       | Bass/treble controls, 12 FM/12 AM presets, chrome eq., 8W               |       | This                      |
| Sansui RX-5100L<br>£250   | Good<br>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     | This                      |

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
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
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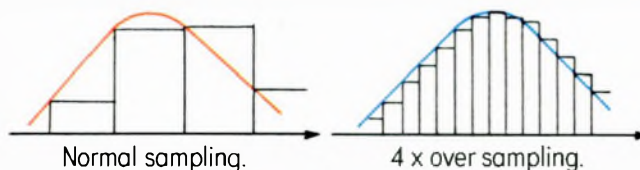
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