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**ASPIRATIONS  
VISITS SUDELEY CASTLE**

**74 CD PLAYERS  
- SUMMARISED**

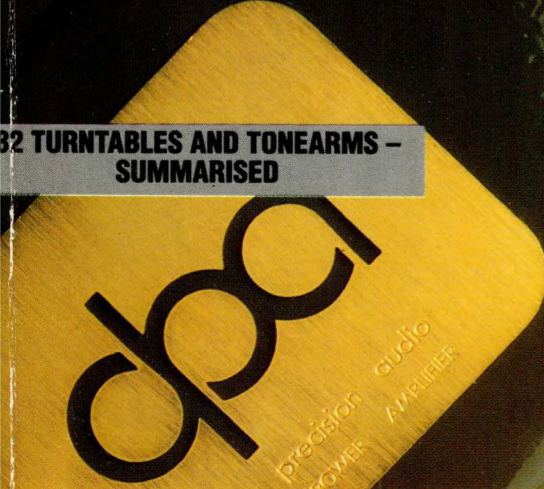
**72 CASSETTE DECKS  
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I am always satisfied with the best'  
*Oscar Wilde*

THE WORLD'S No. 1 GUIDE TO BUYING HI-FI  
**HI-FI CHOICE**  
ISSUE NUMBER 68: MARCH 1989

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PUBLISHED by Dennis Publishing Ltd,  
14 Rathbone Place, London W1P 1DE. Tel: 01-631 1433.

Telex: 8954139 DENNIS G. Fax: 01-436 0350.

Company registered in England.

REPRO: Graphic Ideas.

TYPESET by: Time Graphics Ltd.

PRINTED by: Riverside Press.

DISTRIBUTED by: SM Distribution,  
6 Leigham Court Road, Streatham, London SW16 2PG.

Tel: 01-677 8111.

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PUBLICATION

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

## MENU

“**A**mplifiers are a bit subtle, don't you think?”, JK said to me during our listening tests. We were listening 'blind', of course, and JK was referring to the subtlety of the differences we were observing between various integrated models. Only a couple of days earlier we'd been down in deepest Kent, listening to loudspeakers at Paul Messenger's house – and in contrast to the 'sound' of electronics, there's nothing subtle about the different ways various speakers present a musical performance.

Yes, amplifiers are subtle, but the more models you hear and the longer you listen the more obvious the differences become. It pays to buy the best amplifier you can afford (keeping it in the context of the system, of course – obviously it would make no sense to use a £1,000 model with a £100 turntable), since what might be considered as a seemingly insignificant characteristic of an amplifier can all too easily grow to become a major annoyance after prolonged listening.

As promised, in addition to our tests on amplifiers this month's issue contains reviews on ten loudspeakers and also some pretty ambitious in-car stereos. JVC actually loaned us an in-car DAT player which proved to be a gorgeous piece of kit, leaving us wondering what the future holds for this new digital tape system. Apologies from Ion Systems, by the way, who forgot to send their amplifiers in for testing.

We'll be focusing our attentions on analogue cassette recorders next month, and publishing the results of a survey on the quality of blank tapes. We had 24 cassette decks on the laboratory test bench at last count.

Back to this issue, we'd like to point you in the direction of the Federation of British Audio Awards voting form on page 120. This is for you to have your say on what you consider to be the best hi-fi components launched by British manufacturers during the past twelve months. The awards ceremony is in aid of a worthwhile cause – and as an added incentive there's a chance you could win £100 worth of record tokens simply by filling in the form and returning it to the FBA. Go on, it only costs the price of a stamp!

*John Bamford*

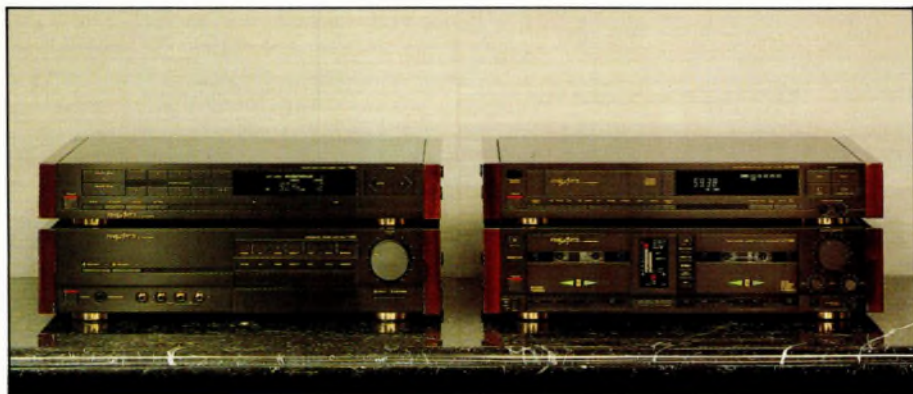
Cover photograph of the  
*Recommended Deltac*  
(see page 56) by  
*Chris Richardson.*



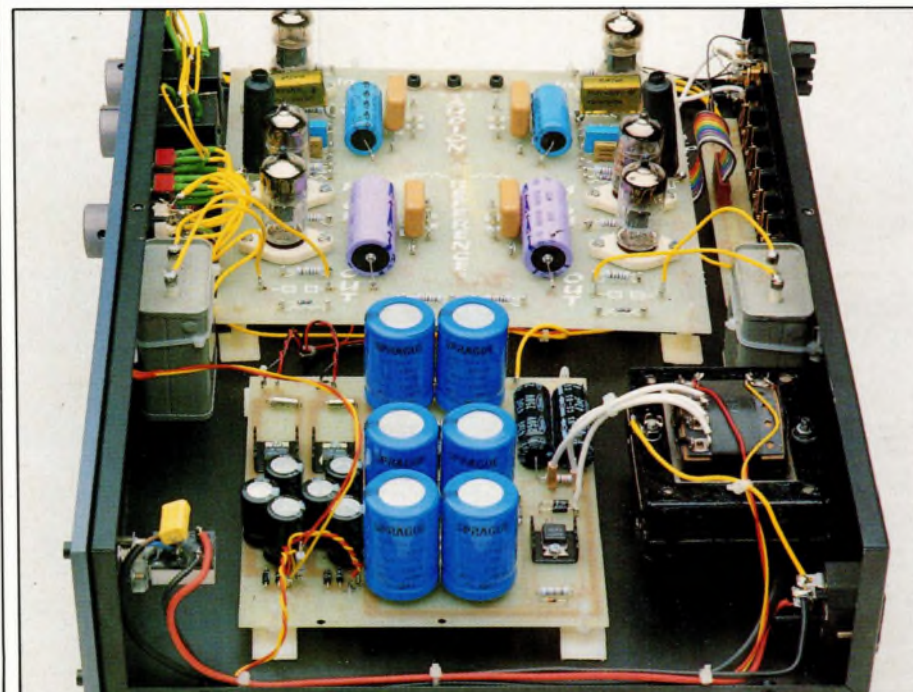
THE WORLD'S No.1 GUIDE TO BUYING HI-FI

# HI-FI CHOICE

ISSUE NUMBER 68: MARCH 1989



*This month Grundig import a super system (above), nobles choose B&O (right) while Audion's valve amp is undressed (below).*



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Your questions answered and your views aired. Write to us at the address on page 1.

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Our unique buyer's guide gives comment on all the currently available equipment we've reviewed.



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Your chance to vote for the best British hi-fi products of the year.

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### PERSONAL MESSAGES

Paul Messenger rounds off the magazine with a look at the developing technology used in TV screens.

*Are your sounds on the move (top) all they could be? Remote control Ariston isn't infra dig for buffs and Wharfedale's 504 (below): upside-down for the nuclear age.*



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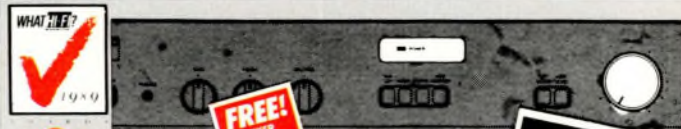


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**DUAL CC8010 Cassette Deck** One of Dual's new-range components, this highly commended cassette deck is another one that speaks for itself. Featuring excellent heads and Dolby B&C NR ●440x119x245



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**NAD 3020E Amplifier** The legendary 3020 in an improved 'E' form. This 20 watt stunner speaks for itself. Need we say more?? ●420x91x270

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**ROTEL RA810A Amplifier** At under £100 you can't go wrong on this 20wpc classic. Impressive performance and a specially designed phono input make it a 'knock 'em dead' 'Best Buy'!!

Full range of Rotel stocked!

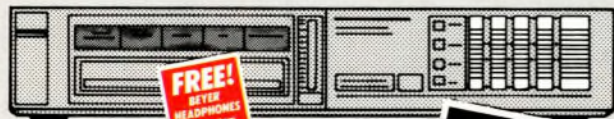


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**ARISTON Q Deck Turntable** What Hi-Fi? magazine's 'Turntable of the Year' and Hi-Fi Choice mag's 'Best Buy' the sound on this 'Q' will blow your mind with fidelity!! While stocks last... (Cart. £5 extra)



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**HITACHI FTMD5500 Tuner** Containing award-winning circuitry a mind-blowing specification and 16 touch presets this tuner's knockout performance takes care of itself! Only while stocks last. ●370x65x268

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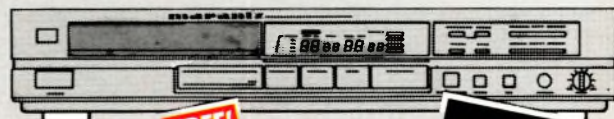


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**DUAL CS503.1 Turntable** An old favourite, and those people at Dual keep managing to improve it. 'Virtually featureless but a great solid sound' ●440x115x363 (Cart £5 extra)

Full range of Dual stocked!

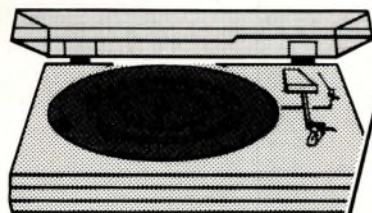


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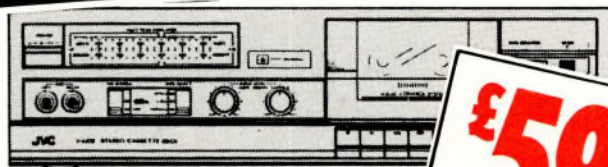
**MARANTZ CD65 II Compact Disc** Four times oversampling and 3 separate internal power supplies have given this player 'Best Buy' status the world throughout. ●420x90x300

## BARGAINS!



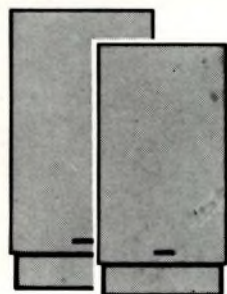
**TENSAI TS705 Turntable** Sleek, low profile belt drive turntable featuring a DC servo motor and static balance tonearm for increased performance

£29



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

£59



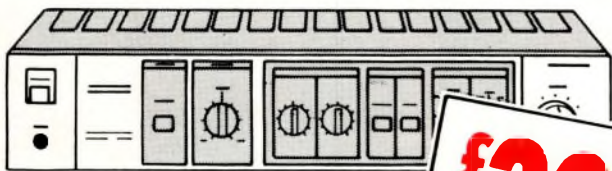
**FISHER STEM48 Speakers** 50 ki/ki/kilowatts of music power - not quite, 25 watts handling sounds more realistic though, from these highly popular 2 way infinite baffle speakers!

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Pair



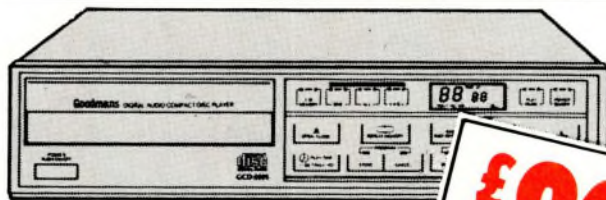
**DUAL CS410 Turntable** Brand-new to the UK, this high performance low priced Dual brings new standards to budget turntables! •(Cart £5 extra.)

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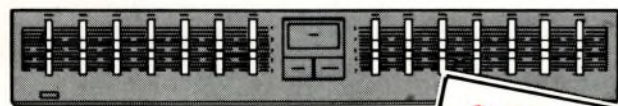
**SANYO JA220 Amplifier** 20 watts of music power! Featuring bass/treble controls, tape monitor and a respectable THD of only 0.9%, what more could one desire?? •420x80x220

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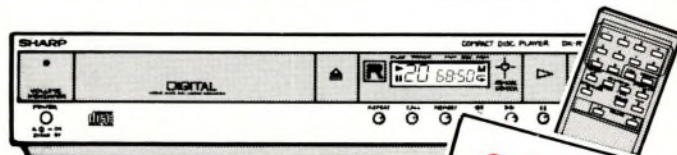
**GOODMANS GCD500S Compact Disc** How do we do it? This multi-function CD player takes value-for-money into a new era with its 16 programs, high luminance display and music search! •350x80x310

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**SANSUI SE1000 Equaliser** No one can beat us for value on this 14-band equaliser, boasting cut or boost of up to 12dB per frequency •430x78x210

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**SHARP DXR554 Compact Disc** This remarkable price isn't a misprint - our exclusive bulk-buy features 20 program memories, 16 bit technology and an infra-red remote control with variable output volume.

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# The UK's biggest selling amplifier.

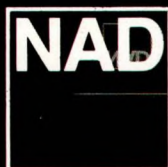


NAD 3130 £169.<sup>95</sup>

# The nearest competition.



NAD 3020E £119.<sup>95</sup>



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## PRODUCTS

### MERIDIAN ACTIVITY

The Boothroyd-Stewart team is planning the launch of its latest three-way active loudspeaker this month. Two-and-a-half years in the making, the £2,500 Meridian D600 is described as 'elegant, standing about a metre high' with a liquid crystal display on the front informing the user of tuner frequency, CD track number, volume etc.

The D600 features on-board volume control and DAC (digital to analogue convertor), with inputs for CD and DAT players as well as two dedicated to analogue, and an optical input.

### PLAYERS OF THE MONTH

Grundig International has launched a comprehensive range of upmarket audio including a DAT player under the 'Fine Arts' banner. Two systems, the 900 and 9000 series, are available through Grundig dealers nationwide.

To our knowledge, Fine Arts is the only brand marketing a DAT player to the public at the moment, other makes preferring to wait until the record industry decides on the issue of copyright. However, the DAT machine, which can only be bought as part of the £4,500 9000 system, is copyguarded so recording can only be done via the analogue input (not as a straight digital link to the CD player).

Other components in the 9000 system include a cassette deck, integrated amplifier, tuner and optional *Connoisseur* turntable with SME's 3009 arm.

The 900 series looks just as sexy and costs £1,500. You still have to buy the package which comprises dual cassette deck, tuner, amplifier, and the same CD player as the 9000 series. CD player, turntable and tuner are sourced from Germany while the cassette deck, DAT player and amplifier are made in Japan. All the equipment is co-ordinated with black aluminium fascias and hardwood end-cheeks. Details include the likes of 'high quality'



*Fine artistry and a line-up featuring DAT from Grundig.*



*See what you're doing: Meridian's readable loudspeaker.*

interconnects with gold-plated phono plugs.

Fine Arts also offers four floorstanding loudspeakers which pay the same attention to

detail in finish and engineering as their electronics. The two more expensive models are 'truncated-pyramid' shaped and feature ribbon tweeters.

## TECHNOLOGY

### FINIAL FINALE

The Finial *Laser Turntable*, expected to be launched at the Las Vegas CES in January, has been shelved as too expensive to produce.

Production costs of the turntable, which reads conventional vinyl records with a laser beam, have soared during its five-year development. With another two or three million dollars needed, the research bill

(about \$6m so far) has given Finial cold feet; the company shelved the project a week before its official launch.

Dennis Wratten, of Acoustic Gold, who was to market the turntable in Europe, said that Finial were now likely to sell the technology to produce the *Laser Turntable* to a major Japanese firm. "The extra money for development would be peanuts to someone like Sony who may be interested in producing it for prestige purposes," said Dennis.

Finial's original price projections for its turntable were \$2500 in 1986. The figure rose to \$3800 last summer but at CES in Las Vegas the company said it would have to triple that figure to make a profit on the project.



*Stillborn: Finial has no baby.*

However, even at the corresponding import price of around £10,000 Mr Wratten felt he could have sold "some" turntables. "As it was I could have sold a thousand immediately," he bemoaned.

Talk of a conspiracy (some commentators have smelt rats over the Finial saga) was vigorously denied by Dennis Wratten. "The people who run Finial are oriented to the market," he said, "the numbers they could sell at the new price just doesn't justify a good return."

The 35 Laser Turntables already made by Finial will not be sold to the public – the company apparently feels it cannot offer any service back up. For Acoustic Gold it means another potentially lucrative springboard has collapsed; Mr Wratten's New Year was spent cancelling meetings with European suppliers. "I was extremely brassed off, it was a case of: Happy New Year Dennis," he commented sarcastically.

## RECORDABLE CD – ON THE BACK BURNER

The first recording CD players, expected in the UK this summer, will be treated the same way as DAT players, and therefore only available for professional use. The technology to record onto 'blank CDs' has been developed by the Taiyo Yuden Company of Japan (manufacturers of That's tapes) who will also sell software under the That's brand here.

At the time of going to press a manufacturer for CD-R machines had not been decided but it will almost certainly be one of the big household names. Taiyo Yuden has developed a low power laser machine which will record onto blank discs by creating a pattern of pits in their surface. The WORM (write once read many) disc can then be read by any conventional CD player. The machine was described as looking like a 'bulky CD player' by Ginny Goudy for That's. It will cost around £700.

That's CD-R will be available in both five and three inch discs with corresponding data storage capacity of conventional discs. The cost of a blank five inch disc



will be around £5. However the copyright implications (the music industry regards selling technology like this as incitement to infringe artists' copyright) mean that Joe Public will not be able to buy one in the foreseeable future.

Already CD-R is getting short shrift from the music press although one of its obvious uses is as a cheap way to make limited edition CDs such as promotional copies or custom pressings. Other applications include CD-ROM (Read Only Memory), archive and educational material, games and electronic publishing.

In spite of the cost of software, CD-R is highly likely to cause glints in pirates' eyes and its inception will throw up, and add to, the arguments well worn with the DAT debate; some sort of copyguard system is needed before the man in the street can be allowed to take advantage of such technology. Michel Kains for the IFPI (International Federation of Phonogram and Videogram Producers) agreed that in many ways CD-R represents more of a threat than DAT. Both DAT machines and software have been kept out of wide circulation by manufacturers fearful of record industry reprisals. CD-R uses the widely established CD format which is more marketable than DAT. So far talks between the record industry and manufacturers have not resolved the copyright question regarding DAT and CD-R.

## PRODUCTS

### HIGH TECH CANS FROM SENNHEISER

Headphone specialist

Sennheiser has introduced two new models to replace the HD420 and 430, namely the HD520 at \$59.95, and the HD530 costing a tenner more.

Their technological advances include larger diaphragms, neodymium magnets and, in the more expensive model,

aluminium voice coils which are 50 per cent lighter than copper and said to give the 530 electrostatic-like clarity. The HD520 uses traditional copper which gives the 'phones a warmer sound.

Unlike their predecessors they have fairly large oval ear pieces which rest circumaurally on the side of the head and despite appearances are open backed. Hayden Labs, Chiltern Hill, Chalfont St Peter, Buckinghamshire, SL9 9UG. Tel: (0753) 888447.

*Comfortable improvements from new Sennheisers with the HD520 below.*



## BASS CULTURE

Due to pressure from the American market, where the craving for earth shaking bass is somewhat more prolific than in the UK, Goodmans has developed a subwoofer to complement its Maxim compact loudspeakers. The *b-max*, as it's been unsubtly christened, is a floor-standing reflex design featuring two long-throw 6½inch drivers with an operating range of 30-150Hz. The *b-max* will retail for £99.99 on its own or £169 with a pair of Maxims as the *b-max system*.

For the Maxim-less it will work with any speaker in the £80 to £500 bracket.

## BABY DUAL

Dual is hoping to capture more of the analogue market with a new £90 turntable. The belt driven, suspended subchassis *CS430* will undercut the best-selling *CS503* Dual turntable by £25, but Dual sees this as falling in line with the corresponding drop in CD player prices.

The *CS430* looks like its big brothers but features a new two-part plinth made of high density fibre board. Other 'hi-fi' features include adjustable anti-skating, micro ball race bearings and a plug-mounted remote power supply. An Ortofon/Dual *DMS245* cartridge is included in the price.

*Dual's answer (below) to fidelity on a shoestring.*



*Bangalonga Goodmans: stick your head in this Gus.*



## QUANTUM LEAP

A range of truncated pyramid style loudspeakers made by QLN of Sweden are being distributed by the Scottish firm Quantum Audio. Four loudspeaker systems, priced from £450 to £1,200 are marketed under the Quantum Audio name. The more expensive models, the £900 *Piccola* and the £1,200 *Signature* are finished in real wood veneer and have been newly developed for Quantum. Two of QLN's existing designs, the £700 *QLN1* and conventionally designed £450 *QLN2* are made from Q-board.

John Carrick (ex Ariston MD), for Quantum, also told *Choice* that he planned to launch a new upmarket turntable this summer. Quantum Audio: PO Box 26, Kilmarnock, Scotland. Tel: (0563) 71122.



The Slate range (not if you're recovering from a hernia).

## BODY BUILDING HI-FI

Slate Audio, which makes money selling unbelievably heavy loudspeaker stands of the dense metamorphic rock, has come up with an amplifier support and equipment table. For floor-siting power amplifiers the £149 *Amp Slab* is described as a self-levelling stable platform which benefits performance and ventilation. The £99 *Table Slab* is marketed as suitable for heavy turntables and equipment and is also supposed to improve performance. You can add £6 for the above in white marble, or order something bespoke from the firm's sculptors. Slate Audio, Leighton Buzzard. Tel: (0525) 384174.

## A ONE LEGGED FOUNDATION

Foundation Audio is well-known for its beefy, heavyweight speaker stands, so it comes as a surprise to see that the company's latest stand, the *Concord*, is a very discreet monopod. In fact, compared to usual standards it's positively domestically acceptable, even down to the £39.95 price tag.

The theory behind the design is that the phenomenal pressure on the single spike gives excellent mechanical earthing. Quite where this leaves all the other parameters of stand design is not immediately obvious but if Foundations' MD Cliff Stone says they work they probably do.

Foundation is also now marketing speaker stand filler to be used with any fillable stand. A complete kit including instructions will retail for £18.99.

And finally, because of the apparently very good reliability of its tube preamplifiers Foundation has introduced a five-year guarantee on all parts, except the valves which are covered for six months.

## STICK OF ROCK

Beach and bikini friendly, the new £20 *Styler* stereo radio from Ross is available in a variety of fun colours. The FM/AM *RSR 281* is battery or mains operated and lists a headphone socket and soft wire FM aerial among its features.

## MOSFETS FROM DIESIS

Continuing the trend for budget MOSFET amplifiers Diesis has introduced the £169 *DA310*. This minimalist integrated amplifier produces 40watts per channel and has internal switching to allow for bridged mono operation when combined with the Diesis *DA300* power amp.

The *DA310* incorporates a headphone socket, phono (MM), CD, tuner, tape and auxiliary inputs. The *DA300* uses the same MOSFET technology, 1 per cent metal film resistors and toroidal transformers as the *DA310* and is due to retail for £149.

on a cube design with an upward facing mid/bass driver and forward facing tweeter, the advantage being that the bass unit cannot create fore and aft movement of the cabinet, giving the tweeter a more constant reference point to work with, not unlike the suspended tweeter on the Roksan *Darius*.

This principle is extended in the two latest models, the *Cubix* and *Cubix Pro*, which are like stacked cubes with a forward and sideward firing tweeter. In the *Cubix* (£1,100) you get one internal upward firing mid/bass unit and in the *Cubix Pro* (£1,800) you get two. According to NVA this doubles or triples the

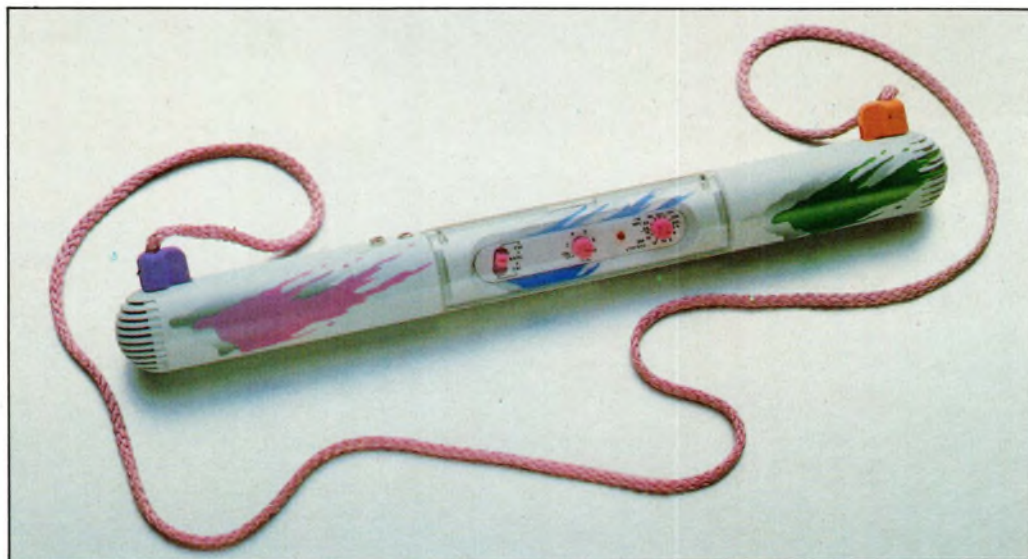


Another budget MOSFET - from Diesis.

## NVA CUBIXED

Primarily thought of as an amplifier manufacturer, NVA has been quietly expanding its range with a turntable, speaker cables and now a range of four loudspeakers. These are based

effective mid/bass unit size without the loss of control associated with large diameter drivers. The sideward firing tweeter is to improve stereo imaging and depth between the speakers. Both the *Cubix* models can be bi-amped, but NVA

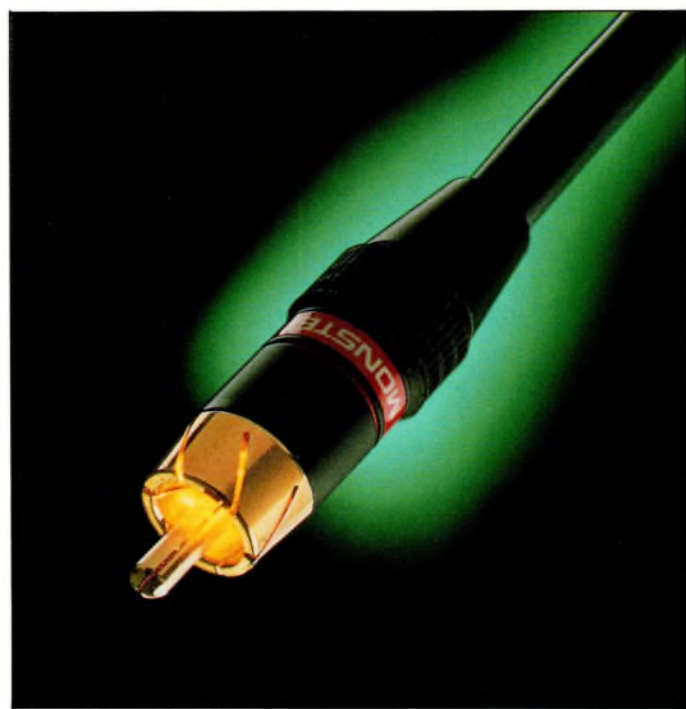


Frequency accessory: wrap a Ross radio in your towel.

stresses that it doesn't recommend bi-wiring. NVA, 1 Church Farm, Hatley St. George, Beds. Tel: (0767) 50532.

## MONSTER CONNECTION

Monster Cable is introducing new gold-plated interconnect plugs this summer. The phono plugs have been dubbed Turbo Connectors because of the little vanes cut in their surprisingly thick metal earth collars. Monster says this type of plug suffers less wear and tear. The plugs will sell for the same price (£10) as present models but the new *Power Drive* (pictured) will put £40 on the cost of a piece of interconnect. *Power Drive* features an extra terminal to take a loudspeaker's negative cable, offering absolute earthing according to Monster.



## CELLO CONTROL

Aston Audio, who recently began importing the Cello range of esoteric audio equipment from the USA, has announced a passive preamplifier for use with the Cello amplifiers. The *Etude Switchbox* offers (line level) control for four inputs, loads of hard wiring and gold plated phono sockets – just what you'd expect for £775. The volume potentiometer, which is the same as that used in the mega-expensive Cello preamplifier, cranks up in 59 steps. Given that the UK price of the *Etude* is the same as Stateside (rather a novelty for high-end hardware) it will surely be a must for Cellists. Aston Audio, Alderley Edge, Cheshire. Tel: (0625) 582704.



*Turbo Connectors from Monster Cable; made in California – where else?*

## NOT JUST FOR FREAKS

Audiofreaks is importing several electrostatic speakers from the American Sound-Lab Corporation's range. Six loudspeakers and two electrostatic subwoofers (yes!) make up the range which is described as being "exquisitely finished and engineered to give a natural sound". One model, the *Dynastat* is a hybrid of electrostatic panels and conventional drivers. Audiofreaks' Branco Bozic hadn't totted up his sums to give prices for the whole range but imagined

the *A3* (middle of the range model) would cost about £5,000. Potential buyers should add the cost of a removal van; most of the speakers are over six feet high. Audiofreaks, 15 Linkway, Ham, Surrey TW10 7QT. Tel: (01) 948 4153.

**BUSINESS**  
**COUNTERFEIT QED**  
QED Audio Products has warned us that certain dealers are selling

inferior speaker cable and passing it off as QED *79 Strand*. QED claims that these cheap copies are manufactured in the Far East and often don't even have 79 strands – the company found one with a mere 48 strands!

The genuine article can be identified by the company's name embossed on the cable, and the same goes for QED's *Flat 79 Strand* which is embossed in gold ink.

## BRISTOL CITY

This year's first hi-fi show will take place at the Holiday Inn, Bristol, over the weekend February 17-19. More than 80 companies (including *Choice*) will be exhibiting at *Hi-Fi 89*. A ten per cent discount will run on most products at the show and there will be many special offers and daily prizes to be won. *Hi-Fi 89* opens from midday until 8pm on Friday and from 10.00am until 6pm on Saturday and Sunday and the entrance fee is £2.

## BADA FORUM

The British Audio Dealers' Association (BADA) looks set to become a more powerful voice within the UK hi-fi industry now that it's allowing manufacturers affiliated membership. Several companies, both British and foreign, have already joined in the move which aims to create an industry forum.

Greater communication between manufacturers, importers and distributors and the marketplace is often called for by dealers, and BADA is trying to open the channels. The forum also gives BADA a stronger and more informed voice from the hi-fi industry as a whole, with obvious long term benefits to the customer.

## IN BRIEF

Hafler has launched its new *XL600 Excelinear* power amplifier at a cost of £995 in the UK. The fan-cooled MOSFET amp produces 305W/channel into 8ohms, is described as having 'tube characteristics' and features the likes of gold-plated in-and-output jacks.

HW International has dropped the Luxman brand of hi-fi separates it imported into the UK. So far no-one has taken on Luxman and for the moment HW agrees to honour any service or warranty commitments.

Havant in Hampshire has a new specialist hi-fi dealer – Compact Music in Market Parade will sell the likes of Albarry, Alexander, QED and SD Acoustics.

Loudspeaker manufacturer Castle has taken over distribution of the Jecklin Float range of headphones which was previously handled by Presence Audio.

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

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



CDP 557 ES

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

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

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

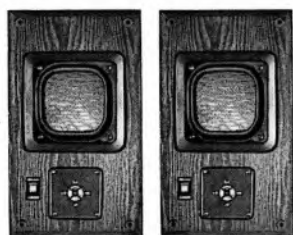
Maybe. But there's definitely no cheating on what goes into our equipment.

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



TCK 700 ES

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



APM 12 ES

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

into three compartments (all shielded), with equal weight distributed on each foot to reduce vibration. The tuner

(What Hi-Fi 'Tuner of the Year' Award 1989) has AM circuitry specifically designed for the UK's medium and long wave bands.



STS 700 ES

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

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

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

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

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



TAF 450 ES

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

**SONY ES**



# Good vibes (without the vibration).

The sound quality of Pioneer's new A-443 amplifier can send shivers down your spine.

But that's where the vibration stops.

The clever honeycomb heat-sink device reduces vibration and thus prevents influence by external noises.

So all you hear is pure sound.

And just listen to these other features:

- Direct path concept (shorter signal path gives less loss of signal)
- "Line Direct" circuit
- Low-impedance driving capability
- Six inputs.

Call Teledata on 01-200 0200 for further information.

 **PIONEER**

Wait 'til you hear Pioneer





# DON'T MISS NEXT MONTH'S ISSUE OF HI-FI CHOICE PACKED WITH IN-DEPTH REVIEWS!



## CASSETTE DECKS ON TEST

Including the latest from  
NAKAMICHI, SONY, TEAC  
and many others.

Our Market Survey investigates the  
dealers' views on the current state of  
the Cassette Deck market  
PLUS . . .

PAUL MILLER LOOKS AT CASSETTE TAPES  
AND RICHARD BLACK PUTS SETTING UP  
YOUR SYSTEM INTO PERSPECTIVE  
PLUS . . .

NEWS, VIEWS, AND MUCH, MUCH MORE.

# HI-FI CHOICE

APRIL ISSUE ON SALE MARCH 10th

## ES SEPARATE STOCKISTS.

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

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

Covent Garden Records, 84 Charing Cross Road

Harrods Ltd., Knightsbridge, Brompton Road

Massey Radio, 117 Chiswick High Road, Chiswick

Nicholls Hi-Fi, 430-434 Lee High Road

PNR AudioVision, 28 Tottenham Court Road

H.L. Smith, 287 Edgware Road

Sound Sense, 350 Edgware Road

Weilbeck Video Plc, 26 Tottenham Court Road

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

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

Bexleyheath Sony Centre, 118 Broadway, Bexleyheath, Kent

Bournemouth Sony Centre, Westover Road, Bournemouth, Dorset

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Barnstable Sony Centre, Holland Walk, Barnstable, Devon

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

Exeter Sony Centre, 15 Paris Street, Exeter, Devon

Paul Green Ltd., HiFi Harpers Furn, 8L, London Road, Bath, Avon

Paul Lawrence, 100 Union Street, Torquay, Devon

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

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

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

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

James Beattie Ltd., Victoria Street, Wolverhampton

Birmingham Sony Centre, 160-162 Corporation Street, Birmingham

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

Derby Sony Centre, 2c Albert Street, Derby

High Grade HiFi, 297 Wellingborough Road, Northampton

Horns, 6 South Parade, Oxford, Oxon

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

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

Mansfield Sony Centre, 14 Queen Street, Mansfield, Nottinghamshire

Northampton Sony Centre, 771 Abington Street, Northampton, Northants

Sounds Expensive, 12 Regent Street, Rugby, Warwickshire

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

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

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

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

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

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

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

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

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

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

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

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

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

Peters HiFi of Chester, 11 St. Werburgh Square, Grange Precinct, Birkenhead, Merseyside

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

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

The Transistor Centre (Wilmslow), HiFi Centre, Green Lane, Wilmslow, Cheshire

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

**Scotland:** Dundee Sony Centre, 18 Union Street, Dundee

Edinburgh Sony Centre, 165 Bonnington Road, Edinburgh

Perth Sony Centre, 38 South Methuen Street, Perth

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

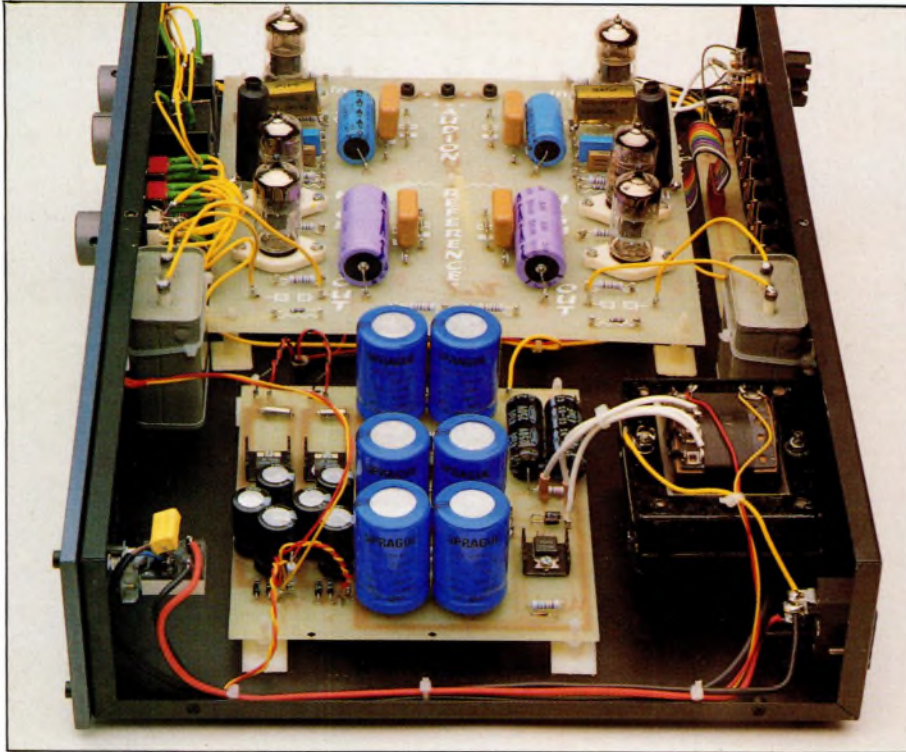
David Stevens HiFi, 1-3 Main Street, The Village, E. Kilbride, Lanarkshire

SONY ES



# CHOICE SESSIONS

*Things we hear . . . This month, the new range of electronics from Audion (they're British, and use valves . . .); SCM50 loudspeakers from ATC (SCM stands for Studio Control Monitor – and they go very loud); speaker stands made by a company called Axhorn (it's into concrete in a big way).*



*Audion Reference preamplifier employs four ECC83s for phono stage.*

## A NEW BREED

*The UK has a new valve amplifier manufacturer called Audion. John Bamford gets a sneak preview of its wares.*

Last autumn's Hi-Fi Show at the Heathrow Penta Hotel witnessed the birth of a new British company called Audion which is based in Brighton on the south coast.

There was some confusion at first, with murmurings that the company's range of valve amplifiers would be manufactured for overseas markets only, but once the fog lifted the facts became clear: Audion would be marketing its products abroad, while UK marketing and distribution was being put in the hands of Surrey-based Audiofreaks, the company best known for importing Kuzma and Oakley gear from Yugoslavia. (Audiofreaks is also UK representative for Empire and Energy, and announced recently that it has also acquired the UK agency for Conrad-Johnson and the legendary Sound-Lab electrostatics which, to my knowledge, have never been heard on UK shores. I've already put my name on the list . . .)

Details as to the background of Audion seem not to be particularly forthcoming, perhaps because I've not been asking the right questions. What I have gleaned is that the company was formed recently by David Chessell, an ex-employee of Audio Innova-

tions (another valve amp manufacturer based in Brighton) and the circuit ideas are not dissimilar to the ones found in some of Audio Innovations' amplifiers. (Surprised?)

What is surprising, though, is that Audion presented itself to the world with not just a product – or a prototype of a product, which is what so many new British companies seem to do – but a complete range of amplifiers, all beautifully finished and seemingly well conceived. There are three preamplifiers, the *Intro* (£749), *Reference* (£1,295), and a £399 CD/Line-only model called *CD1*, and a pair of 24watt monoblok power amplifiers called *Finale* (£995 per pair).



*Gun-metal finish to front panel looks mighty tasty.*

Just before the end of last year end I procured samples of the *Intro* and top-flight *Reference* preamps and have spent a few weeks listening to them in my system with Innovations *Second Audio Amplifiers* (the 15watt triode-coupled monoblok power amps which were reviewed in last October's *Choice*). Needless to say I've been listening mostly to the *Reference* so the more affordable *Intro* I'll discuss in next month's issue. Who knows, maybe in the meantime I'll manage to borrow a pair of the power amplifiers too.

For now, then, the £1,295 top-of-the-range preamp which really is very good indeed. Once installed I was content to let it run and run, so I've not made critical A/B comparisons between it and the Audio Innovations *Series 1000* preamp which normally partners the aforementioned power amps. Once it was warmed up and playing it was obvious that the *Reference* is clearly in the same sort of class as the *Series 1000*, presenting a similarly 'open' and spacious soundstage with superb clarity and depth of image. Preamplifiers have to be really top notch to create that wonderful sense of effortlessness, with no hint of sibilance or electronic glare, and good dynamics; the *Reference* is up there with the best of them and close comparisons with the *Series 1000* seemed unnecessary as the differences were obviously not in the respective preamps' ability but more a matter of cosmetics. For what it's worth, I can tell you that in my particular set-up – I was using Townshend *Glastonbury* speakers, Marantz *CD-65/IISE* and *Rock* turntable with Audio Technica *AT-OC9* cartridge – the *Reference* sounds a little warmer and more polite, with a less detailed but 'sweeter' treble. *Series 1000* is a touch leaner, with a more incisive nature. I'd be hard pushed to choose between them.

The photographs say it all, in that the Audion *Reference* is beautifully presented inside and out. What's really great about it is that this is no tweaky, hairshirt product: it

has full facilities for tape monitoring along with the mandatory phono and CD inputs, line inputs for tuner and 'aux' (a hi-fi VCR, perhaps), a mute switch, a pair of phono sockets alongside the disc input for inserting loading plugs, and a second pair of output sockets should you ever wish to bi-amp your system. The line stage is entirely passive, incidentally, so unless playing records you need not power the unit up. Also, to get the utmost from your record player, the audio signal can be directed from the phono section straight to the preamp's output, bypassing the rest of the circuit.

The controls feel good, the finish is excellent, and it comes properly boxed up. The only thing I've not seen is any literature or instruction book, so for full specifications you'd best contact Audiofreaks on (01) 948 4153. Doubtless a full review will appear in *Choice* in the not-too-distant future; in the meantime it can be said that Audion has made an impressive debut.

## UNDER THE MICROSCOPE

*ATC's SCM50 loudspeakers cost a cool £2,185, but they're everything you'd expect in a near-field studio monitor.*

It's an ironic fact of life that many hi-fi enthusiasts are listening to systems at home that are far superior to the monitoring systems used for quality control in recording studios and mastering suites.

Half the professional engineer's problem, as I see it, is that he/she insists on listening at such high sound pressure levels that qualitative judgements become impossible. If the monitoring loudspeakers in the studio go bloody loud without distorting or breaking up, and for as long as they continue to do so year-in-year-out without the drive units burning out, then for many engineers that's good enough. If only they turned the volume down, they might be able to hear that the systems they are using actually aren't at all informative where it counts. If they listened more critically and asked questions such as, "Does that recorded cymbal sound like a real cymbal?", or, "When we recorded that jazz combo the piano was over to the left and about three feet in front of the drum kit - does it still sound that way?", they'd soon come to realise that the majority of systems they use are seriously corrupting the purity of their recordings. But they don't, so they continue to use them - and since they are using them to keep check on the quality of the recordings we hear at home, it's not surprising that the majority of modern recordings end up sounding totally unrealistic and, in a vast number of cases, awful. The whole thing's a vicious circle.

Of course, it's presumptuous to over-generalise, as there are some professional sound engineers who are in sympathy with the hi-fi buff's ideals, engineers who know when reproduced sound sounds close to real music and when it doesn't. Many of them use ATC monitoring loudspeakers, manufactured in Gloucestershire by a company called Loudspeaker Technology.

The company has been manufacturing ATCs since 1974 and currently employs 18 people. Supertramp was one of the first groups to use ATC drive units in its PA rig, and since the early '80s, starting with Elton John, ATC monitoring speakers have found

their way into over 100 recording studios worldwide. More recently the company has sold systems to some classical people, including Nimbus Records and the BBC.

Full-blown monitoring systems for professional studios cost upwards of £5,000 plus installation charges, while even ATC's smaller 'domestic' speaker systems don't come cheap. The base model, which is the one I've been listening to at home during recent weeks, is the *SCM50* priced £2,185, a three-way enclosure with forward firing port which measures 28 inches high by 12 inches wide and 15½ inches deep. ATC also makes an active version called *SCM50A* with on-board MOSFET power amplifiers, which at £2,990 seems very good value in comparison. Regular readers may remember a pair of these active '50s featured in *Aspirations* in our September '88 issue, when we visited the home of Tony Scott in Milton Keynes.

For those with stately home-sized drawing rooms ATC also produces the *SCM100* (£2,875) and *SCM100A* (£3,400) passive and active models about which I can tell you nothing - other than that they're bigger than the *SCM50s*, of course. All the prices quoted here are for standard textured black finish;



*The formidable ATC SCM50. Crossover panel can be removed for active conversion, thus making it a SCM50A.*



add £250-£300 for hand-finished real wood veneers and a further £200 (or £300 in the case of the *100* models) for high gloss 'piano laquer' finish which can be done in black ash, rosewood, satinwood, yew or ebony.

So why does a not particularly large, three-way passive speaker like the *SCM50* cost so much? The reason is that all ATC speakers are made by hand, paying meticulous attention to fine detail. The centrepiece of all ATC speakers, so to speak, is the company's 75mm soft dome midrange driver with a voice coil consisting of a single layer of edge-wound copper ribbon to a length of 3.5mm so that the coil always remains within the 5mm gap of the magnet. This gives the speaker enormous power handling capabilities combined with low distortion and good sensitivity. The company claims unrivalled dispersion characteristics for this driver, something borne out when you come to hear the speakers. Stereo is everywhere in the room, even when you're listening way off-axis.

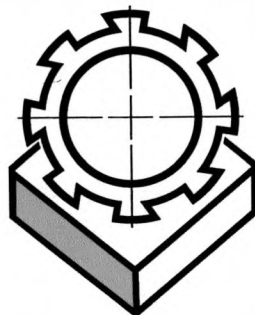
The bass driver is also an ATC design, a 225mm (9inch) woofer with a 10mm coil operating in a 20mm long magnetic field, the Audax-sourced 25mm soft-dome tweeter being the only part of the speaker not made in-house. The cabinets are of high density MDF, heavily braced and damped, and obscenely heavy. The speakers come with open frame steel stands which are not spiked; even though the speakers weigh a ton, I suspect the addition of carpet-piercing spikes could prove beneficial... for the sound if not the floor.

What you get for your money is a loudspeaker which is literally unbreakable and capable of ear-shattering sound pressure levels. Nothing I could do to the *SCM50s* caused them any sign of distress, the sound always remaining clean, taut and controlled. They are also superb at resolving low level detail, with immaculate integrity through the midband which allows you to hear fine details which you probably didn't know were on your records. Most surprising is that they manage this without 'shouting' detail in an overly-bright 'hi-fi' sense.

All things to all men? Well, not quite. The folks at ATC claim their speakers to be unrivalled in terms of low distortion and accuracy - as well they might be - but seem almost unable to comprehend that different listeners might be looking for different things in hi-fi systems. For my own part I'm looking for the loudspeakers literally to disappear; in my 25feet long listening room my primary aim is to create an illusion of musicians performing at the far end of the room, a feat which I concede is next to impossible to accomplish. Nonetheless with some speakers I do get close. Maybe the *SCM50s* just aren't big enough to create lifelike images of real musicians. Whatever, there's no escaping the fact that for all their sonic integrity they still sound like a pair of loudspeakers hung on the end of a hi-fi system.

These ATCs provide a different kind of listening experience, one which many hi-fi enthusiasts used to listening in the near field (say 10 feet away from the speakers) will doubtless be used to. What you get is a very matter of fact presentation, extraordinarily detailed, like you're inspecting the recording through the eyepiece of a microscope. This is equally valid, of course, and I'd hazard a guess that the *SCM50s* are better at it than

**IF ROKSAN  
PRICED THEIR  
EQUIPMENT ON  
PERFORMANCE  
YOU WOULD  
NOT BE ABLE  
TO AFFORD IT !**



**ROKSAN**

**JOIN THE COGNOSCENTI**

most listeners have experienced even in their wildest fantasies. Subjectively they are seamless through the frequency range, while the enormous headroom afforded by the seemingly limitless power handling gives the sound a marvellous sense of ease and 'control'. They do cost a lot of money – but in this world you get only what you pay for.

Doubtless if more engineers used monitors like these ATCs for assessing the quality of their recordings, we'd all be better served with improved software. We live in hope.

## OUT OF THE MOULD

*John Bamford treks deep into the Welsh countryside, returning with tales of giant horn loudspeaker systems and concrete speaker stands.*

The roads gradually become quieter as you drive through the town of Llandeilo, Gwent, and onto the small village of Llansawal. Pass through Llansawel and the highway soon becomes little more than a country lane.

"Living here, in the depths of the Welsh countryside could be a peaceful sort of existence," I mused, as I followed the road on my first visit to Axhorn Loudspeakers. Fortunately I had explicit instructions on how to find the place, because if I thought the dwellings on the outskirts of the village somewhat off the beaten track then clearly I was not prepared for the remoteness of the Davis' home, a converted farmhouse with various outbuildings where Fred Davis runs his Axhorn business. The farm is a good couple of miles off the lane, up a loosely surfaced Forestry Commission track which winds steeply up into the hills. Finally you pass through fields, gates, and across a couple of cattle grids before journey's end.

Axhorn is all about huge concrete horn loudspeakers designed primarily for outdoor public address applications – sound systems at sports arenas or racing tracks, for example. Or, if you're well heeled, music around the outdoor swimming pool and barbecue patio might seem a civilised proposition, a proposition for which Axhorn enclosures are designed to cater. Concrete isn't damaged by the weather, of course, and when it begins to get a little grubby you simply hose it down and set to with scrubbing brushes.

The reason for my visit to Axhorn was to hear Fred Davis' home installation. Ten years ago his house was little more than a cow shed, so it has been built literally from the ground up, the main living area having been built to accommodate two 16ft long horns which extend beneath the concrete floor. The mouths (16sq ft) of the horns are under window sills in adjacent walls at 90 degrees to one another, listeners sitting around the centre of the room for hearing stereo.

The thing about horns this size is that they are efficient beyond imagination. Sensitivity of Fred's sixteen-footers is around 102dB for one watt measured at a distance of one metre, so a couple of watts of amplifier power is all that's needed to produce ear shattering sound pressure levels in his lounge. Fred uses a pair of old Quad II valve monoblocks and Hafler preamp to drive the system, fed by an ageing Linn *Sondek/Ittok/Azak* combination which has seen many years excellent service but was still going strong last time I was there.

Horns this size produce a sense of scale

well beyond the bounds of conventional hi-fi systems. Hearing a few well-recorded live rock albums was as close as I've ever got to experiencing that sense of 'being there'. Such is the effortlessness and dynamic impact of the sound, while the sheer size of the image means that heavily processed multitrack recordings are reproduced seemingly one track at a time. Cosmetically the sound often leaves much to be desired when recordings are put under a microscope with such high magnification, but the resolution of detail is undeniably breathtaking.

It's almost three years ago since I first heard the Axhorns, and there has always been a promise of a 'sensibly sized' modular standalone concrete enclosure for music enthusiasts with good sized living rooms – but it's still under development. In the meantime, Axhorn Loudspeakers' business continues to focus on public address work and specialised home installations where customers are willing to part with upwards of £7,000. In return for this princely sum a small team of builders removes walls, floors and anything else necessary to construct a giant pair of horns within the infrastructure of the living room. They put your house back together again too, of course.

While developing a free-standing horn enclosure, and experimenting with various forms of concrete to provide different damping properties and various finish options, Axhorn has meanwhile produced a concrete loudspeaker stand for conventional loudspeaker enclosures. Eagle-eyed visitors to last autumn's Penta Hi Fi Show at Heathrow airport may have spotted them underneath a pair of Acoustic Energy *AE1*s in the Deltec Precision Audio demonstration room. And very good sounds they were making in there too.

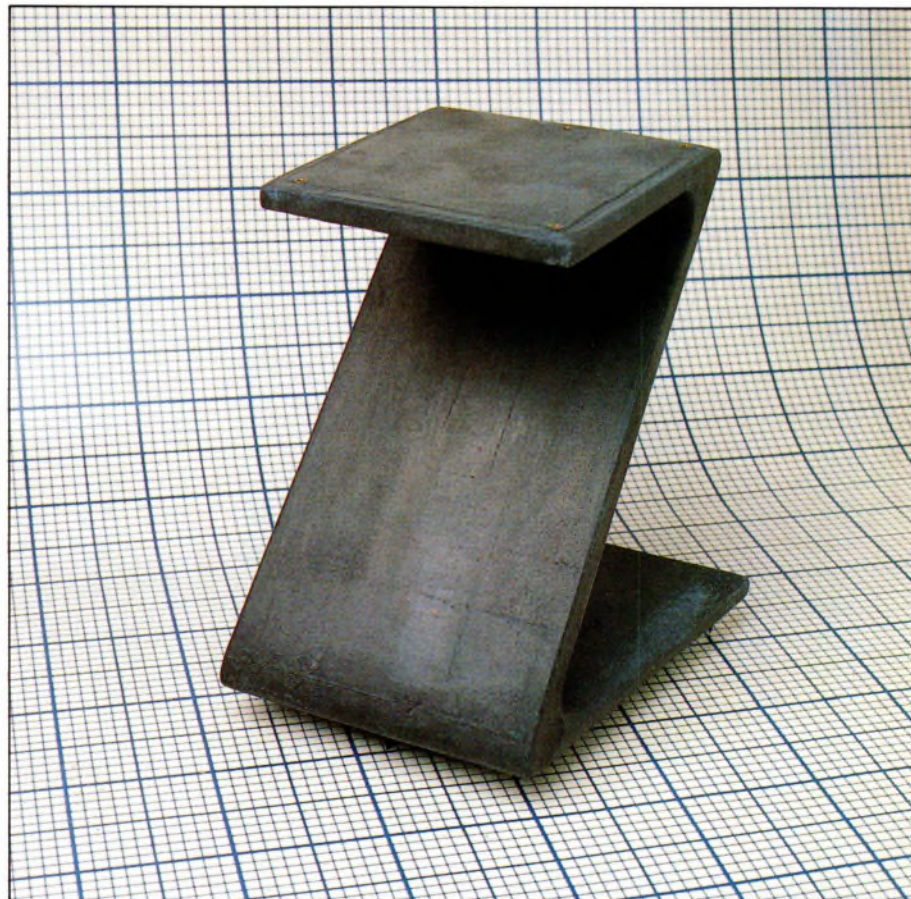
During recent months I've been playing around with these stands myself, using them to support speakers as diverse as ATCs, Yamaha *NS1000Ms* and JBL *L60Ts*. The *Z Stands* as they're known are cast in concrete, reinforced with short strand glass fibre, while a polymer additive gives the concrete a 'sheen' finish. Threaded inserts top and bottom allow for upward and downward facing spikes; the stands are extremely heavy and rigid, and they're available in three sizes: 12, 15 and 18 inches high.

The performance of various stand/speaker combinations is unpredictable at the best of times. However, in my listening room which has a solid concrete floor and with all the speakers tried I found a common trend with the *Z Stand*. Quite different to the kind of over-damped, dry, 'sat-on' quality which can be manifest by some heavyweight column stands in some systems, I found the Axhorns made the speakers sound quicker and lighter on their feet. Bass became a little leaner and better defined, the overall effect being one of sharper focus and improved clarity throughout the frequency range. Whether or not they'll improve your system depends on what your system is doing right now; if you're suffering from soggy bass the *Z Stands* could be just the tonic needed.

I couldn't help but be impressed – and the nice thing is they look decidedly different too. Prices when they reach the shops early this year are likely to be around £120 per pair – not cheap, but they have got style.

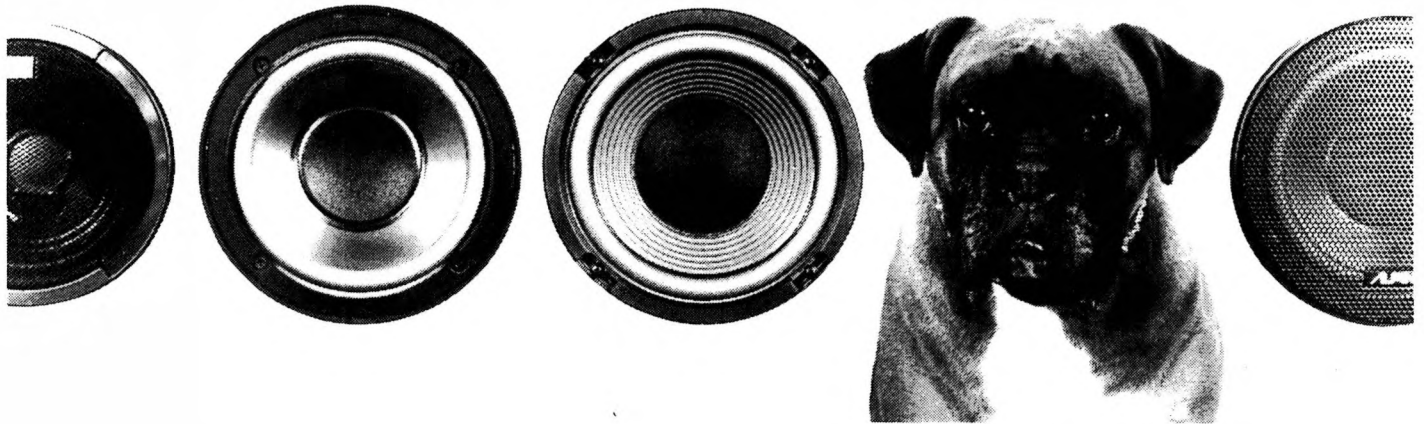
For further details contact Fred Davis at Axhorn Loudspeakers, 'Esgair', Llansawel, Llandeilo, Dyfed, Wales SA19 7PE. Tel: (05583) 559.

And if you ever think of paying Axhorn a visit, make sure you take a good road map with you.



Glass fibre-reinforced concrete (GRC) forms the Axhorn Z Stand.

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# READERS WRITE CHOICE ANSWERS

## AN OBSCURE AMP

About eighteen months ago I decided to buy myself some hi-fi equipment. However, like many a virgin buyer I was attracted to the 'flashing lights brigade' and duly set off to Tottenham Court Road (an unnerving experience). I left with a system comprising Technics SLP220 CD player, SU500 amplifier, RS T22 cassette deck together with Mordaunt-Short MS25 loudspeakers on Target stands. Compact disc is my primary source and I'm fairly happy with it, but I've scraped together £180 from my grant to spend on upgrading the rest of the system. I think the amplifier is the weakest link in the system, so your Amplifier issue (September) came at just the right time. Opting for 'British is best' I shortlisted three amps; Mission Cyrus One, QED A240CDII and the Creek CAS4040II. This time around I visited dealers mentioned in the *Choice Dealer Directory* and found it a very enjoyable experience. I was given good advice, good demos and didn't feel under any pressure to buy. But I found it hard to decide which option to go for and to confuse things further one dealer strongly recommended a Sugden A25 (£160). A what? I've never come across this company before and looking through back issues of several magazines I could find no trace of it. The A25 certainly sounded fine but I would be interested in getting some information about it from a neutral source such as yourselves.

IAN MITCHELL,  
LONDON

*We have tested Sugden products in the past but the company has maintained a low profile recently, adopting the predominantly English attitude of 'no publicity is good publicity' and I guess it gives the company a kind of cult appeal. What reputation it does have, as far as sound quality is concerned, is quite healthy though and the fact Sugden has been around for something like 20 years gives it much credibility. If you find the A25 sounds better with your*

*speakers than the alternatives then there's no reason not to buy one.*

## VOLTAGE VARIATIONS

I am planning on investing in a new hi-fi system. I have a good idea of what I want and how much I want to spend. I intend to buy a Linn Sondek LP12 turntable and have decided on Musical Fidelity MC-2 loudspeakers. My problem is that my job by its nature means that I must often move from country to country. Essentially I need equipment which will work with both US/Canadian and European voltages. Linn tells me I will have no problem using a turntable bought in Britain in the US, and that it will require just a minor adjustment. The speakers will, I believe, require no adjustment. My problem is really with the amplifier. Are there any dual voltage amplifiers on the market? Or, are there amplifiers available in the UK which can be easily converted (or reconverted) if necessary to function on both 110 and 240 volts? Is there any product that you would

especially recommend? My budget for an amplifier is approximately £400.

JOHN CONNOLLY,  
FRANKFURT, W. GERMANY

*The majority of audio electronics manufactured in the Far East feature quite simple switching for the two voltages you require but, according to an engineer at Mission Electronics, in the long run this can have deleterious effects on current supply. Rotel amplifiers feature a variation on this where they use two 110 volt transformers which can be doubled up or used singly. This adjustment needs to be carried out by an engineer but is quite simple and quick. They also manufacture some respectable pieces of equipment including the powerfully specified RA870BX integrated amplifier, which gained a Recommendation when we tested it and retails for £325. Other British models offer better sound quality at the price but none as far as we know offer a dual voltage capability.*



*Rotel RA870BX: changing from 240V to 110V is a ten minute job for an engineer.*

## TRACKING TROUBLES

I have encountered the following problem with my Marantz CD56. I have three discs which behave strangely when my player has warmed up (details given of three innocent looking CDs) but if these are played shortly after the player has been switched on there are no problems. Once the machine has warmed up (after one or more discs) it will not play the first track but will play the rest if that is bypassed. Sometimes the player does not accept the disc at all. I've tried cleaning the discs but this doesn't seem to help.

I have several other discs that cause no problem and I took one of the apparently dodgy discs back to the shop, where it played normally. Do you know what is causing this and is there any cure?

M. C. DONATI,  
LONDON, NW3

*We passed on this unusual query to Eric Kingdon at Marantz and he suggested that it could be caused by a minor set-up error in the machine. If you either drop it in to Marantz directly (Tel. 01 697 6633) or do so via your dealer, Marantz will*

*correct the fault. The reason for it is that when the components of the disc drive warm up they change size and position, only by a few microns, but enough to affect tracking of the innermost track (CDs play from the centre to the outside) if the machine isn't correctly set up.*

## IRISH CHOICES

My first copy of *Hi-Fi Choice* has given me the urge to up-date my system which consists of JVC turntable, tuner, cassette deck and amp purchased in 1978, and Leak Sandwich loudspeakers which must be some ten years older.

I want to add a CD playing facility and am faced with the options of buying a new system such as the Technics X950 which you Recommended recently, or finding a CD player that will be compatible with my present set-up. I have no way of comparing my JVC equipment with a more modern system and the speakers would, I expect, be surpassed by most modern transducers. Have you any advice?

TONY RODGERS,  
LIMERICK, EIRE

*You can use any CD player with your present system by connecting it to the aux socket on your amplifier, and the chances are that it will sound better than a new midi system. Use the Directory to find a CD player of note and we'd suggest you opt for something in the £250 price range as your system will have difficulty revealing the improvements that a dearer model can achieve.*

*If you want to upgrade your system once the CD player is up and running, try out a new amplifier. Look for ones that achieved the Best Buy rating in the Directory – the Mission Cyrus One, Creek CAS 4140 and QED A240CD are all fine examples.*

## STANDING ALONE

I would very much appreciate your advice on selecting some speaker stands for my Rogers LS6 loudspeakers. I was all set to buy a pair of Foundation 15S stands when I read in *Choice* that the

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**MUSICAL**  
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LS6 should be 'on open stands in free space'.

Looking back to issue 58 where you tested speaker stands I see that you recommend Heybrook *Point 5* and QED *TS22* and Origin Live *Tristands*. The *HBS1* and *Tristands* are too large for my room and I would be interested to know if the other two represent an improvement on the Foundation stands I had previously chosen.

KEITH WILDING,  
BRAUNSCHWEIG, W. GERMANY

*We are not familiar with the Foundation model that you mention but would hazard a*



*Which stand for the Rogers LS6?*

*guess at it being a weighty single or double pillar job. If this is so and the pillars are either filled or can be filled (with sand and/or lead) then it should prove a very effective speaker stand. The sonic effect that a given speaker stand will have depends on the loudspeaker it's supporting and the floor type that it sits on, and of course the mechanical connections at each interface. When Paul Miller carried out the speaker stand tests he used a wooden floor and interfaced the stand with spikes on the bottom and Blu-tack at the top. He found that both the very heavy single and double pillar stands and the very rigid lightweight stands worked well under these circumstances but that effects were subtly different with each. Obviously it would be preferable to get some sort of demonstration with a pair of LS6 speakers, but failing that, go for the ones that double up as weight training equipment!*

## ALTER-NAIT-IVES

I read with interest your September issue featuring amplifiers. I am the proud owner of a Linn *Axis/LVX + /K9* gramophone player, Mordaunt-Short *Pageant II* loudspeakers and an Akai *GXC390* cassette deck. I'm looking for a suitable amplifier - I've tried out the Naim *Nait* and love its bounce and sparkle but find it hard to live with its minimalist style. I use AKG *K240* headphones and therefore need an appropriate output; I also require listen/record facilities. I was thinking of going for the Audiolab *8000A* but KJ West One says it will give a very different sound to the *Nait*. Apparently it could sound very dry and maybe a bit flat, and my local Linn dealer echoes this. An alternative is the Arcam *Delta 90* which according to KJ fits sonically somewhere in between the *Nait* and *8000A* but doesn't have the dedicated headphone amp of the latter. I know my ears will have to be the final arbiter but I am torn between these two alternatives. Which do you think will sound most like the *Nait*?

BARRY J. BUCK,  
IMPINGTON, CAMBS

*We have reviewed both the amps you are suffering so much angst over and on the sound quality front the Audiolab was definitely preferred. But what you say about your ears being the final arbiter is very true and you will have to compare these in your system or one very much like it. We haven't reviewed the Nait 2 which makes it difficult to say which it sounds like, but personally I'd be surprised if either of them came close. As if you need it, there is another alternative in the black form of the Rotel RA 870BX which rated marginally higher than the Audiolab and has comprehensive facilities, but not the powered headphone output.*

## BABY FORCES UPGRADE!

For about 13 years I have been very happy with my stereo system, but recently my two year old son decided that the SME/Stanton *EEE* combination was a bit old and removed it from the deck! Unfortunately, he used a rather well developed right hand in preference to a Philips screwdriver and left me musicless. Amazingly my insurance company will reimburse me for

the cartridge and arm but I am wondering about changing to a Dual *505 II* as suggested in the 1986 edition of the *Collection*.

I'd be very glad if you would clarify a couple of points not covered in the review. It states: "Turntable would be the Dual *505 II*, preferably the *Deluxe* as supplied complete with cartridge..." How and why is the *Deluxe* preferable and what cartridge is fitted to this deck? Is it a Dual product or do dealers simply fit a needle of their choice?

Given that I find the sound from my present system, which includes the aforementioned arm and cartridge and Goodmans amplifier and loudspeakers very much to my liking, would I be similarly happy with a Dual and Rotel *RA820BX* or Marantz *PM151* and my old speakers? It is painfully obvious that I am out of touch with all things hi-fi but I have always loved music and my record collection and can't bear to listen to particular favourites on the *SP25* and Ortofon *VMS3* that I've dragged out as a temporary measure.

MARTIN LADBROOK,  
DYFED

*A good start would be to get hold of our February issue which majors on turntables and arms. All the products you mention have been superseded - the Dual 505 in fact went out of production but has recently resurfaced in Mk 3 guise, and*

*maintained its Best Buy status when Alvin Gold reviewed it for us in February.*

*You don't mention what turntable you have but we would hazard a guess at it being a Thorens of some form, although unfortunately this doesn't make it any easier to say whether a new Dual based system would be anything like what you are used to. The following potential replacements should give you a similar or higher standard of fidelity but they will be unlikely to sound the same.*

*The current 505 is one of the least expensive hi-fi standard turntables and comes equipped with an Ortofon OM10 cartridge, as does its competitor the Ariston Q-deck, and both sell for about £140. For £15 less one can buy the rather more competent but cartridgeless Rega Planar 2.*

*There's also a good array of competent amplifiers in the budget market including the current version of the Rotel RA820BX which costs about £160. Take a look at our product Directory for other options.*

*If you feel ambitious you could put a new arm and cartridge on your old deck (if it still has an armboard!). Something like the Moth/Rega RB250 which retails for £65 would be interesting, although your present SME cut-out may be a problem, so unless you are a carpenter we'd suggest you go for a new player.*



*Dual's 505 comes fitted with an Ortofon OM10 cartridge.*



## ASPIRATIONS

*In the 1000-year-old home of Lord and Lady Ashcombe a Bang and Olufsen link system serenades visitors and family alike. Dan Houston writes; Chris Richardson photographs.*

TO THE

# Manor

BORNE



*Lady Ashcombe, above. The castle billiard room houses the hi-fi.*

Bathed in early morning autumn sunshine and lying in the lap of the Cotswolds, Sudeley Castle at Winchcombe in Gloucestershire is one of *Hi-Fi Choice's* more stately destinations to date. The castle is half home, half showpiece of Lord and Lady Ashcombe, and its original fortified buildings date from the twelfth century. Some of them remain in ruins – reminders of the last war fought on English soil. Much of Sudeley history is that of England itself and visitors are guided around on the theme of: 'A Thousand Years of English History'. The rooms are laid out with furniture of the various periods and are designed to look 'lived in'.

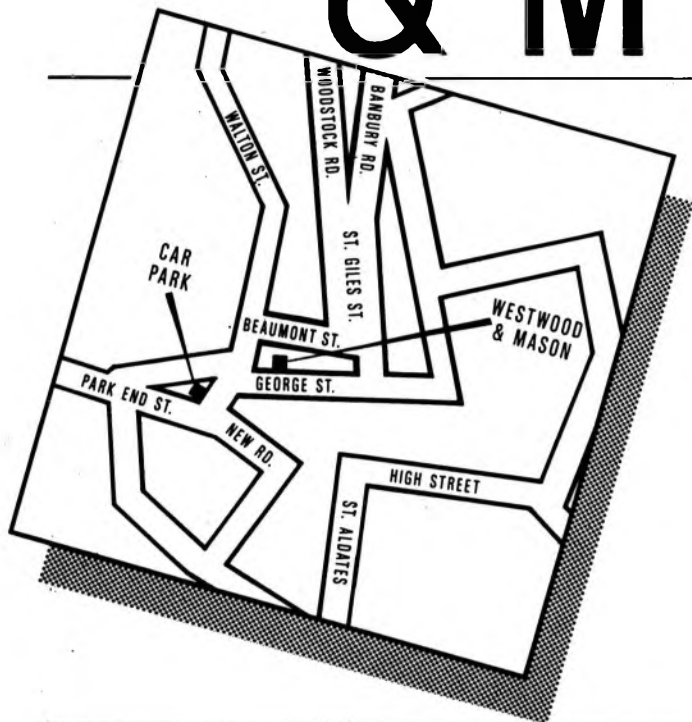
Many of the more impressive buildings were built by a sailor – Admiral Ralph Boteler – who used his share of spoils from the Hundred Years War to create a fabulous residence in the fifteenth century. Sudeley then passed into royal hands under the equivalent of a compulsory purchase order. Richard III was its first royal incumbent and the castle remained in the monarchical limelight through the Houses of Tudor and Stewart. Katherine Parr, Henry VIII's surviving wife, lived here as the Queen dowager, and is buried in the chapel.

However, after the Civil War, during which the castle was a Royalist stronghold and of strategic importance to Charles I, Sudeley was slighted and left in ruins for two centuries. If you say 'two-hundred-





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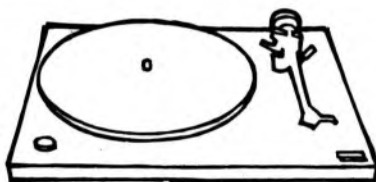
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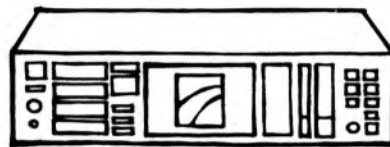
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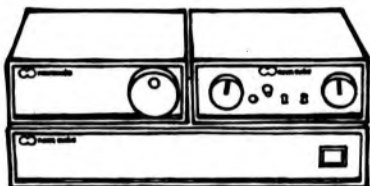
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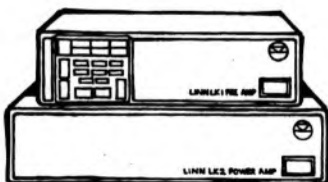
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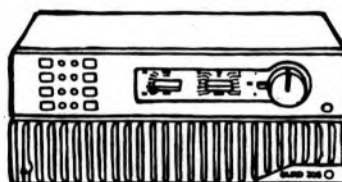
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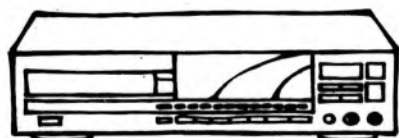
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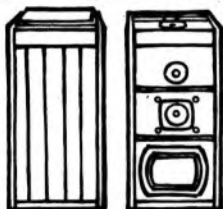
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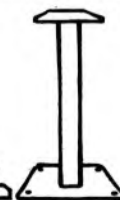
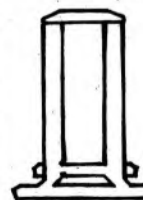
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*From battlements to Bang & Olufsen Sudeley traces 1000 years of (mostly) gracious living. Below, the system can be controlled remotely through these speakers in the drawing room.*

years' quickly it doesn't sound like a long time but in many ways it's amazing that so much of Sudeley was left for restoration in the early Victorian period. Some of the stone and even whole window-casings are evident in nearby Winchcombe where over the years villagers purloined their building materials from the discarded estate.

The next upturn in the changing fortunes of Sudeley was when much of it was rebuilt and made habitable by two brothers from the glove-making Dent family (we're still in the pre-hi-fi era here!).

And it was to a descendant of the Dent

family that the present Lady Ashcombe was married in 1962. She is from Kentucky with a background in fashion design, and many of the present schemes in operation at the castle were her brainchildren. The castle opened to the public in 1970. Mark Dent-Brocklehurst died in 1972 and it was not until 1985 that his widow, now married to Lord Ashcombe, and their family again took up residence.

The family's private quarters, which we have photographed, have largely been refurbished by craftsmen, artisans really, who now work in the various craft shops on



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Or, do we mention that you can listen to anyone from Mozart to McCartney, while someone else in the room is playing the organ? (an unlikely event, we admit, but you never know what turns people on).

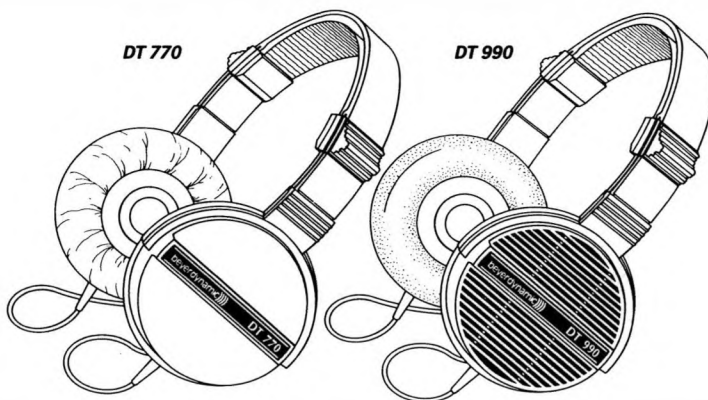
Perhaps we could persuade you that it will go nicely with other status symbols, like your Porsche.

Wait a minute, though, we haven't mentioned the most important thing, yet. The sound.

If we can blind you with science for a moment, here are just a few outstanding features that should help to convince you.

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Expensive? Yes. Worth it? Yes. Every penny.

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the estate. Lady Ashcombe pointed out that although many of the features here look original, they are in fact copies from other parts of the castle. For instance, the drawing room fireplace, was copied from a 15th century one elsewhere. The renovation work took three years and when it was finished the artisans set up a kind of guild at Sudeley – making replica furniture and other items from the castle's display.

Lady Ashcombe explained that the crafts operation further contributed to the economic health of the castle while keeping a core of skilled workers in wood and stone on site. "Selling the Sudeley furniture collection in London and the USA we hope will counter balance the vagaries in the tourism business," she said, "a substantial drop in American visitors was noticed following the Libyan crisis." The hub of activity also creates a real and working atmosphere at Sudeley, while many British houses have ceased to become more than antiquated wedding cakes creating a 'dolls house' impression of the past. Sudeley supports a community.

One of the latest furniture items is a Regency bookcase copy slightly altered to accommodate a modern hi-fi system (or at least a B&O model).

Lord and Lady Ashcombe's system is B&O's 5000 line-up consisting of CD and record players, tuner and amp. Scandyna PCM110 loudspeakers on stands convey the sound in the first floor billiard room while in the ground-floor drawing room the bookshelf-housed CX100 loudspeakers, Link 82 infra-red sensor and lap-portable master control panel make the system remotely operable. The billiard room's hand-carved early 19th century wall (great for acoustics) opens into the public wing of the castle and visitors are serenaded by classical music. This travels surprisingly well and further adds to the ambience of the Victorian bedrooms in that area (though probably not if you play Bon Jovi).

Lady Ashcombe decided to put the main system upstairs, because her son and daughter used it and that room, more. The panelled wall, built in the 1830s is based upon a Tudor design and supports a huge Regency mirror. Sunlight streamed through the stained glass windows from the castle 'quad' onto the 120-year-old billiard table in this masculine room with its hessian flooring and hunting scenes. Bearing in mind that hi-fi is still a grossly masculine pre-occupation it makes more sense to put hi-fi in a room like this, but using the system downstairs does mean a trip to the billiard room if you want to change disc. Another problem in using the system via its downstairs sensor is that the building is 'alarmed' after a certain hour of night – an extra consideration if you're dashing upstairs to play your favourite piece when you haven't actually invited the local police to join you!!

Patience pays with the three-drive-unit CX100s, and they can mildly surprise with



an aggressive delivery unexpected in such a small and almost hidden non-British box. The atmosphere and the acoustics of the room are good; the CX100s certainly don't get lost, and hessian over suspended-flooring, books, oil paintings and the furniture all help soak up any echoes and make it acoustically 'dead'. Not that the music needs to do much work to create an atmosphere; in this room one can sit on the likes of a Jacobean firestool musing the Coronation of Charles I by Reubens or a landscape by Gaspar du Galt.

Much of the furniture here is from Lord Ashcombe's former house of Denbies near Dorking in Surrey – designed by his forbear Thomas Cubbitt. Architecture and its preservation are interests of Lord Ashcombe according to his wife. Many of the other treasures here (and on display) were collected by Emma Dent who lived at Sudeley until 1900. The style of this 'busy' drawing room reflects an eye for the unique, under the du Galt landscape sits a lacquered writing table made in the early 1700s. Exquisitely decorated with flowers and birds it reflects the Chinese influence in England at that time – though it is English.

The *Choice* working-visit to this unique neck of rural England was broken by a ploughman's lunch from the castle kitchen where the scullions do a mean line in peach and kiwi fruit pickle.

This is a home where the furniture and decor are of more important consideration than the hi-fi itself. It would be impudent to disregard such surroundings in favour of a detailed examination of the 5000's workings (in any case the system has since been upgraded). This isn't to detract from the Danish audio giant; we covered one of its all-singing-and-dancing super systems in a recent issue. Here hi-fi is an unobtrusive musical conveyance within the overall aspired aim; that of creating a home, partly shown off, which celebrates centuries of the art in design.

*Finished copies of Sudeley furniture at the castle workshops. (One of the latest ideas is a hi-fi cabinet.)*





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## PERSPECTIVES

*Paul Messenger visits Philips' HQ in Eindhoven to report on the genuine digital amplifiers of the future. What tricks will they be able to perform?*

# Real Digital Amplifiers

Digital audio has now been with us for around a decade – or at any rate available to the enthusiastic and well-heeled amateur prepared to wrestle with video recorders and outboard A-to-D convertors. And compact disc has been busily converting the unfaithful for more than half that time, as it slowly but surely establishes itself as a genuine mass market product. But apart from digitising for storage or transmission, theoretically with negligible degeneration, and then 'undigitising' the signal again for analogue amplification, nobody outside the Pro Sound industry has yet seemed much interested in playing with the digital signal itself.

So far, the only 'digital' devices to appear alongside CD players are a clutch of 'digital amplifiers' whose existence is very hard to justify. The only advantage they offer over conventional amplifiers is the ability to accept digital domain signals from CD players, and so avoid the possible degradation introduced by the connecting cable. It can also be claimed that they allow the owner of an early CD player the opportunity to update his/her DAC (convertor) performance, though this presupposes that the said player is equipped with a digital bitstream output. And given that DAT players are prohibited from receiving digital bitstreams direct from CD players, and that these digital amplifiers do not contain ADCs (analogue-to-digital convertors), there seems very little point. Furthermore, the batch came a collective cropper when assessed sonically by MC for *Choice* recently: only the separate Technics pre-/power combination merited Recommendation, largely on account of its versatile switching and interconnection facilities.

Other 'pseudodigital' components such as the Yamaha surround sound processors and the recently announced Toshiba *XB-1000* integrated digital AV amplifier do seem to have rather more validity than those referred to above. But I describe them as pseudodigital because the surround sound circuitry that is partly responsible for the 'digital' logos does not operate directly on 16-bit PCM (compact disc style) digital inputs; instead comparatively crude, lower resolution ADCs are used to create the basis of supplementary, lower level simulated reverberation that is added in various ways to the basic analogue signal.

All this pseudodigital activity is all very well, but it really only scratches the surface of what direct digital processing can offer. In contrast to analogue, signal processing in the digital domain is (or at any rate should be) benign – certainly as benign as the converting, reading, writing and storage systems. Furthermore, again in contrast to analogue, digital bitstream signals may be manipulated in the time domain, so processing has capabilities which devices operating on analogue signals cannot even approach.

In fact there is some irony in the situation that alongside the introduction of digital signal sources, the other main trend of the hi-fi '80s has been the discrediting and gradual disappearance of analogue signal processing. The upmarket midi system may still be covered in elaborate switching, tone controls, Old Uncle Tom Loudness and all, but even the downmarket separate hi-fi system – especially those aimed at UK enthusiasts rather than global (ie US) markets – are increasingly likely to eschew any unnecessary circuitry in the

interests of simplifying signal paths – by implication (and observation) improving sound quality.

The analogue signal is a fragile and delicate artefact, which at best can provide a near magical subtlety of human, especially musical communication. But careful listening with good equipment shows that even a length of wire or an apparently innocuous passive component such as a switch can introduce degradation in some form or another, particularly to such a rarefied and nebulous creation as a convincing 3-D stereo soundstage.

How important such degradation is seems to vary from listener to listener, and clearly many people are perfectly happy with their midi systems. But few of the people who take their music making equipment more seriously than their washing machines can now be in any doubt that analogue signal processing in all its various forms adds progressive levels of degradation to the integrity of the signal.

A major theoretical advantage of digital audio is that the music signal is mathematically defined in terms of the very basic on/off binary code used throughout computing. This approach may seem very wasteful of bandwidth and does involve some errors of quantisation, but is also inherently 'rugged', particularly when reinforced by error correction systems.

To be more precise the digital 'signal' consists of a series of 'samples' spaced about 1/40,000th or so of a second apart. Each 'sample' consists of a 16-bit binary 'word' which defines the 'quantisation level' of the signal at that moment in time. It's a bit like plotting the original analogue signal on very fine scale graph paper, using the digital words to describe the vertical



*Philips' as yet unnamed prototype gives a hint of what tricks tomorrow's genuine digital amplifiers will be able to perform.*

co-ordinates of the signal as it moves along the paper varying with time.

Simplistically therefore, the digitised audio signal consists of a string of numbers, one every 40,000th or so of a second and each consisting of 16 binary digits. Which is guaranteed to make them difficult to pronounce by human beings, but which also means they share a common basic language with a modern personal computer. While it's true enough that processing data fast enough to keep up with the output of a CD player is somewhat beyond the typical PC, the *modus operandum* is fundamentally similar. And just as the PC can manipulate strings of numbers, it is possible to manipulate the bitstream output of a digital audio sound source.

In fact the very first digital pre-amplifier I came across resembled nothing more than a personal computer, at least in terms of the physical 'user interface', whatever may have been going on under the table. No mention had been made of this then unique device during some days of seminars on ES and CD-I product at Sony's Tokyo headquarters. But presumably that was because it was being readied for a working display at the prestigious annual Tokyo hi-fi show, as an example of future technology.

Being very much a prototype not a product there was no accompanying publicity material – pix or paperwork – and the engineer responsible's command of



*Sony's 1987 prototype digital preamp, looking more like a personal computer.*

English did not match his courtesy or helpful *mien*.

The technology is pretty hairy stuff, reportedly using 32-bit coding internally, while the package consisted of a large, featureless 'black box' about the size of a compact VCR, a small dedicated microcomputer-style keyboard, and a VDU (CTV monitor). This preamp not only provided normal mixing, equalisation and switching, but also a range of functions in the digital domain that are denied analogue by their very nature.

The menu was divided into 'static' and 'dynamic' processing: the former offered various tone control/filter/equalisation

functions of unusual versatility; the latter could vary such parameters as attack, recovery time, pre-delay, and noise gating – definitely something completely different.

In my show report at the time I said I'd be surprised to see UK availability before the beginning of the next decade, though it looks as though Sony may well beat this deadline by a comfortable margin.

In preparing material for this feature, I anticipated receiving some further information regarding the subsequent development of this prototype, and understand that a later version was shown at the '88 Tokyo show, which I did not attend. But at the end of 1988, Sony Japan seemed curiously reluctant to respond to requests for more details, never mind any illustrations.

The reason, it now transpires, is that a major announcement is due to be made 'in a matter of weeks' of an actual commercial product, initially for the Japanese market but with UK availability expected before the end of 1989. With the PR leviathan already grinding inexorably in action, there is no way any company is going to pre-empt a major announcement to help a journalist with a specific feature. In effect, our timing was just a little too good.

Expect therefore the world's first genuine digital amplifier to appear with a Sony badge on it, possibly not long after the ink on this issue has dried. What form it



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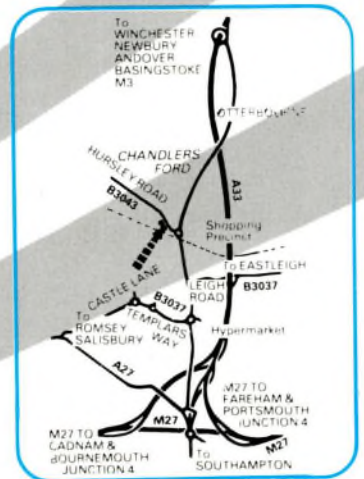
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will take is anybody's guess, given Sony's track record for ergonomic innovation. Although the graphic capabilities of the menu display is attractive, given the potential complexities of the device, I somehow doubt it will look like a PC – front-mounted control surfaces are still a hi-fi essential.

More likely it will have something in common with a Philips prototype which certainly came very close to production and which was widely rumoured back in '86/'87. In the end Philips decided not to go ahead, though 20 pre-production samples of an 'economy' version were produced, looking surprisingly like a conventional integrated amplifier – and even reviewed in a Dutch hi-fi magazine. In the end the project was temporarily shelved for commercial reasons – the amplifier was certainly well ahead of its time, making demand difficult to predict, while the escalating price of DRAM (dynamic random access memory) chips from late '87 must have increased costs.

Philips' unnamed but unquestionably practical – and presumably manufacturable – prototype is so far the best guess yet at what tricks tomorrow's genuine digital amplifiers will be able to perform.

At the heart of the hardware lies an ASP (audio signal processor) chip, which was developed out of experience with the highly successful 16-bit DACs. This integrated digital signal processor is a versatile device that can perform a number of tasks in various combinations with other ASPs and components such as RAM and/or ROM memory. Input and output words can have as many as 24-bits, and the incorporated ALU (arithmetic logic unit) 'adder' has a capacity of 40-bits.

Philips stresses that the applications are the key, and that these must have real validity and usefulness if direct digital processing is to have a future. The prototype that was very kindly demonstrated to me at short notice on a recent (unrelated) visit to Eindhoven incorporates three different forms of processing, each of which fulfils this criterion pretty well.

The first is compression and expansion, on the prototype by factors that range from 0.3X (compression) to 3X (expansion), with adjustable release time too. This operation is widely used in recording and broadcast studios on analogue signals, but results have never been particularly successful by hi-fi standards. In the digital domain there is an initial advantage in that the main signal can be delayed by short-term RAM storage for pre-monitoring, while the process itself is effectively one of simple multiplication (albeit complicated by tricky factors like the need to cope with indivisible quantisation steps). The compression/expansion circuitry consists basically of one ASP plus 64K RAM.

Philips points out some very sound theoretical justifications for being able to compress material, some of which are worth repeating. A large orchestra in a fine



*The Toshiba XB-1000 – one of the 'pseudodigital' amplifiers, but with useful AV interconnection and features.*

concert hall can cover a range from 30dB to 120dB, which is more or less the sort of dynamic range that the CD medium can handle, but which is also distinctly impractical for most replay environments. A range of 40 to 90 or 100dB is more practical in the domestic lounge, though just the 10dB span between 40 and 50dB is the sort of range required when music is used as a background to conversation. In contrast, the car is likely to start with a background noise level of around 80dB, so a maximum dynamic range of about 20dB is most useful here. Being able to adjust dynamic range therefore has some obvious practical advantages, even though the idea may offend the purist; the possibility of creating pre-conditioned tapes for in-car use is particularly attractive to my mind.

The second digital process feature is the addition of reverberation, again in a man-

ner which appears to be significantly superior to traditional analogue techniques. Two ASPs plus 256K RAM are used to simulate 'natural' reverberation patterns which may be adjusted to taste, or by means of four pre-programmed settings.

Whether this facility is as useful as compression/expansion must be a moot point, given that the recording engineer has already made an artistic decision on the reverb. content of a particular disc. But there's little doubt that many enthusiasts would welcome the opportunity to 'adjust to taste', particularly with the current fashion for rather 'dry' recorded acoustics.

Those seeking to recreate the live experience in the home will welcome the capability to adjust reverberation to simulate the sort of acoustic in which a work is most likely to be played, and the addition

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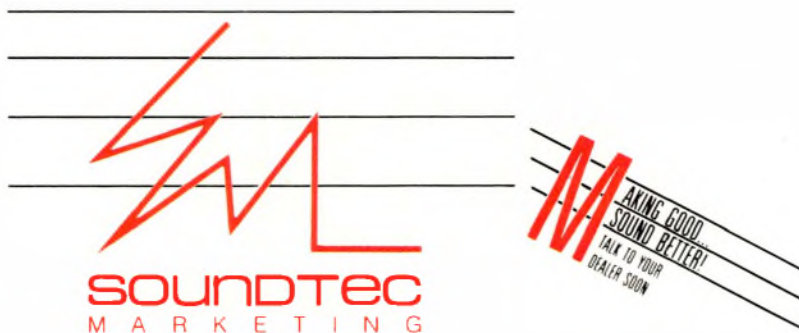
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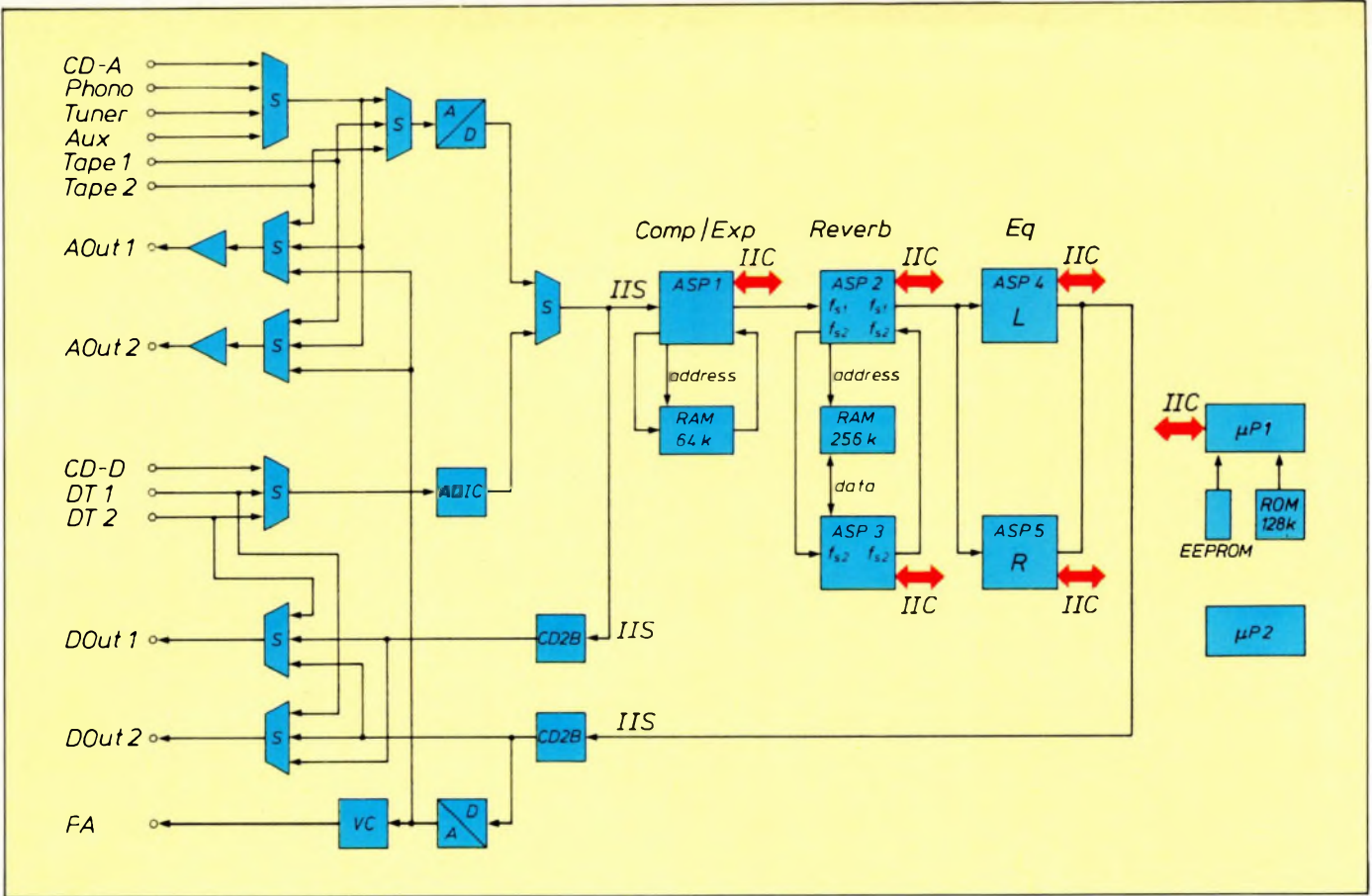
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Block diagram of a Philips ASP-based digital signal processing system. Inputs and outputs (on the left) are converted in A/D (analogue) and ADIC (digital) to IIS digital format prior to selection and processing in five ASPs plus memory, under control of IIC control bus.

of surround sound extra channels is a natural further extension.

The third function available on the prototype is equalisation – the return of the tone control, no less. In fact despite operating in the digital domain the EQ provided in this particular pre-amplifier differs little from an analogue device, the net result consisting basically of a ten-band high quality graphic, albeit with 1/3-octave bands at low frequencies for the fine tuning of room modes. However, more elabo-

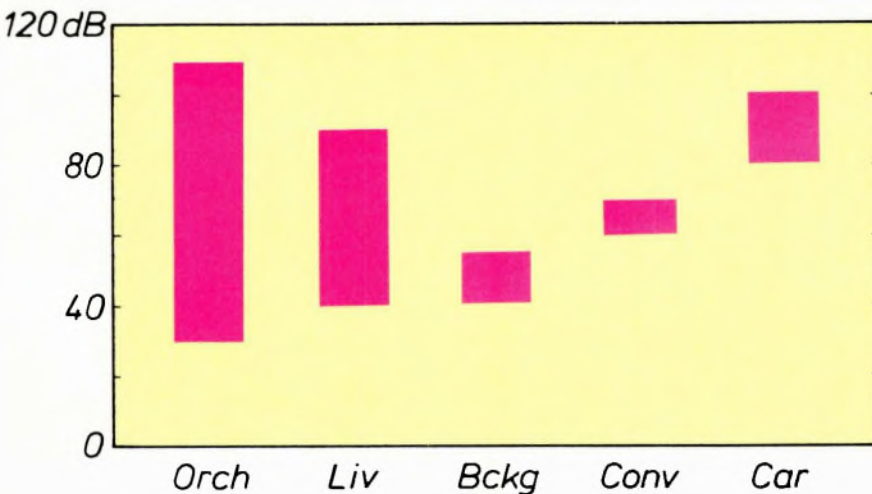
rate and expensive flat-phase FIR and/or variable turnover filters can also be built using the same basic technology, to the point where elaborate pre-equalisation to 'cancel' room interaction effects can be carried out (prior to adding reverberation perhaps?)

Philips also sees possibilities in using the ASP for the suppression of 'tick' removal during replay of substandard vinyl discs, and of carrying out auto-equalisation using, for example, a sensor

microphone built into the remote handset, alongside test signals, to analyse and pre-equalise the room acoustic. Further opportunities for automatic adjustment of dynamic range and loudness compensation may also be envisaged.

I can't see these all-singing and dancing digital amplifiers actually replacing the sort of stripped-down specialist amp that now dominates the enthusiast marketplace, though I think it is more than likely that they will come to be used alongside by many enthusiasts, particularly as prices are sure to come down in time.

If and as more digital sources become available, from satellite broadcast and DAT perhaps, the attractions of digital integration and processing will increase, particularly for the system rather than the separates purchaser. However, as long as loudspeakers and power amplifiers continue to operate in the analogue domain (for the foreseeable future at least), it seems likely that the audiophile product with its emphases on simplicity and vinyl disc replay will continue to play a part, possibly fed from a digital convertor/processor/preamplifier that accepts and plays with the various digital domain signals prior to analogue conversion. And as the quality of affordable analogue-to-digital convertors increases (ADCs are currently something of a weak link), the temptation to digitally process existing analogue sources will also increase.



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## CD-451: Incredible Journey, Bob Mintzer Big Band

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

## CD-453: NY Cats Direct, John Tropea

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## CD-454: Big Notes, Flim & the BB's

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## CD-455: Lighthouse, Billy Barber

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## CD-459: Braziliana, Manfredo Fest

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

## CD-460: Thom Rotella Band, Thom Rotella

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

## CD-461: Spectrum, Bob Mintzer

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

## CD-462: The Further Adventures of Flim & the BB's, Flim & the BB's

The BB's fifth album for DMP and perhaps their best to date. Once



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

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(Tick selections)

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- CD-447: Tunnel, Flim & the BB's
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- CD-453: NY Cats Direct, John Tropea
- CD-454: Big Notes, Flim & the BB's
- CD-455: Lighthouse, Billy Barber
- CD-459: Braziliana, Manfredo Fest
- CD-460: Thom Rotella Band, Thom Rotella
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# MARKET RESPONSE

*In our exclusive market survey Dan Houston polls specialist dealers on amplifiers, bringing you a synopsis of what's selling well and what brands are reliable.*

Whackiest comment this month goes to Brian Peaston of Holborn Hi-Fi, who explained that amplifiers in the Scottish highlands often buzz due to a higher voltage from hydro-electric power. "They hum like the clappers," bemoaned Peaston, "and I've often measured 260 volts from the mains. Amplifiers using toroidal transformers are better but most amps have close tolerances and they overheat and start humming very easily."

Unfortunately, (as far as a good story goes) the Scottish Electricity board could not be drawn to verify the matter and their spokesman Dan Ross told *Choice*: "I don't want to pour cold water on the idea but our supply boards are the same as those in England and power can't vary more than six per cent. With hydro power we barely make enough electricity for ourselves and this year we've been importing from the south to keep up levels."

Market Response this month is based on comment from 42 dealers covering 69 brands of amplifier currently on sale in Britain. The average dealer stocks just over ten brands of amplifier and although a couple boastfully replied they stocked "everything" we don't believe them. Just 16 brands were stocked by more than ten dealers, which shows how divided and individualist the British Hi-Fi retailing scene is.

Estimates on the size of the amplifier separates market vary with BREMA (British Radio and Engineering Manufacturers' Association) telling *Choice* that in the period January to October 1988 there were 293,000 units delivered into shops. This figure compares with 206,000 for the same period in '87 and 189,000 in '86. However, the AGE (Audits of Great Britain Group) told us there had been a slight drop in amplifier sales from 223,900 units in the year to November '87, to 218,000 in the same period for '88. While not wishing to comment on the diversity of the above figures many of the dealers said their sales were up on last

year. We also heard from a couple that they were selling more separates systems than midi systems which was a reversal on previous trends (and would be a triumph for the hi-fi cause if it could be universally proven).

Several dealers remarked on the better quality of amplifiers available now compared to a few years ago. Advances in the component industries have led to more efficient capacitors and the like, and computer aided design has brought previously esoteric principles to a purse-conscious public. Chew and Osborne told us this had produced a "small crop of exceptional budget amplifiers"; and particularly sung the praises of A&R's *Arcam Alpha Plus*.

## RELIABILITY

Sounds Exclusive hadn't had a faulty amp delivered in the last two years. While noting that it only sells the most exotic volume pumps where you'd expect exemplary quality control it's nice to include a 'perfect world' comment. Elsewhere things aren't quite so smooth but amplifiers are among the more

"no problem" dealers keep relaying horror stories about waits and lack of attention. One dealer, citing NAD and Denon as exceptions to the rule, said many Japanese firms (or their distribution bases here) didn't keep parts for amplifiers over three years old and if your amp was over seven years old it was impossible to get parts even from Japan! However, this said things are not so awful across the board.

We calculated that on average dealers could turn repair work around in 2.48 weeks if the amp had to be sent back to the manufacturer and they could usually expect to mend it themselves in under a week if they had the parts. Some manufacturers deal with problems quickly, some slowly. From dealers' comments we calculated Mission, Quad, A&R Cambridge, Linn, and Naim as fast companies while Sony (average 11 weeks), Marantz, Denon and Rotel excited comment for being slow.

We asked dealers to name their most reliable and unreliable brands and calculated the results on a points basis.

in terms of sound quality. Dealers are, after all, listening to equipment day in day out in similar surroundings and are perhaps best placed to comment on any changes (for good or worse) that occur in equipment ranges. However, dealers have become more and more reluctant to give us their opinion on this matter – many told us that everything always sounded the same. From the paucity of comments we did receive, Quad came out top for consistency, followed by A&R, Mission, Naim and Rotel. The only two companies attracting more than one comment for inconsistency were Rotel (again!) and Musical Fidelity. Without wishing to appear too disheartened it is likely that rain will stop play on this topic in future as it is becoming too difficult to umpire with any meaning.

## MARBLE SLABS

Everyone accepts that loudspeakers sound better on isolation stands, turntables ditto. However, many dealers told us that amplifiers should be properly isolated as well for 'that better sound'. The advice was especially stressed for valve amps and preamplifiers which can be microphonic in nature. Isolation platforms come in different guises, from the Target-type equipment tables to platforms such as those made by Mission and RATA. Zeus Audio was particularly keen on a slab of marble on feet dubbed the 'Black Pearl' by Audio Dimensions of N. Ireland. Demonstrating a difference in sound was claimed by some dealers especially where expensive equipment was concerned, but Fiveways Hi-Fidelity said it was sceptical of the 'magical aspect'. "It's down to them; imagine saying: 'now can you hear the difference when I put it back on the table?' I don't think we could keep a straight face if we were to try and demonstrate a difference in sound ourselves."

Several dealers also pointed out that pre and power amplifiers should be kept apart or at least side by side rather than stacked



*Reliable best seller: the Arcam Delta 90.*

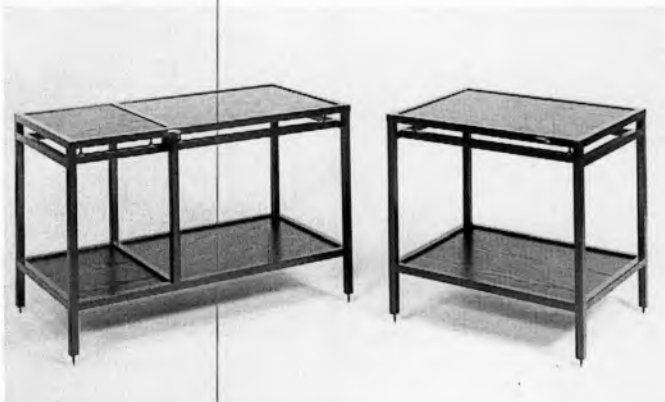
reliable components with only just under three per cent arriving faulty. That compares with a figure of just over three per cent in our September issue. One cause of chagrin to dealers is having to get amplifiers repaired after a certain age. Japanese companies came in for most flak on this and we heard that even in the guarantee period parts could take months rather than weeks to arrive.

Sony has consistently come under attack for its policy to farm out servicing and repairs to private 'servicing centres', but while the audio giant says there

Quad was found most reliable with 63 points followed by A&R Cambridge (56 pts), Naim (39 pts), NAD (28 pts) and Audiolab (23 pts). Unreliable brands were calculated as: Musical Fidelity (-27 pts) Cambridge Audio (-19 pts) and Mission (-19 pts). It should be pointed out that Cambridge was bought by Hi-Fi Markets at the time of this survey and hopefully unreliability will soon be a thing of the past for the company.

## CONSISTENCY

We asked dealers for comment on brands which were consistent



Target Audio: more and more people realise the benefits of isolation.

up to avoid excessive noise or interaction between them. This also goes for the rest of your equipment but John Rogers of Brentwood Music agreed: "happy is the man who can put it (hi-fi) where he likes."

## INTERCONNECTING

More important than siting is a good conveyance for signal between the various elements of your hardware once you have it set up (table or no). Many dealers told us they now hoped to sell interconnect when they sold an amplifier, or at least when they sold a system. The number of companies dedicated to making specialist cables for interconnection between amplifier and sources and from amplifier to loudspeakers bears out the importance of this field.

The main thing is to get compatible wiring for your system. John Rogers pointed out that the difference between using multi or single strand cable could be crucial to the overall sound. "Wiring should match that of the equipment itself," said John. Dealers have told us that a system can be fine tuned with the right interconnect and we heard that some will let you take several different types home to try at your leisure.

While there are substances on the market that purport to clean phono sockets and banana plugs dealers told us that the easiest way to keep interconnect clean was to push the plugs in and out of the sockets a few times every few months to keep oxidation at bay.

## THE BEST SELLERS

We asked dealers for their top three selling amplifiers in three price categories. The results are calculated on a points system; five for the first, four for the second, three for the third and then added up.

### Budget Category up to £200

- |                      |    |
|----------------------|----|
| 1) A&R Arcam Alpha   | 80 |
| 2) NAD 3020e         | 49 |
| 3) Mission Cyrus One | 41 |
| 4) Denon PMA250      | 33 |
| 5) Creek 4040        | 31 |

Of these the Creek, A&R, NAD and Denon amps were also best sellers in September last year.



Mission: doing well with its Cyrus range.

### Mid Price £201-£500

- |                        |    |
|------------------------|----|
| 1) Audiolab 8000A      | 49 |
| 2) A&R Arcam Delta 90  | 46 |
| 3) Mission Cyrus Two   | 43 |
| 4) Naim Nait           | 35 |
| 5) A&R Arcam Delta 60  | 30 |
| 6) Musical Fidelity A1 | 30 |

The Audiolab and Delta 60 amplifiers were featured in September as best sellers.

### Top Price £500+

- |                |    |
|----------------|----|
| 1) Quad 34/306 | 96 |
|----------------|----|

- |                                |    |
|--------------------------------|----|
| 2) Naim 62/140                 | 39 |
| 3) Musical Fidelity Pre 3/P140 | 31 |
| 4) Linn LK1/LK2                | 27 |

Quad's and Naim's combinations remain on top as favourites; Linn's pre-power combo also featured in September's round-up.

This survey was compiled by sending questionnaires to dealers up and down the country. Telephone polling then puts flesh on the bones of the results. The survey is mostly random but if a dealer does want to be regularly contacted then we do so. The nature of the survey also means that it covers the most common brands; reliability among the less common brands is difficult to gauge in a survey of this limited size.

The survey complements the main review topic every month but concentrates on mostly different criteria to give readers a distillation of dealers' views on the various topics. It is also mostly based on specialist dealers who are to hi-fi what tailors are to clothing. The survey is a poll and should be seen as such.

this survey:

A. Panthorpe Ltd, Hull, Humberside.  
 Analog Audio, Finchley, London N12.  
 Aston Audio, Alderley Edge, Cheshire.  
 Audio Excellence, Cardiff, Wales.  
 Audio Insight, Milton Keynes, Bucks.  
 Avon Hi-Fi Ltd, Shrewsbury, Shropshire.  
 Basically Sound, Bracon Ash, Norwich, Norfolk.  
 Brentwood Music and Hi-Fi Centre, Essex.  
 Cambridge Hi-Fi, Cambridge.  
 Chew and Osborne Ltd, Saffron Waldon, Essex.  
 Chichester Hi-Fi, Chichester, W. Sussex.  
 Cloney Audio, Dublin, Eire.  
 Covent Garden Records, London WC2.  
 Doug Brady Hi-Fi, London WC2.  
 Eastwood TV Ltd, Leicester, Leicestershire.  
 Fiveways Hi Fidelity, Edgbaston, Birmingham.  
 Gilson Audio Ltd., Middlesborough, Cleveland.  
 Grahams Hi-Fi, Pentonville Road, London N1.  
 Holborn Hi-Fi, Aberdeen, Scotland.  
 Hopkins Hi-Fi, Portsmouth, Hants.  
 In Hi-Fi, Edinburgh, Scotland.  
 Jeffries Hi-Fi, Eastbourne, E. Sussex.  
 Kensington Hi-Fi, London W14.  
 KJ Leisuresound, London W1.  
 Lyon Audio, Stanway, Colchester, Essex.  
 Moorgate Acoustics, Rotherham, S. Yorks.  
 Nottingham Hi-Fi Centre, Nottingham, Notts.  
 Now That's Hi-Fi, Portsmouth, Hants.  
 O'Brien Hi-Fi, Wimbledon, London SW19.  
 Paul Green Hi-Fi, Bath, Avon.  
 Performance Hi-Fidelity, London.  
 Peter Russell's Hi-Fi Attic, Plymouth, Devon.  
 Pro Musica Ltd, Colchester, Essex.  
 Radlett Audio, Radlett, Herts.  
 Rogers Hi-Fi, Guildford, Surrey.  
 Sounds Exclusive, Cranleigh, Surrey.  
 Swift of Wilmslow, Wilmslow, Cheshire.  
 The Audio File, Bishops Stortford, Herts.  
 The Cornflake Shop, Windmill St, London W1.  
 University Audio, Cambridge.  
 Witney Audio, Witney, Oxford.  
 Zeus Audio, Belfast and Donaghmore, N. Ireland.

## PARTICIPATING DEALERS

Our thanks to the following dealers for helping us compile



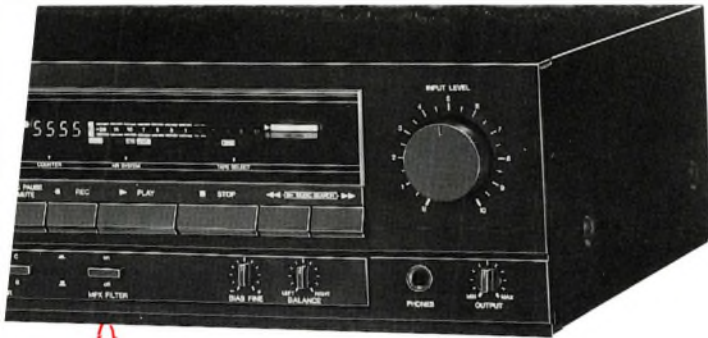
96 Winner on all fronts: the Choice Recommended 8000A.

“The consistency with which audio ideals have been allowed to predominate over gadgets and facilities is what marks the Denon range out. . .”  
*Hi Fi Choice, April 1988.*

DR-M07 £124.95

“In practice the ‘M07 simply sounded marvellous with good stereo, abundant detail and a welcome lack of artificiality. Obviously Best Buy material.”

*Hi Fi Choice*



DR-M12HX/R £219.95

“...the DR-M12HX proved extremely easy to use and provided fine sound quality both with recordings and pre-recorded tapes... it offers good results in every respect.”

*Noel Keywood, Hi Fi Review.*



DR-M24HX £289.95

“This is a very clean, open and spacious sounding recorder with an attractive range of facilities. The sound is very positively presented, to the point of being larger than life at times. A deck of breeding, and very well built to boot.”

*Hi Fi Choice*



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# CHOOSING AND USING . . . AMPLIFIERS

Cliché or not, the amplifier is the heart of the hi-fi system. Its purpose is to accept the different signals from the various sources, conform and order them as necessary, and then provide the power to drive and control the loudspeakers. In what is known as an integrated amplifier, the first part of this task is carried out in the preamplifier section, while the power amplifier part deals with the loudspeakers, but the whole is contained within a single box. In more costly systems these two sections are often separate units, and power supplies may also be separately cased. The tasks are quite distinct, so integration is only a matter of cost, convenience and compactness.

Twenty years ago amplifiers were mostly low powered, using Class A circuitry with valves and output transformers. Then the transistor took over rapidly, offering higher specification power, lower cost, and improved longevity. So far, so good, but the valve amplifier – like the moving coil cartridge – never quite died. And after a couple of false starts it is currently enjoying its strongest revival yet, albeit at prices which will make many readers blanche. The valve versus transistor debate is a fascinating one, though too rarefied for much of an airing in this introduction. Where cost-effectiveness is king, the transistor still rules.

The other historical trend concerns the complexity of the preamplifier section. When hi-fi had to make the best of barely adequate source quality, a complicated and flexible pre-amplifier section was a useful means of making the best of a bad job. During the Japanese invasion of the '70s, rival manufacturers vied with each other to invent and incorporate more and more extensive features: tone controls became graphic equalisers, and the often baffled user was encouraged to fantasise that he was on the bridge of the Starship Enterprise. However, improvements in sources have since started a 'simply better' backlash. Ten years ago a fledgling Naim Audio abandoned tone controls on the grounds that they degraded

sound quality. This was a major heresy at the time, but the trend is now firmly established, and even some of the Japanese manufacturers have since followed suit.

## TWO MARKETS

There are now two distinct types of hi-fi amplifier. The so-called 'bells and whistles' models still exist, though they now tend to be down- rather than upmarket products. Those who appreciate the flexibility of extensive switching and tone shaping can now take advantage of the low prices which derive from highly efficient manufacture for a mass market.

However, the real hi-fi amplifier action has been towards improvements in sound quality, much of which has been due to simplifying the circuitry by eliminating as many frills as possible, and even in some cases omitting a complete gain stage through the use of the latest transistors. The ear has proved a more subtle tool than any spectrum analyser in adjusting circuit topography, simplifying earth patterns, beefing up power supplies, and selecting key passive components, all in the interests of improving sound quality.

## PREAMPLIFICATION

As hi-fi amplifiers become increasingly minimalist, the pre-amp now only retains two key functions: the sorting out of the signals from the vinyl disc source, and the switching of the various inputs and outputs. Tuners, cassette decks, CD players, and what-have-you all put out more or less the same sort of signal, which is already equalised to 'flat'. Vinyl disc apart, the pre-amp then becomes little more than a glorified switch with volume and balance controls. Which explains why suchlike devices – using purely passive components and hence inherently simple – are now becoming available in the most specialist end of the market.

Vinyl disc replay is quite a different kettle of fish. The pre-amp is connected directly to the transducer itself, with no intervening electronics, and this introduces all sorts of

difficulties. Furthermore, the signal from the cartridge is very small, and requires two distinct stages of equalisation to get a 'flat' end result. To add insult to injury, there are now two popular kinds of cartridge, the high output moving magnet and low output moving coil (plus a few odd permutations), and they are different enough to need quite separate treatment. There's not even a standard for the source or input impedance of low-output cartridges.

For the future, it is quite possible we will see wider use of turntables with built-in cartridge preamps, so that each source feeds a 'flat' signal at line level to a simple switching and attenuating preamp. But now that the first digital signal source (CD) is becoming accepted, with others (DAT and DBS) planned for the future, we are beginning to see a new type of preamp which accepts digital signals directly, carrying out various functions by means of an on-board microcomputer before finally converting the signal back to analogue before feeding to the power amplifier. Such a system should theoretically be immune from the signal degradation which has been leading the market towards simpler analogue amplifiers, and could lead to a revival of more complex preamps, though progress will be slow because any preamp section will need to handle conventional signals alongside digital for many years to come.

## POWER AMPLIFIERS

This is the part of the amplifier whose job it is to drive the loudspeakers – and a right old job that can turn out to be. Like the cartridge, a loudspeaker is a transducer, and the task is to turn the electrical model of the music signal back into a mechanical (acoustical) signal for the benefit of the ears. The loudspeaker is a form of motor, but its task of covering the whole range of audio frequencies is mechanically almost intolerable, and there is an inevitable lack of control at various resonance points. While the amplifier provides the loudspeaker with a voltage which corresponds to the amplified music signal, it is the

characteristics of the loudspeaker itself which determines the current demand. This current demand can be very unpredictable, particularly at resonance points, which is why serious hi-fi amplifiers are usually designed with plenty of surplus current capacity, and with an eye on the stability of the voltage signal whatever the current demand.

The main measurements on amplifiers relate to power output and distortion, but more important than the maximum power output itself is the way the power is maintained into different loads, and this is analysed in the reviews. The various distortion measurements also help explore the limits of the amplifier, but paradoxically, striving for very low distortion seems to prejudice sound quality.

## CHOOSING

There are a number of criteria one could use when selecting an amplifier, and the most valid is probably sound quality. Despite the attention it attracts, power output comes much further down the list, because the differences between most models is not in fact that great, and measured power is by no means a reliable indicator of subjective loudness capability.

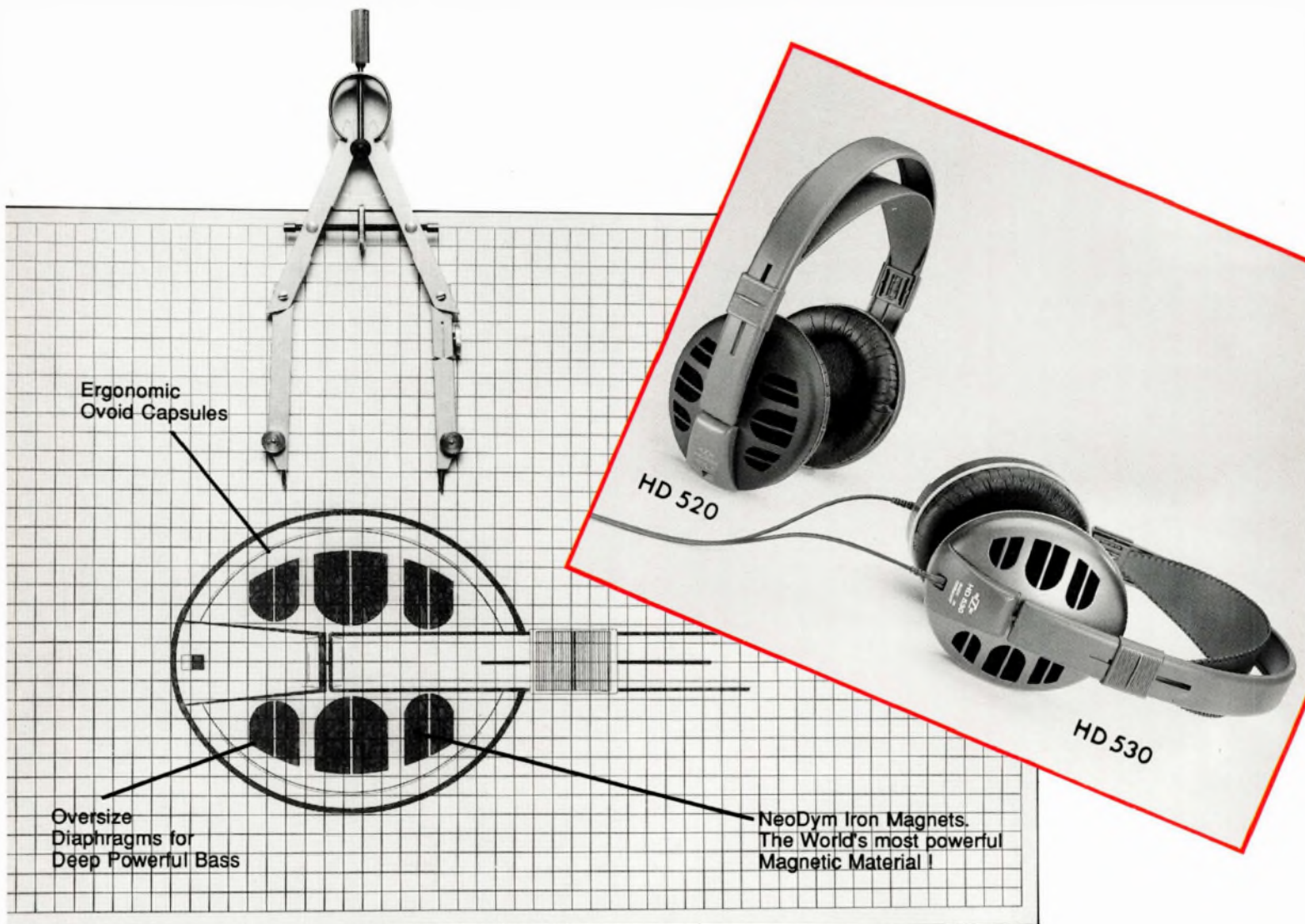
The range of facilities required should naturally be taken into account, paying particular attention to the type of cartridge being used. But it should also be borne in mind that every unused feature contributes nothing and will probably have a negative effect upon the potential sound quality. While some people seem more sensitive than others to the sound of amplifiers, both pre- and power sections are fundamental to the system as a whole, because all signals pass through them en route to the loudspeakers.

The reviews provide an excellent guide to shortlisting some of the better sounding bargains in amplifiers around. But as ever they cannot replace an individual's selection to his or her own tastes, preferably in the correct system and ideally in an 'own room' context. Once again, the conscientious specialist dealer provides a vital link.

# APPLIED TECHNOLOGY

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# ADC A-2080E

SOUNDTEK, UNIT 9 BELFONTRADING EST, LUCKLOW HILL, HALESOWEN, WEST MIDLANDS. TEL: (021) 550 7387.



ADC's A-2080E integrated amplifier is a most sophisticated and modern looking piece of equipment, and the company manufactures a sleek, slimline CD player and tuner to match. The slate grey fascia with its discrete legends is actually some sort of plastic moulding as are all the function controls, but the amp is solidly constructed nonetheless.

Rotary controls are provided for bass, treble, balance and volume adjustment while a series of minute mechanical pushbuttons are included to facilitate CD-direct, 15Hz infrasonic filter and loudness functions. Unfortunately the CD-direct switch has not been implemented correctly, so while bypassing the tone controls it also *increases* the (unwtd) mains hum by 20dB!

The remaining source/record-out select buttons (each illuminated with its own inset LED) operate by CMOS logic so may also be triggered by ADC's system remote control. An infra-red eye is located in the centre of the fascia, offering control over the two tape, tuner, aux, CD and phono (MM/MC) inputs as well as the volume control which has its own dedicated motor.

Small A/B speaker select switches fire two relays mounted near the 4mm terminals on the rear of the amp, the relays also being used for muting purposes and/or protection from switching transients when the MM/MC selector is deployed.

ADC has really gone to town on the power supply which uses a total of 40,000µF reservoir capacitance together with separate regulation for the driver and output stages. The output stage is extremely rugged, featuring no less than two hardwired pairs of Toshiba's 2SA1301/2SC3280 complementary bipolar transistors per channel.

## LAB REPORT

Technically speaking this is a very 'steady' amplifier. It offers around 108watts across an astounding 72kHz bandwidth into 8ohms with an extra +1.97dB into 4ohms and +1.2dB for musical peaks. Output impedance could be lower, but 0.08ohm isn't too bad, while the moderate fall in channel separation (55dB at 20kHz) and 0.8dB channel balance error at -60dBV are pretty typical. Only the -79dB A-wtd noise via the line

input at 0dBW need give cause for concern because of the compromised CD direct facility.

The RIAA curves are very flat and extended, the MM response falling to -3dB way down at 7Hz while the MC reaches -3dB at 8.5Hz - hence ADC's inclusion of switchable infrasonic filter. Note the way that THD decreases with increasing power due to crossover non-linearities, a fact reflected in the strong 3rd and 5th  $F_{0-20k}$  harmonics and singular 3rd-order IMD route  $F_{0-50k-0} + 2F_{0-20k}$  shown on the 3-D ultrasonic plot. The 40Hz supply modulation plot is very clean except for a nasty 10Hz product at -60.4dBV.

## SOUND QUALITY

On test the A-2080E proffered a neutral, integrated and wholesome balance that only began to sound colder, harder and less comfortable with extended listening. On the whole, though, its presentation was bold and direct without necessarily becoming overly forceful or 'shouty'. The line input suffered from a poorer sense of stereo depth than is usual but redressed this with a fair degree of life and urgency in the mid and treble registers.

The MM input was certainly less compressed or 'sat-on' than the dedicated MC stage; it was refreshingly transparent in fact with a realistic projection of vocals and stringed instruments alike together with a firm, rhythmic bass line. Much of this cohesiveness and pleasant fluidity was lost via MC which, though relatively clean and controlled, was both softer and reduced in crisp articulation.

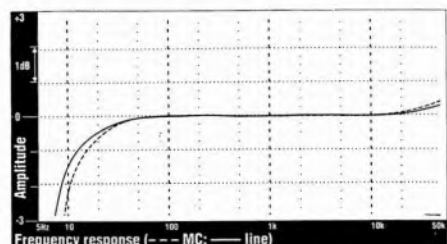
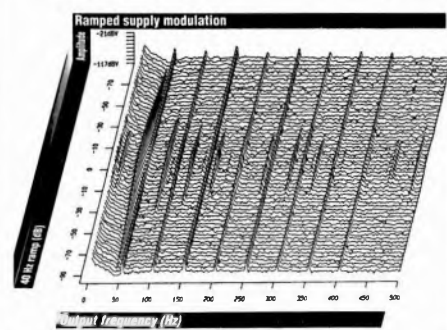
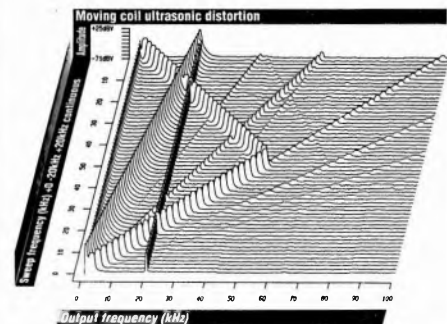
## CONCLUSIONS

This amplifier offers a high degree of operational convenience in a very stylish package, qualities no doubt reflected in the substantial £400 price ticket. It offers a controlled and likeable sound but is a little less advanced in the sonic stakes than some £400 amplifiers we can think of and so just falls short of a formal Recommendation.

Certainly in the context of a complete ADC separates system the A-2080E would be well worth considering.

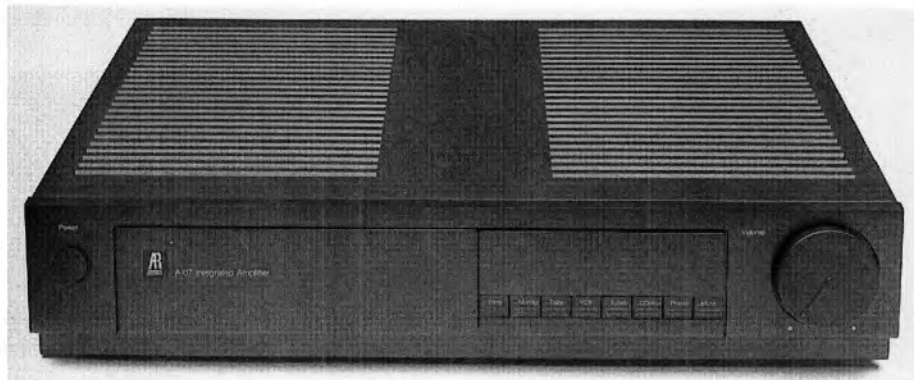
## TEST RESULTS

Maximum Continuous Power Output - 8ohms	20Hz 108.0W	1kHz 107.6W	20kHz 107.1W
- 4ohms	168.8W	169.5W	167.2W
Dynamic headroom (IHF)		+1.19dB	(141.5W)
Output impedance	0.081ohm	0.076ohm	0.098ohm
Damping factor	98.3	105.3	81.8
Stereo separation (20Hz)	CD/Aux 98.4dB	MM 75.9dB	MC 63.8dB
(1kHz)	81.2dB	72.6dB	62.2dB
(20kHz)	53.6dB	55.9dB	56.1dB
Channel balance (1kHz, -20dBV)	0.28dB	0.14dB	0.09dB
(-60dBV)	0.75dB	0.80dB	0.91dB
Total harmonic dist. (0dBW) (% power)	-77.7dB -79.4dB	-75.9dB -79.3dB	-73.5dB -74.9dB
CCIR intermod. dist. (0dBW)	-76.9dB	-72.8dB	-65.8dB
CCIR IM dist. (% power)	-79.1dB	-72.6dB	-65.8dB
Rise time			2.7µsec
Power bandwidth (<0.1% THD)			6Hz - 72kHz
Squarewave linearity			-93.2dB
Phase shift (20Hz)	19°48'	21°36'	25°30'
(1kHz)	358°30'	306°0'	309°36'
(20kHz)	331°12'	252°0'	250°30'
Noise (A wtd, 0dBW) (% power)	-79.1dB -94.5dB	-78.7dB -87.5dB	-69.5dB -72.9dB
Residual noise (unwtd)	-66.7dB	-66.5dB	-67.2dB
Input sensitivity (for 0dBW) (for full output)	17.74mV 181.2mV	265.7µV 2.742mV	25.93µV 254.3µV
Disc overload (20Hz) (1kHz)		16.41mV 146.2mV	1.696mV 14.95mV
(20kHz)		127.6mV	127.0mV
(50kHz)		215.7mV	127.7mV
Tape output/impedance			8.836V/699ohm
Input loading		180kohm	47kohm/150pF
DC offset, left/right			+4.52mV/+5.10mV
Typical price inc VAT			£400



# AR A-07

ACOUSTIC RESEARCH LTD, HIGH STREET, HOUGHTON REGIS, BEDS LU5 5QJ. TEL: (0582) 867777.



Better known for its loudspeakers and suspended-subchassis turntables, Acoustic Research has more recently introduced a series of matching electronics. The A-07 integrated amplifier is essentially a second generation model replacing the earlier A-06. The slatted steel wrap and angled fascia of the original has been carried over to this new model, though the use of a satin black alloy has substantially improved the general appearance of the unit.

A wired remote port on the rear of the case will allow hands-off operation when used in conjunction with other AR separates, the motorised volume control offering that extra touch of convenience and luxury without necessarily compromising performance. Two tape and two VCR inputs are provided, the latter including a separate video buffer composed of discrete devices – a true A/V amplifier!

These inputs, together with tuner, CD and phono (MM and MC), are selected via logic circuitry triggered on the fascia by a row of small illuminated keys. Other features such as bass, treble, balance adjustment, A/B speaker select and a headphone socket are hidden away beneath a pull-down flap.

AR is still using two separate transformers in this dual-mono amplifier, together with four 6800 $\mu$ F electrolytic capacitors and discrete regulation configured to offer a low source impedance power supply. Very low noise transistors are used at the input to the MC disc stage with series feedback RIAA equalisation being executed around a single NE5532N op-amp. Two single channel NE5534N op-amps are used after the volume control as buffers prior to the power amp which utilises four pairs of Sanyo's chunky D1047/B817 output transistors.

## LAB REPORT

A +1.63dB increase in power was measured between 8 and 40hms while a further +1.8dB was available under dynamic conditions across a very extended 42kHz power bandwidth. Distortion was low, typically <0.016 per cent THD and IMD via the MC stage up to two-thirds power. This is reflected in the ultrasonic plot which shows subjectively innocuous 2nd and 4th harmonics dominat-

ing the very clean spectrum.

A 1-2dB error in volume tracking was measured at -60dBV while stereo separation fell to 48-49dB on all inputs at 20kHz as a result of capacitive coupling through the logic circuitry. Headroom of +27.7dB and +26.6dB was available on the MM disc input (1kHz and 20kHz respectively) though evidence of slew limiting above 19kHz was observed.

This amp has a complex and convoluted signal path. The output is fed via speaker select switches and the cable is bundled-up with the transformer's secondary wiring before reaching the 4mm terminals on the rear of the case. Hence the dominance of 50Hz field harmonics and IMD products on the ramped supply modulation test! Apparently, this will be corrected in future samples of the A-07. Note also some evidence of (RF) noise floor modulation.

## SOUND QUALITY

Via CD the amplifier sounded fairly open and pleasantly airy if tainted with a certain glaze across the highest frequencies. At high levels stereo images tended to become a trifle indistinct, while the amp failed to capture the ambient weight of an orchestra in full flow. By contrast the MM input was thought to be that much smoother and believable in presentation, the extra treble lift of the MC stage (see plot) being realised as a more forward and noticeably more sibilant presentation.

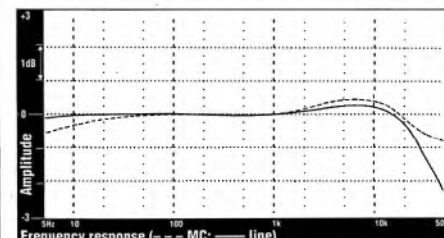
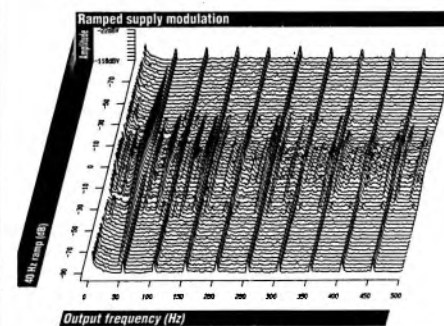
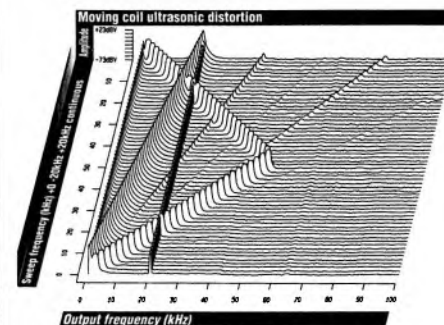
Interestingly, the initial feelings of the panel were somewhat more favourable, the buoyant and nimble character of the amp earning it a degree of praise. However, listeners soon began to comment on a slightly bland or subconsciously distorted presentation that made the interpretation of subtle details rather hard work. Clearly, this doesn't bode well for long term listening.

## CONCLUSIONS

On the face of it AR's new integrated amplifier certainly looks purposeful enough. It offers low distortion, is reasonably load tolerant and enjoys widely compatible input sensitivities. Unfortunately it does sound a trifle uninvolved which puts the dampers on any purely subjective recommendation.

## TEST RESULTS

Maximum Continuous Power Output – 8ohms	20Hz 69.9W	1kHz 75.4W	20kHz 73.3W
– 4ohms	97.6W	109.9W	107.4W
Dynamic headroom (IHF)		+1.81dB	(114.4W)
Output impedance	0.071ohm	0.066ohm	0.114ohm
Damping factor	112.9	120.6	70.1
Stereo separation (20Hz)	82.3dB	84.5dB	83.6dB
(1kHz)	72.5dB	73.1dB	74.1dB
(20kHz)	48.3dB	49.3dB	49.3dB
Channel balance (1kHz, -20dBV)	0.63dB	0.74dB	0.81dB
(-60dBV)	1.88dB	1.95dB	2.11dB
Total harmonic dist. (0dBW) (% power)	-84.3dB -82.5dB	-77.7dB -79.2dB	-76.3dB -80.3dB
CCIR intermod. dist. (0dBW)	-85.9dB	-77.1dB	-78.8dB
CCIR IM dist. (% power)	-82.3dB	-75.1dB	-78.2dB
Rise time			3.5 $\mu$ sec
Power bandwidth (<0.1% THD)			38Hz – 42kHz
Squarewave linearity			-93.7dB
Phase shift (20Hz)	354°14'	345°36'	355°0'
(1kHz)	0°	311°24'	309°36'
(20kHz)	14°24'	270°0'	270°0'
Noise (A wtd, 0dBW) (% power)	-83.1dB -97.1dB	-82.2dB -89.6dB	-76.4dB -75.8dB
Residual noise (unwtd)	-72.4dB	-71.9dB	-71.9dB
Input sensitivity (for 0dBW) (for full output)	21.61mV 176.3mV	295.1 $\mu$ V 2.594mV	23.63 $\mu$ V 198.3 $\mu$ V
Disc overload (20Hz) (1kHz)		13.87mV 121.1mV	1.068mV 9.705mV
(20kHz)		106.5mV	88.72mV
(50kHz)		2399mV	220.3mV
Tape output/impedance		7.595V/3.312kohm	
Input loading		20kohm/300pF	45kohm/90pF
DC offset, left/right			-58.1mV / -55.8mV
Typical price inc VAT			£280



# AKAI AM-93

AKAI (UK) LTD, 12 HASLEMERE HEATHROW ESTATE, SILVER JUBILEE WAY, HOUNSLOW, MIDDX. TEL: (01) 897 6388.



A truly monstrous creation, the AM-93 is an all-singing, all-dancing, D-to-A converting brute of an integrated amplifier. This vast creation is flanked by two polished wooden end cheeks making the whole thing look like a piece of real hi-tech furniture.

The massive alloy fascia is dotted with equally huge function knobs. A direct-source function enables the user to bypass the bass, treble and balance controls when using any of the conventional analogue inputs as well as any of the four digital inputs. Akai has provided both coaxial and optical digital inputs in addition to two pairs of digital outputs for dubbing or editing with DAT.

The internal digital circuitry operates with 8 times oversampling and a 16-bit dual-channel DAC (Akai's hefty 'digital screening' prevents close scrutiny!). The accompanying analogue inputs include both MM and MC phono, aux, CD, tuner, and three tapes with totally independent record out selection.

The AM-93 has a high quality screened toroidal mains transformer, sealed ALPs volume control and multiple power supply regulation to help isolate the digital and analogue circuitry. Nevertheless, mounting the D/A convertors on a board immediately parallel to the RF-sensitive disc input is probably not such a good idea.

## LAB REPORT

Considering its bulk the AM-93 was not a real powerhouse, offering 112watts into 8ohms and 185watts into 4ohms over a good 45kHz bandwidth. The 3-D distortion plot derived from the digital input highlights those 2nd, 3rd, 5th and 7th  $F_{0-20k}$  harmonics also represented on the ultrasonic plot taken through the MC input - clearly these are non-linearities inherent in the Sanken output stage. 3rd, 4th, 6th and 8th-order difference IMD routes associated with  $3F_s$  (132.3kHz) can also be seen tracking downband. However, with a reduced +18.6dB headroom (at 20kHz) on the MM input THD and IMD soared to 0.18 per cent and 5.1 per cent respectively; the moderate slew-limiting >10kHz on the MC input and +27.4dB headroom still giving rise to 2nd-order IMD (seen at  $F_{20k} - F_{0-20k}$  and  $F_{0-50k-0} - F_{0-20k}$  on the 3-D plot).

## SOUND QUALITY

Comparing both the digital and analogue CD inputs proved very interesting if only because the built-in D/A circuitry was considered to sound worse than the conventional analogue output of our test CD player. This is something of a paradox bearing in mind that the on-board D/A convertors are meant to improve the sound quality of the attached CD player. Specifically, the digital input sounded compressed, and 'spiky' at the top end, while analogue CD input proffered a freer, livelier and rather more involving sound quality.

A warmer, richer balance was available via the disc inputs though the alarming LF rise measured on the MC input might give rise to some unpredictable effects with other arm/cartridge and loudspeaker combinations. A pronounced bass lift was heard but tended to influence the sensation of stereo space as much as rhythm or tempo. The mid sounded forward, emphasising vocals and stringed instruments while the far treble was comparably reticent, lacking crispness and detail.

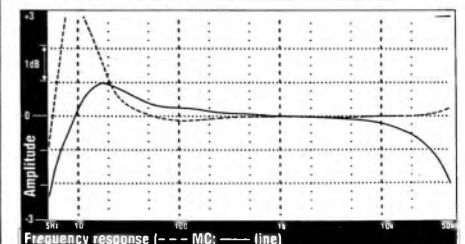
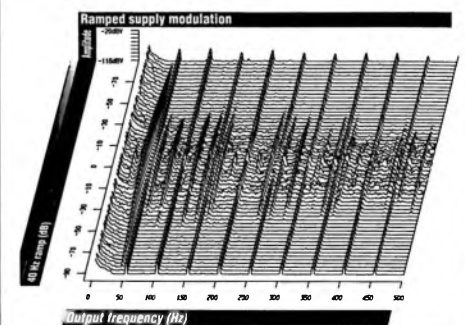
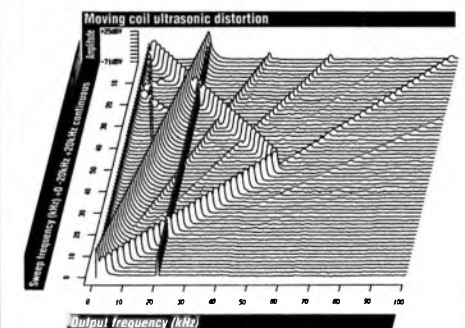
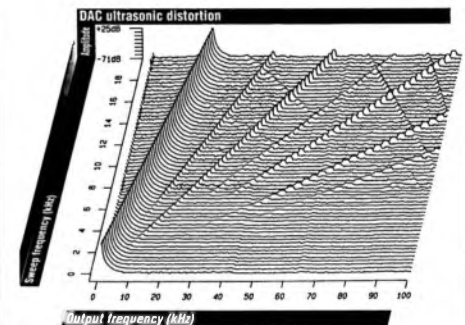
## CONCLUSIONS

Until further digital processing is available (tone controls and the like) the implementation of D/A convertors inside a standard integrated amplifier seems to be a pointless exercise. In fact such practice appears to degrade the overall sonic performance of neighbouring circuitry, giving rise to the kind of mixed subjective results recorded here. Although laden with facilities which many may find useful, the AM-93 cannot be Recommended on sonic grounds.

## TEST RESULTS

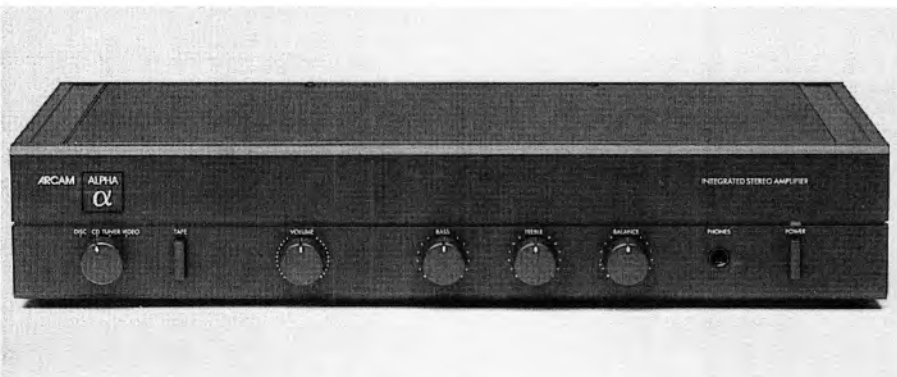
	20Hz	1kHz	20kHz
Maximum Continuous Power Output - 8ohms	105.3W	111.9W	110.8W
- 4ohms	161.6W	184.5W	175.5W
Dynamic headroom (IHF)		+ 1.21dB (128.6W)	
Output impedance	0.057ohm	0.064ohm	0.120ohm
Damping factor	140.9	124.8	66.5
Stereo separation	CD/Aux	MM	MC
(20Hz)	82.5dB	47.9dB	40.3dB
(1kHz)	79.7dB	74.5dB	69.1dB
(20kHz)	53.5dB	52.8dB	51.3dB
Channel balance			
(1kHz, -20dBV)	0.27dB	0.27dB	0.27dB
(-60dBV)	0.42dB	0.88dB	1.03dB

Total harmonic dist. (0dBW)	-91.2dB	-55.4dB	-71.7dB
( $\frac{1}{2}$ power)	-88.8dB	-55.7dB	-73.2dB
CCIR intermod. dist. (0dBW)	-81.6dB	-25.7dB	-46.9dB
CCIR IM dist. ( $\frac{1}{2}$ power)	-84.3dB	-25.8dB	-46.7dB
Rise time			6 $\mu$ sec
Power bandwidth (<0.1% THD)			31Hz - 45kHz
Squarewave linearity			-102.7dB
Phase shift (20Hz)	7°55'	7°30'	8°30'
(1kHz)	0°	306°0'	300°0'
(20kHz)	343°48'	266°24'	260°38'
Noise (A wtd, 0dBW)	-75.7dB	-75.7dB	-73.1dB
( $\frac{1}{2}$ power)	-90.6dB	-89.4dB	-77.8dB
Residual noise (unwtd)	-72.4dB	-71.7dB	-72.4dB
Input sensitivity (for 0dBW)	11.61mV	156.9 $\mu$ V	19.88 $\mu$ V
(for full output)	123.9mV	1.538mV	209.8 $\mu$ V
Disc overload (20Hz)		10.48mV	1.391mV
(1kHz)		97.05mV	12.28mV
(20kHz)		425.6mV	117.0mV
(50kHz)		429.3mV	255.1mV
Tape output/impedance			8.675V/2.385kohm
Input loading		47kohm/100pF	47kohm/150pF 100ohm
DC offset, left/right			-3.7mV/-5.7mV
Typical price inc VAT			£550



# A&R ARCAM ALPHA II

A&R CAMBRIDGE LTD, DENNY END IND. EST, WATERBEACH, CAMBRIDGE CB5 9PB. TEL: (0223) 861550.



Having achieved considerable success with the first and second generation *Alpha* amplifiers, A&R is aiming for a third triumph in the form of its latest *Alpha II* integrated amplifier. Still competitively priced, the *Alpha II* has been improved both inside and out, the revised aesthetics bringing it into line with other A&R products. The new matt black fascia is split into two levels with the bass/treble tone controls, balance, volume and input selection knobs occupying the lower portion. A new *Arcam* logo takes pride of place on the upper half of the fascia.

Inputs for video (audio only), tape, CD, tuner and disc are provided, though only MM cartridges are catered for on the standard model. An optional plug-in header will soon be available (at £20), switching both the input loading and gain to accommodate lower output MC cartridges. Recessed 4mm speaker sockets are fitted at the rear of the case, offering the choice of either switched or unswitched operation.

Beautifully constructed, this amplifier uses low noise Signetics *NE5532N* op-amps in both the series-feedback RIAA equalisation stage and line buffer, while single-channel *NE5534s* are used in the tone circuitry. Two pairs of 15A *TIP3055/2955* complementary output devices are employed, each fuse protected against continuous output into loads any lower than 4ohms. The fuses blow with little provocation but may be uprated from 2A to 3.15A without really compromising safety.

## LAB REPORT

A beefier 150VA toroid has been included to improve the dynamics of the *Alpha*, perhaps reflected in the useful +1.54dB headroom recorded via the IHF test into 8ohms. Noise and channel separation were very good indeed. RIAA equalisation was band-limited to a -3dB point of 20Hz, the line stage reaching -3dB at 10Hz. Disc headroom was only average at +26.9dB (1kHz) and +26.4dB (20kHz), though both RIAA THD and IMD were typically below 0.02 per cent.

The ultrasonic plot confirms this, the 2nd-5th harmonics (-68dB) and weak  $F_{20k} - yF_{0-20k}$  [ $y = 1.2$ ] IMD routes emanating through non-linearities in the transfer char-

acteristics of the output devices. The ramped supply modulation plot is impressive and demonstrates the care taken in the layout of this amplifier. Hum (50Hz) and rectifier (100Hz, -59.9dBV) products are evident at 20Hz (-93.9dBV), 140Hz (-80.5dBV) and 220Hz (-96.1dBV). All IMD and THD routes are linear with respect to amplitude while RF-based noise floor modulation seems well suppressed.

This amp is essentially phase inverting (line), so experimentation with phasing at the loudspeaker end might prove rewarding.

## SOUND QUALITY

Smooth and confident sounding with a strong, rhythmic bass line the 'velvety blackness' encouraged a deep and captivating stereo acoustic. The panel were impressed by the punchy bass available via the CD input, commenting on a weighty 'presence' that was traded against a slight loss in midband transparency. As a result stereo images, particularly those of strong vocals, were revealed in a slightly larger-than-life fashion.

Rich, to the point of laziness, via disc, the listeners seemed almost to doze off, not through apathy or boredom but thanks to the amp's flowing, mellifluous character. The term 'civilised' cropped up on a number of occasions with one listener desiring a trace more crispness and attack at high frequencies. Nevertheless, everyone agreed that despite its slightly rose-tinted presentation the *Alpha II* was undeniably seductive - a valuable quality at any price point.

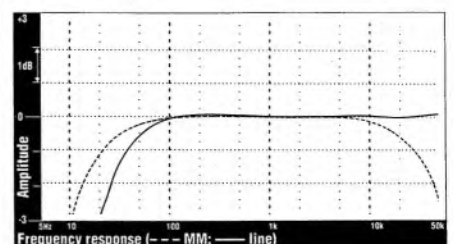
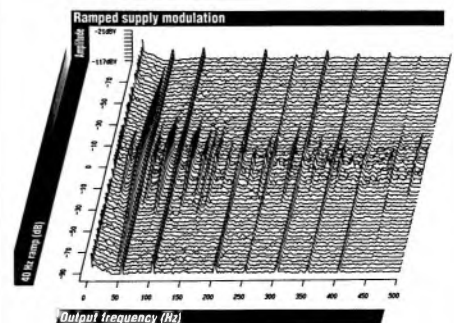
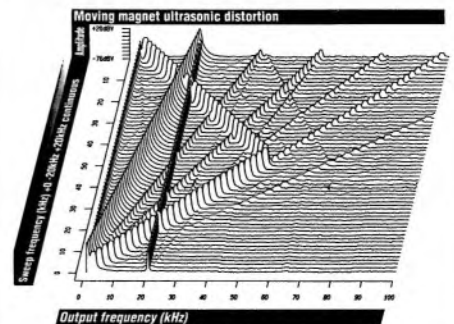
## CONCLUSIONS

A&R has succeeded in producing a very gutsy 'beer-budget' amplifier, perhaps best suited to systems already on the bright and breezy side of neutral; bass heavy speakers are likely to sound soft and sluggish with this amp.

Subsequent 'sighted' listening confirmed the *Alpha II*'s long-term listenability, and I was personally more enthusiastic than the remainder of the panel, so feel confident in awarding it a Best Buy.

## TEST RESULTS

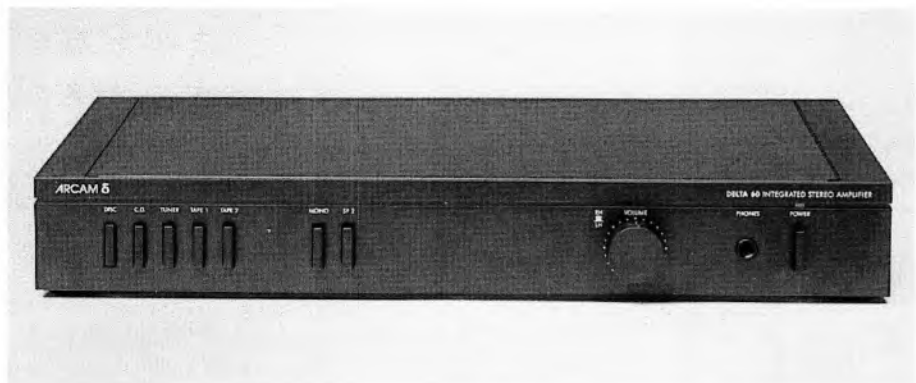
Maximum Continuous Power Output - 8ohms	20Hz 37.1W	1kHz 40.7W	20kHz 40.1W
- 4ohms	50.8W	58.8W	58.0W
Dynamic headroom (IHF)			+1.54dB (58W)
Output impedance	0.052ohm	0.052ohm	0.103ohm
Damping factor	153.9	153.2	77.8
Stereo separation (20Hz)		CD/Aux	MM
(1kHz)		97.6dB	99.7dB
(20kHz)		84.5dB	88.6dB
		59.9dB	64.8dB
Channel balance (1kHz, -20dBV)		0.32dB	0.35dB
(-60dBV)		2.42dB	2.55dB
Total harmonic dist. (0dBW) (½ power)		-83.3dB	-82.6dB
CCIR intermod. dist. (0dBW)		-73.7dB	-73.5dB
CCIR IM dist. (½ power)		-80.2dB	-76.8dB
Rise time		10µsec	-73.7dB
Power bandwidth (<0.1% THD)			34Hz - 18kHz
Squarewave linearity			-92.9dB
Phase shift (20Hz)		213°7'	
(1kHz)		179°12'	131°24'
(20kHz)		149°46'	70°12'
Noise (A wtd, 0dBW) (½ power)		-84.7dB	-80.5dB
		-96.9dB	-82.2dB
Residual noise (unwtd)		-66.5dB	-62.9dB
Input sensitivity (for 0dBW) (for full output)		54.18mV	403.9µV
		381mV	2.62mV
Disc overload (20Hz)			16.90mV
(1kHz)			110.6mV
(20kHz)			1045mV
(50kHz)			2534mV
Tape output/impedance		9.823V/1.84kohm	
Input loading		10kohm/6kohm	47kohm/100pF
DC offset, left/right			+3.8mV/-0.3mV
Typical price inc VAT			£160



# A&R ARCAM DELTA 60

A&R CAMBRIDGE LTD, DENNY END IND EST, WATERBEACH, CAMBRIDGE CB5 9PB. TEL: (0223) 861550.

RECOMMENDED



At least two generations of hi-fi enthusiasts have been weaned on the redoubtable A&R A60, but with the introduction of the company's Arcam Delta 60 integrated amplifier the A60 has finally been put out to pasture. We tested this new Delta 60 six months ago in fact, but at that stage it was hot off the production line and suffering a few teething troubles. In retrospect we were probably a bit hasty in reviewing such an early sample.

In A&R's product hierarchy the Delta 60 is more like a slimmed-down Delta 90 than a beefier Alpha II. A dual-concentric volume control occupies the right of the matt black fascia along with headphone socket, while a series of slim pushbuttons are dotted across the left of the amp. These cater for the disc (MM and MC selected at rear), CD, tuner and two tape inputs, while another pair of controls effects mono operation and activates the 'switched' 4mm speaker sockets at the rear of the amp. When headphones are used for private listening these switched output sockets are disabled. The Delta 60 may lack the tone controls incorporated in the costlier 90 but for most practical purposes the amplifier is well enough equipped.

Elsewhere, pennies have been well spent. For instance, the MC input uses a discrete three-transistor headamp fed from its own regulated supply which then feeds the MM network that employs a very low noise OP27 op-amp. Equalisation is accomplished via a mix of active and passive networks, the active LF section based around an NE5534 op-amp which is capacitor-coupled to the volume control.

Interestingly, the CD input is pre-attenuated by about 4dB before reaching the volume control and power amp section, the latter an unusual quasi-complementary stage built of Sanyo 2SD1046 transistors attached to the rear-facing alloy heatsink.

## LAB REPORT

The MM/MC disc responses are well matched and sensibly tailored at low frequencies, the -3dB point being 17Hz. The '60's low output impedance is a good sign but the 7-8dB channel imbalance at -60dBV needs addressing. The amplifier proved fairly load tolerant in terms of power output, offering a +1.9dB

increase from 8 to 4ohms with some +1.2dB headroom for musical peaks. Nevertheless the linearity of the Delta 60 deteriorated with increasing frequency and decreasing loads - as demonstrated by the 3-D ultrasonic plot.

At 1kHz THD was just 0.003 per cent via MC but this increases to 0.095 per cent above 10kHz on the plot; note the 2nd-6th harmonics of  $F_{0-20k}$  and dominance of the summation IMD routes  $F_{0-50k-0} + yF_{0-20k}$  and  $F_{20k} + F_{0-20k}$  [ $y = 1$  and  $2$ ]. Evidence of slew-limiting above 10kHz on the MC input (+21dB headroom) is also denoted by the trace in-band IMD products.

## SOUND QUALITY

Somewhat in contrast to earlier reports of this amplifier, the Delta 60 went down a storm in the blind listening tests. Via CD most forms of music were expressed with great poise and refinement, the acoustic was dry, and the perceived timbre of all instruments seemingly very lifelike. It was refreshing to hear the true liveliness of our guitar recording untainted by any brashness at higher frequencies; cymbals, for instance, sounded both fast and sweet but never hard or fatiguing.

Listeners commented on the fine stereo focus, the control, and sure-footedness of the amplifier particularly when it was reproducing complex classical works filled to the brim with tonal and dynamic contrasts. There was a general loss of fidelity when auditioning the phono inputs but the MM stage still managed to recreate a marvellously spacious acoustic. It was moderately forward in presentation but the musical tempo remained unaffected: brisk, sparkling and lucid.

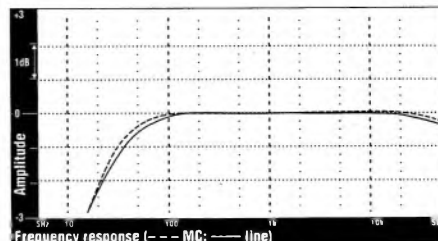
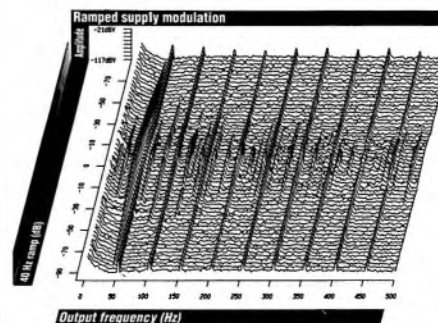
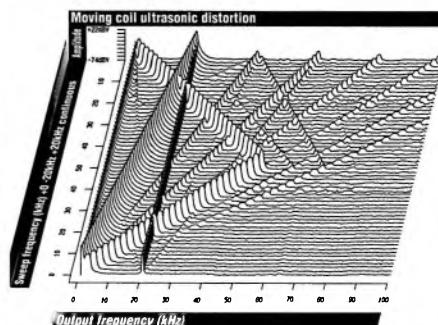
Only the MC input drew any really disparaging remarks, its brighter and harder balance tending to make strong vocals sound a little too ragged and sibilant.

## CONCLUSIONS

A&R Cambridge has certainly tidied up the design of the Delta 60 since it was last reviewed, turning it into a top-notch performer. It may lack the bells and whistles provided by some of the competition but it counters this with a sound quality that is considerably less synthetic.

## TEST RESULTS

Maximum Continuous Power Output - 8ohms	20Hz	1kHz	20kHz
	57.7W	58.4W	56.0W
- 4ohms	80.7W	89.6W	79.2W
Dynamic headroom (IHF)			+1.22dB (77.3W)
Output impedance	0.056ohm	0.056ohm	0.107ohm
Damping factor	141.5	143.3	74.5
Stereo separation	CD/Aux	MM	MC
(20Hz)	98.6dB	79.6dB	76.6dB
(1kHz)	73.7dB	72.7dB	72.2dB
(20kHz)	48.8dB	61.8dB	63.2dB
Channel balance			
(1kHz, -20dBV)	0.13dB	0.15dB	0.18dB
(-60dBV)	8.04dB	7.45dB	6.92dB
Total harmonic dist. (0dBW)	-79.8dB	-82.8dB	-83.2dB
(½ power)	-91.4dB	-90.5dB	-90.2dB
CCIR intermod. dist. (0dBW)	-82.3dB	-73.6dB	-61.1dB
CCIR IM dist. (½ power)	-89.4dB	-72.2dB	-61.1dB
Rise time			5.5µsec
Power bandwidth (<0.1% THD)			10Hz - 11kHz
Squarewave linearity			-91.7dB
Phase shift (20Hz)	9°0'	21°36'	18°36'
(1kHz)	357°30'	311°24'	315°25'
(20kHz)	336°36'	253°48'	255°30'
Noise (A wtd, 0dBW)	-80.6dB	-79.3dB	-76.0dB
(½ power)	-93.8dB	-84.7dB	-76.9dB
Residual noise (unwtd)	-67.5dB	-67.4dB	-67.3dB
Input sensitivity (for 0dBW)	31.75mV	231.6µV	20.31µV
(for full output)	238.1mV	1.653mV	146.7µV
Disc overload (20Hz)		11.48mV	1.073mV
(1kHz)		97.12mV	9.479mV
(20kHz)		405.7mV	56.24mV
(50kHz)		537.7mV	68.87mV
Tape output/impedance			8.625V/1.847kohm
Input loading			6kohm/150pF 4.7kohm/100pF 220ohm
DC offset, left/right			+4.5mV/+5.6mV
Typical price inc VAT			£250



# The best way to buy hi-fi is to begin by using a pen and a pair of scissors

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# ARISTON AMPLIFIER

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RECOMMENDED



Nowadays, the use of logic circuitry to effect input switching and basic signal processing is becoming more popular, a trend reflected in the computer-like build of Ariston's new integrated amplifier. A bold logo streaks across an otherwise plain black Perspex fascia which conceals the input select, tape monitor and up/down volume functions. An additional mute facility is included on the matching infra-red remote control handset, while any balance adjustment is achieved using a conventional rotary control on the rear of the amplifier case.

CD, tuner, aux, tape and MM disc inputs are provided next to a pair of upright and slightly undersized 4mm output sockets. Inside, a low noise *LM833N* op-amp is used for the disc gain and equalisation which then feeds an *MC14066B* CMOS selector switch together with the remaining line inputs. An *AD7528* D/A convertor multiplies the analogue (music) signal by the appropriate digital word to determine its volume setting. Steps between 1-3dB are available depending on the absolute volume level.

The power amp section then follows, comprising one pair of complementary *TIP132/131* Darlingtons per channel, fuse-protected against horrible loads! To minimise RF interference between the digital logic and analogue stages Ariston has specified the use of several isolated supplies together with very careful star-earthing.

## LAB REPORT

As expected, the ladder network used in the volume control gave a fine channel balance at -60dBV though stray coupling elsewhere in the CMOS network has degraded the channel separation to a meagre 40dB across the entire audio bandwidth. A-wtd noise on disc was pretty good at -78dB (ref 0dBW) though the input was fractionally insensitive at 3.07mV for full output. Talking of which, the amp failed to meet its 35W spec into 8ohms even though it increased by +1.9dB to 48W into 4ohms.

The MM response demonstrated a peculiar -0.42dB sag around 8kHz together with a very mild -0.2dB shelf below 150Hz. Those distortions highlighted on the 3D plot are derived from the power amp section and

include the 2nd, 3rd, 4th and 6th harmonics of  $F_{0-20k}$ , together with  $F_{0-50k-0} + yF_{0-20k}$  [ $y = 1.3$  and  $5$ ] summation IMD routes. 2nd to 4th and 6th IMD routes associated with the  $F_{20k}$  are also present - all of these mechanisms are very specific and indicate reduced feedback, an increase in crossover effects and subsequent distortion at higher frequencies.

The 40Hz ramp supply test is operating over a maximum 142.8dB dynamic range in this instance and highlights IMD components at 20Hz (-92.1dB), 140Hz (-89.3dB) and 220Hz (-97.5dB). Rectifier sampling artefacts dominate at each 100Hz interval while the 2nd and 3rd harmonics (80Hz and 120Hz) rise and fall in a non-linear fashion with respect to the 40Hz output ramp.

## SOUND QUALITY

The panel were evenly divided on this one, for though the amp possessed an attractive liveliness there was also some loss of image focus coupled with a degree of blurring and overhang at lower frequencies. Via CD it was slightly heavy-handed if not crude, one listener being disconcerted by the level of instrument modulation while another felt that the sheer fluidity of its presentation over-rode any such detractors. Such are the whims of subjectivism.

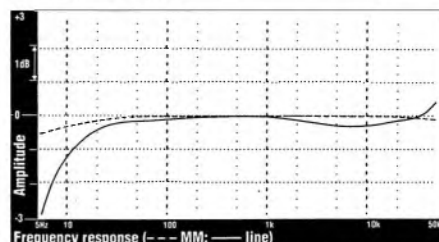
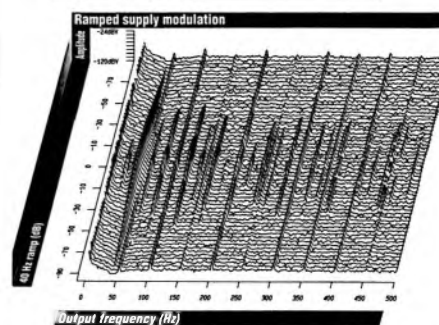
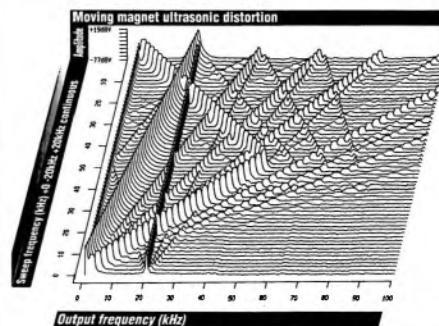
I felt the MM input was over-sensitive to radiated RF noise as a number of spurious clicks and pops were detected during the listening tests. In general terms it enjoyed an easy-going, friendly quality though vocals could sound a little thin at times, lacking 'body' and warmth if not suffering from any additional sibilance. If there was an insubstantial 'feel' to the projected soundstage this must be linked to the faintly sluggish or masked quality noted at low frequencies.

## CONCLUSIONS

This integrated amplifier certainly embodies a degree of 'brave new world' technology and is a bold move for a company best known as a turntable manufacturer. Nevertheless, it's due for a price rise this Spring, bringing it close to £200 and therefore - bearing in mind the subjective discrepancies - worthy only of a most cautious Recommendation.

## TEST RESULTS

Maximum Continuous Power Output - 8ohms	20Hz 29.0W	1kHz 31.4W	20kHz 31.2W
- 4ohms	42.4W	48.1W	48.6W
Dynamic headroom (1HF)		+ 1.13dB (40.8W)	
Output impedance	0.044ohm	0.05ohm	0.098ohm
Damping factor	182.1	159.3	81.7
Stereo separation (20Hz)		CD/Aux MM	
(1kHz)		40.2dB	40.1dB
(20kHz)		40.1dB	40.2dB
Channel balance (1kHz, -20dBV)		0.50dB	0.62dB
(-60dBV)		0.55dB	0.65dB
Total harmonic dist. (0dBW) (% power)		-72.9dB	-71.4dB
CCIR intermod. dist. (0dBW)		-72.9dB	-71.1dB
CCIR IM dist. (% power)		-72.8dB	-78.2dB
Rise time		-83.7dB	-76.5dB
Power bandwidth (<0.1% THD)		13µsec	9Hz - 30kHz
Square wave linearity			-90.1dB
Phase shift (20Hz)		23°24'	345°36'
(1kHz)		0°	309°36'
(20kHz)		331°12'	259°12'
Noise (A wtd, 0dBW) (% power)		-79.9dB	-78.0dB
Residual noise (unwtd)		-90.1dB	-83.3dB
Input sensitivity (for 0dBW)		-67.8dB	-67.2dB
(for full output)		31.10mV	563.6µV
Disc overload (20Hz)		175.7mV	3.069mV
(1kHz)			11.68mV
(20kHz)			107.2mV
(50kHz)			1019mV
Tape output/impedance			2331mV
Input loading			5.899V/217ohm
DC offset, left/right			47kohm/47kohm/22pF
Typical price inc VAT			-15.6mV/-11.9mV £180-£200



# BRYSTON 12B/4B

ROKSAN ENGINEERING LTD, 22 DOOLE ROAD, LLANDRINDOD WELLS, POWYS LD1 6DF. TEL: (0597) 491.



Although this is the *Choice* debut for Bryston amplifiers they have actually been distributed in the UK, courtesy of Roksan Engineering, for over a year. In its home country of Canada, Bryston Inc. has been steaming ahead for some 27 years and earning itself a reputation for exceptionally linear, load-tolerant, bomb-proof amplifiers. The reason for the rugged build and rather austere appearance of its many pre and power amps is partially explained by the fact that over half Bryston's production is destined for the pro-audio market.

The 12B preamp is the most versatile and flexible model in the range, devoid of tone controls but equipped with plenty of other facilities such as a 32Hz 'subsonic' filter, mute, balance and full tape monitoring. Four precision-milled alloy controls grace the very slim 19inch rack-mount fascia; the volume and balance controls are both 100kohm dual log taper potentiometers, the input and record-out selectors 4-pole/6-throw rotary switches – all of the highest quality. The remainder of its facilities, including the MM/MC cartridge selector, are initiated using a series of stiff black pushbuttons dotted underneath the main controls.

As you might expect, the internal design of the preamp is equally workmanlike and thoughtful – the case may be slim but the power supply is as big as any you might find in a small integrated amplifier! Phono equalisation is a two or three-stage affair based around two active gain blocks composed entirely of discrete 2N5679/5681 devices with high quality metal-film resistors and polystyrene capacitors.

A passive 32Hz high pass filter is placed between the two active RIAA sections but this is switchable from the front panel of course. Low output moving coil cartridges

are first connected to Bryston's internal step-up transformer which provides a flat gain of some 22.5dB.

A reed relay disconnects the output of the preamp and turns the dual-colour power-on LED red for the first few seconds after switch on but, other than this, the protection circuitry is completely non-invasive. The same can also be said of Bryston's 4B power amp which is rated at 200W (or 800W in bridged mode) and includes a very fast acting protection circuit that is indicated by the power-on LEDs turning from green to red. Whether any V/I limiting is instigated is unclear, though if the LEDs do ever turn red I would suggest reaching for the volume control as a safety measure...

In practice this is hardly ever likely to occur as the amp is exceptionally tolerant of nasty loads. The 4B also weighs a ton, well 23kg anyway, thanks to its massive construction with 6400cm<sup>2</sup> of heatsinking and two huge laminated C-core mains transformers. Aesthetically the 4B is still a brute, though remarkably compact and dense given its power output. Two gold-plated phono connections are provided at the rear (balanced input power amps are also available I believe) together with a set of chunky 4mm binding posts and bridged/stereo mode selector.

To all intents and purposes the amplifier is configured as a dual-mono unit (just look at those separation figures!) and adopts what Bryston terms complementary and quad-complementary gain stages. The latter configuration refers to the rugged output stage which uses both npn and pnp devices to cover both halves of the signal waveform; these are actually very special BR6521/BR6522 bipolars that are sourced from Motorola.

## LAB REPORT

Bryston's 12B preamplifier proved to have an exceptionally flat and even MM RIAA response, rising only +0.17dB at 10kHz and +0.09dB at 60Hz. However, the MC set-up transformer also introduced further phase shifts and bandlimited the response of this stage to -3dB limits of 6Hz (which is fine) and 7.5kHz (which is not fine); hence the subjective remarks noted during the listening tests. Stereo separation also fell quite markedly with increasing frequency and only measured 41-42dB at 20kHz with some -37dB of crosstalk between line and disc inputs at the same frequency.

Channel balance was much better while the results for THD on all inputs was nothing short of exceptional. Bettering 0.0018 per cent at 1kHz, some additional indication of the non-linearities inherent in the step-up transformer are provided by the increase in THD from -99dB to -80dB at 20kHz. CCIR IMD also increased to -65dB via the MC input despite it benefitting from a nominal +26.9dB headroom at this frequency. The headroom available at 20kHz via the MM input is higher at +30.6dB.

Neither of these properties are readily observable on the 3-D ultrasonic plot because of the downtilting response (and therefore lower output) of the MC stage at progressively higher frequencies. Some RF sensitivity is demonstrated though by the stray line at 86kHz. Anyway, the 12.3V peak output should prove more than sufficient while the 106ohm output impedance will reduce its sensitivity to various interconnect cables.

Bryston's 4B power amp exceeded its specification by 70W into 8ohms but failed to achieve its notional +3dB increase into 4ohms whereupon a mere 392W was realised.



Tight supply regulation has reduced the dynamic headroom to +1.1dB (red protection LED flashes at 308W pulsed into 8ohms), while the use of feedback around the output stage has reduced the output impedance to a usefully low 0.02ohms at 20Hz. For the same reason both IMD and THD were typically <0.004 per cent across the entire audio bandwidth, only a trace of 2F<sub>0-20k</sub> cropping up on the 3-D ultrasonic test. Supply modulation artefacts were restricted to the usual 60Hz (-100dB), 140/160Hz (-104dB) and 240Hz/260Hz (-110dB) IM products but the proliferation of odd-order field products (50Hz, 150Hz, 250Hz, 350Hz) indicates an interaction between the secondaries of the mains transformers.

## SOUND QUALITY

More than any of the amplifiers auditioned in this survey, the Brystons - and in particular the power amp - clearly benefitted from a very protracted warm-up period. During the first few hours the CD input afforded a dry, very controlled but slightly lean and ascerbic sound quality that impressed the listeners with its lively and sparkling gait but drew criticism for a loss of image focus and stability. The leanness of the combination was partially redressed once they had been left powered-up over three or four days but I still observed a somewhat matter-of-fact, and rather two-dimensional picture of musical events.

Auditioned separately the 4B power amp proved to be fairly neutral but also very quick on its feet. It was fast, dynamic and to the point but was perhaps lacking in the euphonic subtleties displayed by the less macho amplifiers in this test. Nevertheless, there's nothing like a big amp for recreating the authoritative scale of a large orchestral piece.

A most remarkable difference in the quality of the respective MM and MC inputs was observed (having not measured the preamp at this juncture), the MM stage offering a very detailed, articulate and sharply focused quality if seemingly a little forward in its presentation. By contrast the MC input afforded

a distinctly warmer, laid-back sound that imparted far less bite and less attack to percussive or stringed instruments. Transient edges seemed couched in cotton wool while low frequencies were blighted by a thick, boxy coloration that compromised any sense of ambience or rhythm.

Clearly these comments were prompted as a result of non-linearities inherent in the step-up transformer, problems that require more than the sound of a bright cartridge to be overcome. I imagine there might be some circumstances where an overly-smooth MC input is desired, but then, as one of our more erudite listeners put it: "Is this a duff MC input?" Unfortunately, yes.

## CONCLUSIONS

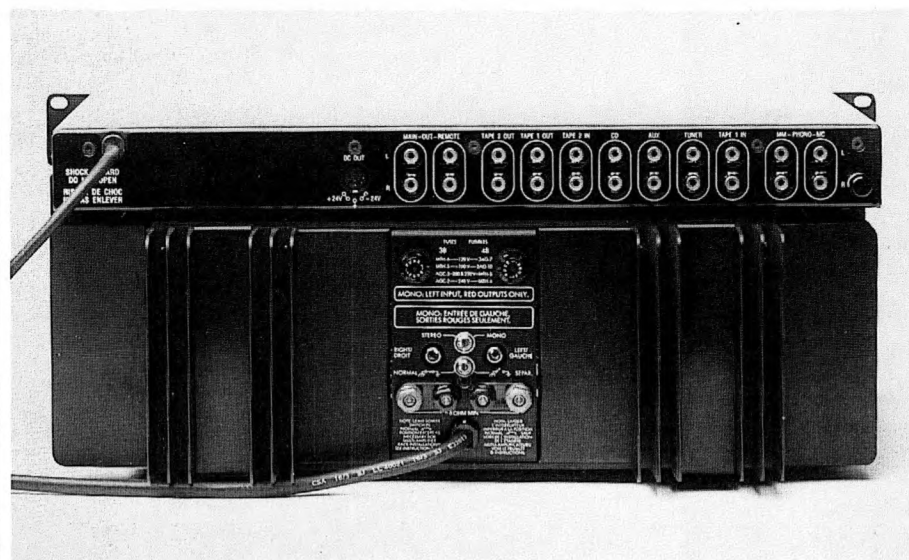
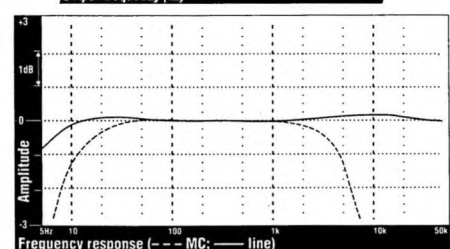
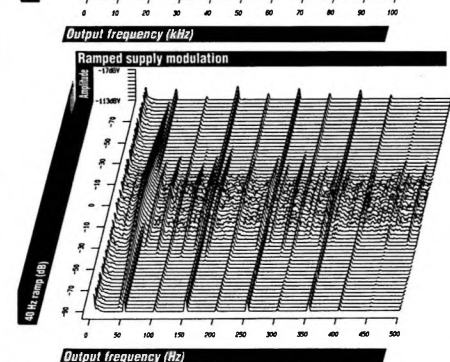
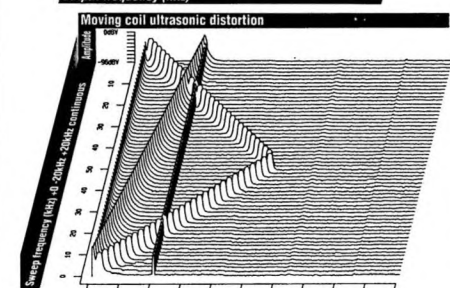
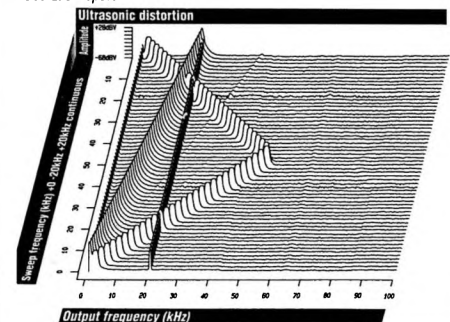
Previous experience with the cheaper pre/power combinations in Bryston's range indicates that perhaps the 12B/4B combination is not as good value in the sonic stakes as we thought it would be. As is often the case it's the preamp that lets the side down, the 4B power amp offering a healthy, very low distortion and load-tolerant output for a very reasonable asking price. I am happy to recommend the power amp then in its own right but suggest that the cheaper 0.5B/2B combination be auditioned if the Bryston 'style' seems particularly attractive.

## TEST RESULTS

PREAMPLIFIER			
Stereo separation			
(20Hz)	Aux/CD	MM	MC
(1kHz)	102.5dB	103.5dB	102.7dB
(20kHz)	67.9dB	67.5dB	67.1dB
	42.3dB	42.2dB	41.1dB
Channel balance			
(1kHz, 0dBV)	0.14dB	0.17dB	0.11dB
(-20dBV)	0.12dB	0.11dB	0.14dB
(-60dBV)	0.54dB	0.77dB	0.63dB
Total harmonic dist.			
(0dBV, 1kHz)	-97.1dB	-97.8dB	-99.1dB
(20kHz)	-95.5dB	-94.7dB	-80.3dB
CCIR intermod. dist. (1:1)			
Phase shift (20Hz)	7°12'	180°0'	0°
(1kHz)	0°	133°12'	309°36'
(20kHz)	353°9'	88°12'	255°36'
Squarewave linearity			
Noise (A wtd, 20Hz-20kHz)	-92.9dB	-81.9dB	-79.6dB
Residual noise (unwtd)	-97.9dB	-98.5dB	-98.0dB
Input sensitivity (for 0dBV)	132.3mV	2.305mV	149.6μV
Disc overload (20Hz)		24.72mV	1.610mV
(1kHz)		226.3mV	14.86mV

(20kHz)	1701mV	110.9mV	
(50kHz)	1687mV	248.9mV	
Input loading	4.7kohm	49kohm/220pF	
Preamplifier output (max)/impedance		12.32V/105.5ohm	
Tape output (max)/impedance		12.67V/99.1ohm	
DC offset, L/R		-28.3μV/-27.9μV	
<b>POWER AMPLIFIER</b>			
Maximum Continuous	20Hz	1kHz	20kHz
Power Output - 8ohms	254.5W	272.4W	250.7W
- 4ohms	363.5W	392.1W	360.5W
		+ 1.06dB (307.8W)*	
Dynamic headroom (IHF)			
Output impedance	0.019ohm	0.019ohm	0.042ohm
Damping factor	423.4	426.6	190.4
Stereo separation (0dBV)	126.5dB	110.8dB	107.6dB
Total harmonic dist. (0dBV)	-93.9dB	-89.2dB	-87.5dB
(½ power)	-89.2dB	-93.5dB	-88.2dB
CCIR intermodulation distortion (0dBV)			-93.2dB
CCIR IM distortion (½ power)			-91.7dB
Rise time (@ 10kHz)			1.5μsecs
Power bandwidth (<0.1% THD)			5Hz - 130kHz
Squarewave linearity			-93.5dB
Phase shift 20Hz			0°
1kHz			0°
20kHz			14°24'
Noise (A wtd, 20Hz-20kHz) 0dBV			-81.0dB
(A wtd, 20Hz-20kHz) ½ power			-91.9dB
Residual noise (unwtd)			-81.8dB
Input sensitivity (for 0dBV)			90.94mV
(for full output)			1459mV
Input loading			50kohm
DC offset, left/right			+ 16.9mV/+ 17.5mV
Typical price inc VAT			pre £995, pwr £1,395

\*See Lab Report



# DELTEC DSP-50S/DPA-50S

DELTEC PRECISION AUDIO, 16 CLAUDE ROAD, ROATH, CARDIFF CF2 3PZ. TEL: (0222) 482818.



Deltec Precision Audio is a relatively unusual company, not only because the curvaceous style and pristine finish of its amplifiers is hard to reconcile with the small *size* of the company's operation, but also because the electronics are truly innovative. Innovation is a term used carelessly by many marketing divisions for in reality there is little that is genuinely new about audio amplifiers these days. Rehashing the groundplane or rediscovering some long-lost circuit topology for instance is not innovation by any stretch of the imagination.

Aesthetically, both the pre and power amps are very distinctive and therefore likely to polarise opinion – if you prefer your amplifiers to come in big rectangular boxes bristling with vicious heatsinks then the Deltecs are likely to be something of a disappointment. If, however, you have a preference for the Continental style then these glossy grey amps with their gold legends may appeal. The *DSP-50S* preamplifier is shallower than the *DPA-50S* power amp but is built to the same width for continuity.

Four rotary controls grace the front of the preamp, each fashioned from cast alloy and finished in the same livery as the alloy fascia and wrap that covers the unit. Separated from the three function knobs by a discrete 'DPA' logo, the fourth rotary control is in fact the on/off switch; the volume control lies on the other side of the fascia! Next to this is a limited range balance control and input selector equipped to route either MM or MC disc, tape, CD or tuner sources into the preamp. A row of four DIL switches underneath the preamp are used to determine both the input loading and resultant gain of the disc stage but some annotation here would not go amiss.

The alloy case is reinforced internally by a

series of ribs while the use of only three feet also helps cut down on the ingress of vibration. A standard 5-pin DIN socket is provided for connection to a tape recorder, the other inputs utilise gold-plated phonos and the output is configured using balanced XLRs to match the input socketry of the *DPA-50S* power amp. This power amp also has a large rotary on/off control which gives it the appearance of a minimalist preamp, especially as the heatsinking is accommodated by the 6mm alloy base of the amplifier.

One of the unusual – though not unique – features of the *DPA-50S* is its extension of the output feedback network to the very ends of their proprietary four-conductor speaker cable, a feature that reduces the output impedance of the amp to infinitesimally small levels in addition to maintaining its extreme linearity right up to the loudspeaker itself. The compound-Class A output stage of the power amp is conceived around five pairs of high speed Motorola *MJE15028/15029* drivers bolted onto the same heatsink as its two complementary pairs of current-dumping *MJ15003/15004* output transistors. The gain of the current dumpers, which in turn determines the peak output current of the stage, is linked to both the hfe and vbe characteristics of the output devices; this is slightly different to the topology utilised in the earlier *100S* power amp which employed a series of paralleled emitter resistors for this purpose.

Nevertheless, it's the *DH-OA32* thick-film single-channel op-amp that lies at the heart of both pre and power amp, four being used in the *DSP-50S* (two for disc and two for line) and two in the *DPA-50S*. These hybrids combine a sandwich of resistors and tracks which are laid down onto an inert alumina substrate with a variety of surface-mounted

capacitors, transistors and diodes to yield a series of three cascoded differential gain blocks. Discrete transistors are used for the Class A complementary output of each hybrid which is also defined by a strict double-pole feedback regime that offers a high dominant pole of 20kHz followed by a fast 12dB/octave open-loop roll-off. Deltec claims an astonishing 0.8GHz open-loop gain bandwidth product at this frequency with a closed-loop THD of just –130dB (0.000032 per cent) at 1kHz for a gain of 20dB!

## LAB REPORT

The stringent power supply regulation that is part and parcel of the *DPA-50S* design philosophy is revealed in the healthy +2.6dB increase from 8 to 40ohms and the further +2.5dB available from 4 to 2ohms. However, this same regulation is responsible for a paltry +0.25dB dynamic headroom. Courtesy of Deltec's feedback system the output impedance of the amp at 20Hz fell to an amazing 0.00039ohm, responsible for a nominal damping factor of some 20,500! This was reduced to 258 at 20kHz because of a secondary feedback network included to prevent oscillation when driving highly reactive loads. Midband distortion fell to 0.00035 per cent at two-thirds power, the virtual absence of any spurious artefacts being reflected on both the 3-D ultrasonic plot and the –105dB noise figure which is usually compromised by harmonics.

At low frequencies (20Hz) the level of THD increased to 0.0056 per cent though CCIR IM distortion only rose from 0.00035 per cent to 0.00056 per cent between 1W and two-thirds power. Stereo separation is a trifle weak (42dB) at 20kHz but the input sensitivity, loading and squarewave linearity figures are all fine. The power amp is phase-

inverting, so swap the red and blue loudspeaker leads over at the loudspeaker!

RIAA equalisation accuracy was pretty good although the MM and MC stages rolled-off at slightly different rates at LF. Deltec is still using the very expensive Penny & Giles volume potentiometers in its preamp but has recently improved the channel tolerancing of them. The channel balance was out by only 0.77dB at -60dBV. Input sensitivities and overload margins are all adequate though the -74dB A-wtd noise via MC is something of a fly in Deltec's technical ointment. Linearity-wise the DSP-50S is unbeatable, the hybrids (operating at 40dB gain) giving rise to <0.00018 per cent THD at 1kHz via CD and 0.0004 per cent via MC. The incredulity of this result was only redressed by the level of IMD via MC which rose to a 'huge' 0.0063 per cent!

## SOUND QUALITY

The dry control, superb transparency and exquisite resolution of subtle musical detail ensured that this pre/power combination stood out as 'a little out of the ordinary' in the listening tests. Via the CD input the sound was thrilling, so vivid and sharply etched were the images of instruments and vocalists. Stereo width and depth was quite impressive, the listeners commenting on the clarity and space surrounding each performer. Its resolution of bass lines was uncannily tight, sounding faintly lean in comparison with the other pre/power combinations tested. Perhaps for the same reason it didn't reveal the monumental swelling of an orchestra in quite the same fashion, and as a result climaxes were thought to sound a little 'sat-on'.

Indeed, one listener considered that the balance erred slightly on the clinical or analytical side of neutral but others thought otherwise. It certainly took more than a few minutes to appreciate the musical vista afforded by this combination which sounded as if every unnecessary coloration or veil had been stripped from the scene without compromising the sparkle or inherent 'magic' of the music. This same innate control and precision was audible through both disc inputs,

which proved to be virtually indistinguishable on test.

Our listeners actually preferred the sound of 'analogue' sources through the DSP-50S preamp; vocals delighted in precise articulation without any hint of sibilance, while the natural tonal colours, the individual textures, of contrasting instruments were revealed in all their glory. The balance was extended and neutral, soundstages broad and deep and populated with uncannily tactile images.

## CONCLUSIONS

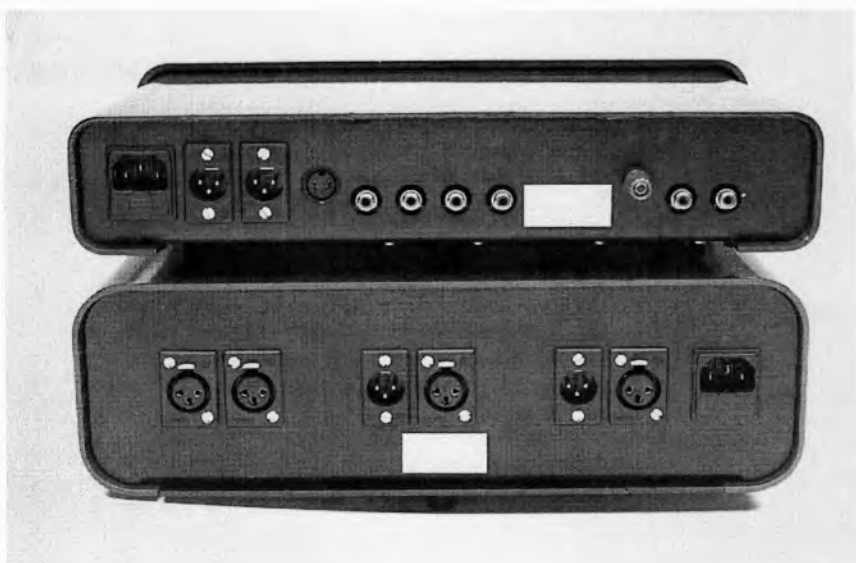
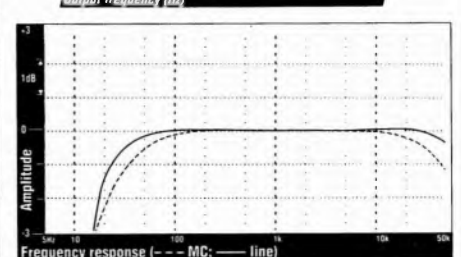
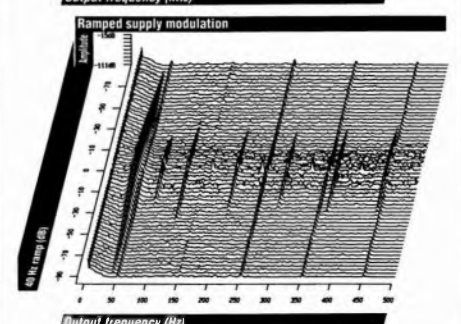
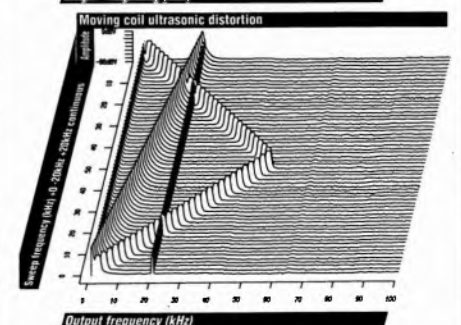
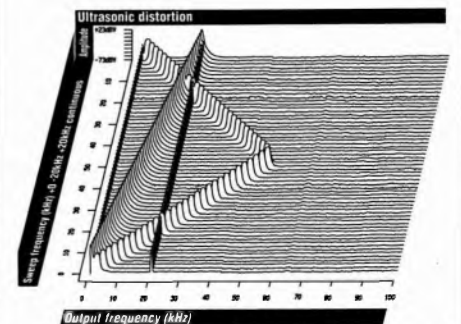
Deltec is to be heartily congratulated on the success of this elegant pre/power combination which sets new standards in transparency and detail resolution at this price, or virtually any other for that matter! If a Best Buy could be awarded at this level then the Deltec combo would most certainly be a recipient. However, as £1,500 is clearly far more than many people would ever dream of spending on an amplifier, then an unreserved Recommendation will have to suffice.

Once Deltec moves into its new South Wales factory, finishes the DSP-100S preamp and completes the hybridisation of the DPA-100S power amp the company should certainly start putting the collywobblers up much of the imported high-end competition.

## TEST RESULTS

PREAMPLIFIER			
	Aux/CD	MM	MC
<b>Stereo separation (20Hz)</b>	116.9dB	85.8dB	68.5dB
(1kHz)	89.5dB	83.6dB	86.5dB
(20kHz)	64.9dB	77.1dB	69.9dB
<b>Channel balance (1kHz, 0dBV)</b>	0.06dB	0.05dB	0.06dB
(-20dBV)	0.48dB	0.45dB	0.49dB
(-60dBV)	0.73dB	0.77dB	0.74dB
<b>Total harmonic dist. (0dBV, 1kHz)</b>	<-11.5dB	-110.7dB	-107.9dB
(20kHz)	-113.8dB	-105.7dB	-105.4dB
<b>CCIR intermod. dist. (1:1)</b>	-97.6dB	-89.5dB	-83.9dB
<b>Phase shift (20Hz)</b>	7°30'	43°12'	43°30'
(1kHz)	0°	50°36'	50°30'
(20kHz)	14°30'	102°30'	101°12'
<b>Squarewave linearity</b>			-103.5dB
<b>Noise (A wtd, 20Hz-20kHz)</b>	-92.8dB	-82.6dB	-73.6dB
<b>Residual noise (unwtd)</b>	-88.9dB	-88.9dB	-88.6dB
<b>Input sensitivity (for 0dBV)</b>	102.9mV	1.895mV	178.4µV
<b>Disc overload (20Hz)</b>		15.62mV	1.865mV
(1kHz)		145.9mV	15.79mV
(20kHz)		789.8mV	124.9mV

(50kHz)	956.6mV	176.7mV	
<b>Input loading</b>	10kohm/47kohm/150pF	100ohm	
<b>Preamplifier output (max)/impedance</b>		10.78V/21kohm	
<b>Tape output (max)/impedance</b>		10.8V/25kohm	
<b>DC offset, L/R</b>		702µV/650µV	
<b>POWER AMPLIFIER</b>			
<b>Maximum Continuous</b>	20Hz	1kHz	20kHz
<b>Power Output - 8ohms</b>	60.7W	62.5W	62.2W
<b>- 4ohms</b>	112.5W	114.0W	113.1W
<b>Dynamic headroom (IHF)</b>			+0.25dB (66.2W)
<b>Output impedance</b>	0.00039ohm	0.00048ohm	0.031ohm
<b>Damping factor</b>	20513	16667	258.1
<b>Stereo separation (0dBW)</b>	98.5dB	66.8dB	41.6dB
<b>Total harmonic dist. (0dBW)</b>	-95.7dB	-98.9dB	-97.6dB
(½ power)	-84.8dB	-108.6dB	-97.1dB
<b>CCIR intermodulation distortion (0dBW)</b>			-109.2dB
<b>CCIR IM distortion (½ power)</b>			-104.8dB
<b>Rise time (@ 10kHz)</b>			1.9µsecs
<b>Power bandwidth (&lt;0.1% THD)</b>			11Hz - 28kHz
<b>Squarewave linearity</b>			-104.7dB
<b>Phase shift 20Hz</b>			174°12'
<b>1kHz</b>			187°30'
<b>20kHz</b>			189°12'
<b>Noise (A wtd, 20Hz-20kHz) 0dBW</b>			-92.1dB
<b>(A wtd, 20Hz-20kHz) ½ power</b>			-104.7dB
<b>Residual noise (unwtd)</b>			-102.8dB
<b>Input sensitivity (for 0dBW)</b>			135.9mV
<b>(for full output)</b>			1109mV
<b>Input loading</b>			10kohm/4.7µF
<b>DC offset, left/right</b>			+15.1µV/-19.0µV
<b>Typical price inc VAT</b>			pre £675, pwr £825



# DENON DAP-2500/POA-4400A

HAYDEN LABORATORIES LTD, HAYDEN HOUSE, CHILTERN HILL, CHALFONT ST. PETER, BUCKS. TEL: (0753) 888447.



Denon has apparently had some success with the introduction of a costly 'digital' preamplifier and matching monoblock power amps, so has decided to launch a matching but cheaper pair of units. The 'digital' in this preamp refers to its captive D/A conversion circuitry which, like a couple of the integrated amplifiers in this test, allows the digital data stream from either a CD player, DAT deck or satellite broadcast to be converted back to an analogue signal prior to any further processing that may be desired. In this respect the *DAP-2500* is like any other preamp, offering a range of facilities such as defeatable tone controls, full tape monitoring, a variable loudness contour and L/R balance adjustment.

Returning to the digital side of things, both optical and coaxial sockets are provided and once the 'digital direct' switch is depressed an internal CMOS switch automatically routes the incoming signal to the interface, oversampling and D/A converter ICs. The appropriate sampling frequency is flashed up on a small 2-digit display near the top of the preamp. A proprietary 4x oversampling filter is employed together with two complementary pairs of 16-bit DACs, configured to reduce so-called 'Zero-Cross' distortion which becomes most important at the MSB (most significant Bit). Nevertheless, I'm not sure whether this technique accommodates the inevitable differences in the conversion gain of each 'half' of the complementary pair.

The preamp itself is exceptionally well-built and features a very solid satin-black alloy fascia, populated with the bare minimum of input switching facilities. A retractable flap exposes the peripheral facilities I mentioned earlier, together with a headphone switch, source direct and MM-MC phono selector. A subsonic (rumble) filter is

also available for use with either of the phono inputs but for best results this should generally be left switched out. The remaining analogue inputs include CD, tuner, two auxes and two tapes while both unbalanced and balanced output configurations are provided, both driven via a unity gain buffer ensuring a low and uniform output impedance of around 18ohms.

Denon's *POA-4400A* monoblock power amps seem to have undergone a slight metamorphosis, the original version apparently graced with a logo declaring its use of a 'Dual Super Non-NFB Circuit'. Our sample read 'Optical Class-A' instead, this referring to the use of optical linkages inside the amplifier which alter the bias current in the output stage in accordance with the demands of the incoming music signal. This technique is similar to other sliding-bias topologies in attempting to reap the rewards of Class A operation without the disadvantages of excess heat and inefficiency.

Once again, the power amp is beautifully built with tasteful gold lettering contrasting with the black of the fascia – they certainly look more expensive than the £600 pricetag would suggest! Both coaxial and balanced XLR inputs are provided together with a remote connection enabling the unit to be turned on or off from the preamp. The preamp itself is also compatible with Denon's *RC-110* system IR control which will allow the remote switching of inputs in addition to powering the motorised volume control.

## LAB REPORT

Measured without the subsonic filters in circuit the RIAA equalisation response of both disc inputs followed a similar trend above 50Hz flat to 3.5kHz but then experiencing a gentle HF roll-off with a  $-3\text{dB}$  point of 22kHz. The low bass response was less well

matched between inputs, the MC stage rolling off sharply to yield a  $-3\text{dB}$  point of 17Hz. Stereo separation fell to around 45dB (at 20kHz) on all inputs but the channel balance was rather better, for despite a slight discrepancy of 0.47dB at  $-20\text{dBV}$  the balance recovered to a marvellous 0.12dB at  $-60\text{dBV}$ . An A-wtd noise figure of  $-94.8\text{dB}$  for the MM input is another great result.

THD was fairly well balanced between inputs at very high frequencies (typically  $<0.013\%$ ) though it actually increased from  $-78\text{dB}$  to  $-74\text{dB}$  via the direct digital input as a result of non-linearities in the D/A conversion process. Quantisation errors are not likely to be responsible at peak level furthermore, as the 3-D spurious output plot shows; the distortion complement is principally second harmonic. Denon's filtering is unable to reduce all the stop-band artefacts, particularly near the top end of the pass-band where the second-order sampling IMD route  $F_S - F_{0-20k}$  rises out of the noise floor. Spurious output was rejected by  $-88\text{dB}$  thereafter though some 3rd-order products ( $3F_S - 2F_{0-20k}$ ) can be seen tracking down-band on the far right of the plot.

Denon's monster power amps kicked out some 170W into 8ohms across an impressive 52kHz bandwidth, rising  $+1.76\text{dB}$  into 4ohms and  $+2\text{dB}$  under dynamic conditions. The 740nsec rise time (at 10kHz) is also reflected in the bandwidth and minimum phase condition of this power amp. Feedback around the output stage has reduced the output impedance to 0.075ohm and distortion to 0.0016 per cent up to 5kHz ( $\frac{3}{4}$  power), though with less correction available above the dominant pole THD rose to around 0.0045 per cent at 20kHz. Traces of the 2nd and 4th harmonics of  $F_{0-20k}$  are visible on the two-thirds power 3-D ultrasonic distortion plot.

At far lower frequencies the 40Hz ramped supply modulation test reveals a predominance of odd-order mains field harmonics that possibly emanate from the fact that the toroidal power transformer has more than one secondary winding. Subsonic IMD products are suitably suppressed, those at 140Hz, 160Hz, 240/260Hz and 340/360Hz typically  $< -71$ dBV. Note also the brief emergence of the 2nd harmonic (80Hz) when the 40Hz driving signal is raising the amp some  $-30$ dB below full output.

## SOUND QUALITY

Once again it proved interesting to compare the sound quality of the conventional analogue CD input with that of the digital input and its attendant D/A conversion circuitry. In the event we all came down on the side of the analogue input which offered a neutral and extended balance with a fine sense of detail and stereo focus. The power amplifier encouraged a light and 'fast' sound that handled the complex, multitudinous dynamics of our classical CDs with considerable ease, recreating a deep and fairly transparent soundstage populated with satisfyingly tactile images.

By contrast this unfettered and dynamic quality was quashed by the digital input which compromised both the resolution of fine treble details and the precise focus of stereo images. Strong vocal images were not so well represented, while the leading edges of transient notes – especially piano – seemed blurred by comparison to the analogue CD input. Similarly, both the MM and MC phono inputs were considered merely 'average' rather than convincingly musical.

The MM stage was the lighter and perhaps more detailed of the two but even this had an air of superficiality about it – 'very hi-fi' was how one listener described the sound of this preamp. A warmer and weightier presentation was afforded by the dedicated MC input but though this avoided the occasional splashiness of the MM stage it also sounded softer at low frequencies, an effect that caused the amp to lose its 'grip' when reproducing particularly strong bass lines.

## CONCLUSIONS

Denon's *POA-4400A* monoblok amplifiers are certainly the brighter side of this new pre/prepower combination and may be confidently Recommended in their own right; they offer plenty of power together with a pleasingly light and fresh sound quality without costing an arm and a leg. The perceived and real value of these units is high indeed. Nevertheless, I feel unable to Recommend the combination with such assurance, for once again we are faced with the situation of on-board D/A converters playing second fiddle to the sound of a conventional (cheaper) CD player. If the sole purpose for including this digital circuitry in a preamp was to improve the calibre of the reconstructed digital signal then Denon, like so many others, has failed.

## TEST RESULTS

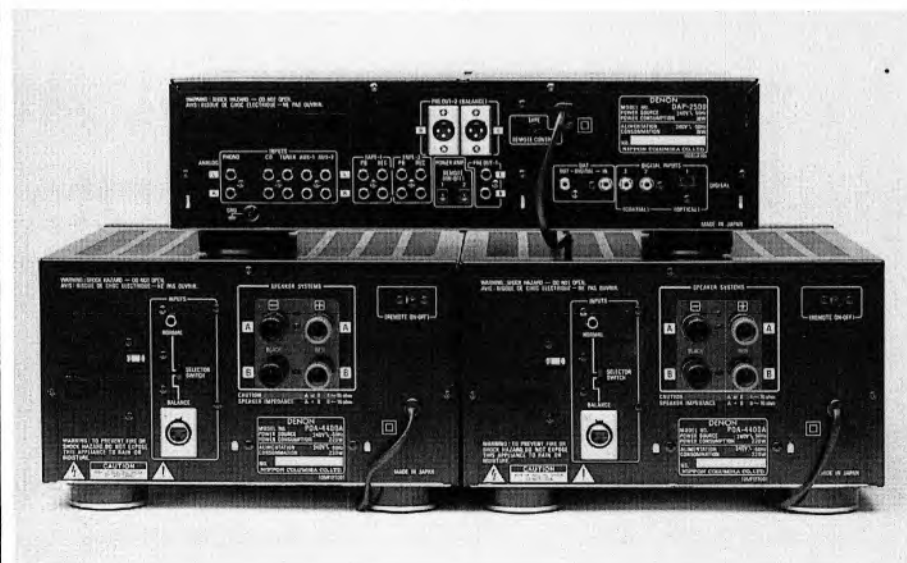
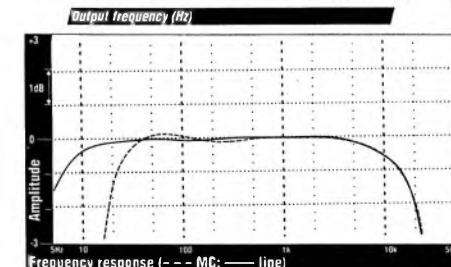
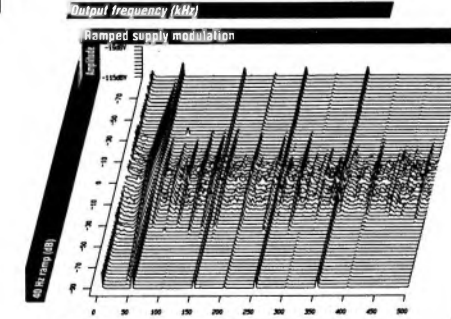
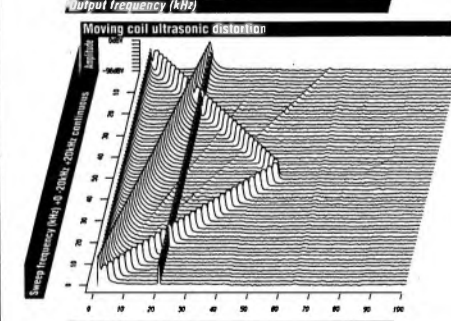
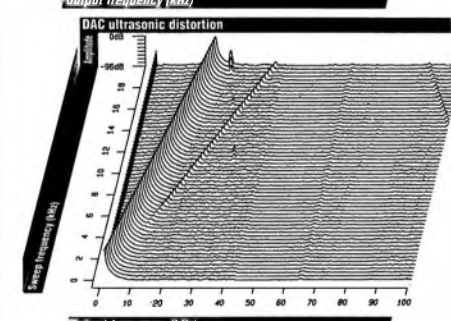
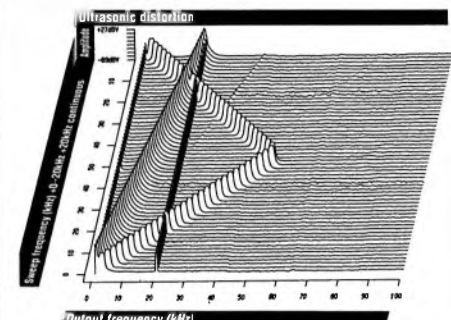
### PREAMPLIFIER

Stereo separation	Aux/CD	MM	MC
(20Hz)	85.8dB	86.5dB	87.2dB
(1kHz)	72.1dB	70.8dB	69.2dB
(20kHz)	47.3dB	45.9dB	43.4dB
Channel balance			
(1kHz, 0dBV)	0.16dB	0.06dB	0.05dB
(-20dBV)	0.47dB	0.35dB	0.27dB
(-60dBV)	0.12dB	0.06dB	0.04dB
Total harmonic dist.			
(0dBV, 1kHz)	-88.3dB	-82.7dB	-80.6dB
(20kHz)	-77.9dB	-78.6dB	-79.7dB
CCIR intermod. dist. (1:1)	-84.6dB	-70.1dB	-72.9dB
Phase shift (20Hz)	7°55'	352°48'	352°30'
(1kHz)	353°9'	307°26'	306°26'
(20kHz)	309°36'	244°48'	242°30'
Squarewave linearity			-97.6dB
Noise (A wtd, 20Hz-20kHz)	-101.5dB	-94.8dB	-78.1dB
Residual noise (unwtd)	-104.9dB	-104.8dB	-104.9dB
Input sensitivity (for 0dBV)	163.5mV	2.633mV	213.3μV
Disc overload (20Hz)		19.51mV	1.849mV
(1kHz)		174.9mV	13.89mV
(20kHz)		1598mV	135.8mV
(50kHz)		1646mV	169.7mV
Input loading	33kohm/10kohm	4.7kohm	100ohm
Preamp output (max)/impedance		10.30V/17.9ohm	
Tape output (max)/impedance		10.85V/61.3ohm	
DC offset, L/R		+25.5μV	+95.8μV

### POWER AMPLIFIER

Maximum Continuous Power Output	20Hz	1kHz	20kHz
-8ohms	169.1W	171.7W	167.6W
-4ohms	246.7W	258.1W	247.9W
Dynamic headroom (IHF)		+2.03dB	(273.9W)
Output impedance	0.075ohm	0.076ohm	0.118ohm
Damping factor	106.5	105.7	67.8
Stereo separation (0dBW)		monoblok	
Total harmonic dist. (0dBW)	-93.4dB	-89.2dB	-88.1dB
(½ power)	93.2dB	95.5dB	87.7dB

CCIR intermodulation distortion (0dBW)	-84.2dB
CCIR IM distortion (½ power)	-86.4dB
Rise time (@ 10kHz)	740nsecs
Power bandwidth (<0.1% THD)	5Hz - 52kHz
Squarewave linearity	-93.7dB
Phase shift 20Hz	0°
1kHz	0°
20kHz	3°12'
Noise (A wtd, 20Hz-20kHz) 0dBW	-81.3dB
(A wtd, 20Hz-20kHz) ½ power	-93.4dB
Residual noise (unwtd)	-81.1dB
Input sensitivity (for 0dBW)	85.26mV
(for full output)	1096mV
Input loading	29.8kohm
DC offset, le t/right	-0.77mV/+0.56mV
Typical price inc VAT	pre £549, pwr £600



# EXPOSURE VII DUAL/VI/VIII SUPER

EXPOSURE ELECTRONICS, THE WORKS, 59 NORTH STREET, PORTSLADE, SUSSEX BN4 1DH. TEL: (0273) 423877.



Various of these traditionally British amplifiers have been reviewed in previous issues of *Choice*, though this is the first occasion where one of the dual-supply preamp versions has been assessed. This is in fact a three-box pre/power combination as the preamp is powered by an Exposure VI out-board supply that furnishes two separate 24V DC rails, each destined for one channel of this double-mono design. A standard single supply preamp is also available at a saving of some £90, both single and dual versions being supplied with the appropriate power cabling.

Once hooked up the use of these amplifiers could not be more straightforward, the VII preamp featuring a single volume control and adjacent selector for routing the input of either aux, aux 1 (it must pain them to print 'CD'), tape, tuner or 'gram' sources. The latter refers to disc, of course, both MM and MC cartridges being catered for by an independent gain/loading switch at the rear of the box. A mute facility is also provided together with outputs for a tape machine and matching power amp.

Exposure's VII preamp may look rather spartan from the outside, but those facilities that are provided do benefit from very high quality controls. For instance, the volume control is a decent sealed ALPs potentiometer while the input selector is an hermetically-sealed CNK switch with gold-plated contacts.

The 24V supply rails are regulated down to 18V in the preamp with independent feeds for the input buffers catering for each of the MM and MC inputs. The moving coil input uses a very low noise diff. amp which is isolated from the MM buffer by a selector switch that routes either signal into the RIAA equalisation section. Equalisation is part active

(LF) and part passive (HF) and is accomplished with wholly discrete components. The main selector switch feeds an active (constant impedance) volume control which then runs to a diff. amp and finally the low impedance, Class A emitter-follower output. A double-pole reed-relay mutes the output of the preamp for about 30 seconds after switch on to prevent a large DC offset from appearing at the output.

There is not much that can be said about the exterior of the VIII Super power amp save that it matches the style (if not the dimensions) of the preamp and is equipped with an on/off switch, gold-plated input phonos and two pairs of recessed 4mm sockets for the connection of loudspeaker cable. Inside is a different matter. A grain-oriented stainless steel laminate provides a degree of screening for the VIII's 250VA toroid which supplies what is essentially a dual-mono power amp via two 25A rectifiers and 4 proprietary electrolytics.

The input is configured as a Class A diff. amp while a phase compensation network operates about the pre-drivers (1MHz), drivers and complementary output stage (20MHz devices) together with about 20-30dB of feedback to maintain stability. Each mono amp 'card' is matched for THD and IMD so that any sonic characteristics are balanced between the left and right channels.

## LAB REPORT

Exposure's use of split printed circuit boards seems to have paid off as far as stereo separation is concerned, all inputs achieving 83dB at 1kHz. However as they all fall to 58dB at 20kHz (not a bad figure anyway) this does suggest some capacitive coupling at the few close junctions on the board, the CNK selector switch perhaps. Anyway the channel

balance proved quite excellent, the L/R error only 0.13dB at -60dBV with a worst case of 0.2-0.3dB at -20dBV where a slight mismatch between the tracks of the volume control is manifest.

The frequency response of both disc stages is commendably flat and even over the bulk of the audio range though small boosts of +0.18dB (50Hz) and +0.25dB (10kHz) show up on the MM response just prior to rolling-off at the frequency extremes. Both THD and IMD are kept to within 0.0032 per cent-0.028 per cent respectively on both the line and MM disc inputs, though a massive deterioration to 0.38 per cent (THD) and 0.79 per cent (IMD) was measured via the MC disc input at progressively higher frequencies. It is evident that the MC stage is considerably less linear than the MM stage as a whole, for the nominal MC overload margins are very high at +32.9dB (1kHz) and +32.4dB (20kHz - both to 1 per cent THD). Consequently the MC input incurs a relatively high level of distortion over a wide range of input levels, there being no sudden clip at the overload point, simply a gradual increase in THD to 1 per cent.

This is reflected in the MC ultrasonic plot which highlights those even order mechanisms such as  $F_{20k} \pm F_{0-20k}$  and  $F_{0-50k-0} \pm F_{0-20k}$ . The second harmonic of  $F_{0-20k}$  dominates, though the 3rd harmonic increases above 13kHz together with those in-band 3rd-order routes  $F_{20k} - 2F_{0-20k}$  and  $F_{0-50k-0} - 2F_{0-20k}$ . Nevertheless the bulk of the non-linearities are quite 'pleasant-sounding', unlike the equivalent 3rd-order artefacts observed with the Linn amplifier for example.

A similar feature is observed with Exposure's VIII Super power amp though all the 2nd-order mechanisms give rise to summation rather than difference routes, a pro-

duct of reducing feedback at progressively higher frequency. This said, judging by the high-ish 0.24ohm output impedance the Exposure is indeed a moderate to low feedback amplifier. The 40Hz ramped supply modulation test also reveals a very interesting change in distortion with increasing signal (40Hz) level. Note how the 2nd, 3rd, 4th and 6th harmonics of 40Hz fluctuate in a non-linear fashion with respect to level, a property that can be exacerbated by the biasing condition of the output stage. In this instance the effect is slight, but a change in harmonic manipulation of this sort can have subjective repercussions when listening to music that covers a wide dynamic range simultaneously.

Exposure's *VIII Super* is also relatively insensitive (1467mV) when you consider its moderate 63W output. A further +1.27dB is available into 4ohms but the stringent supply regulation has reduced the IHF dynamic headroom to just +1dB.

## SOUND QUALITY

The relaxed and deeply spacious presentation afforded by this pre/power combination was appreciated by all the listeners who described it as 'confident' but also a little 'slow' or 'heavy' in the lower mid. The CD (sorry, 'aux') input in particular was very smooth and fluid sounding. It did not appear incisively detailed but possessed a most beguiling and attractive quality that prompted the sensation of 'effortlessness' despite it quite obviously struggling to meet the demands of an orchestra in full swing.

Its resolution of well-recorded vocal material was very good indeed and this was reinforced by its tactile imagery and 'dark' acoustic. Only at the frequency extremes was there some deterioration both in detail resolution and soundstaging, the lowest octaves appearing slightly 'plummy' while the highest treble notes were just a little too rounded or sweet. Nevertheless, despite these technical criticisms the amp proved to be most enjoyable in the musical context.

The MM input could sound faintly slow and ponderous in the manner of the CD input, but was pleasantly spacious and

relaxed in its presentation. There was a lack of quick bass 'slam' but appropriate recordings were recreated with unusually good depth and spaciousness - notes were allowed to flutter and die away in a most convincing fashion that certainly found favour with most of the listening panel.

There was some disagreement over the calibre of the dedicated MC input though, which seemed to take the warm and rich balance noted earlier just a little too far. A loss of bass resolution lent an artificial warmth or fuzziness to the sound, compromising the attack of bass strings or the tightness of rhythm. On other occasions the MC stage was considered to sound a trifle 'tizzy' at the top end which introduced a little sibilance into strong vocals.

## CONCLUSIONS

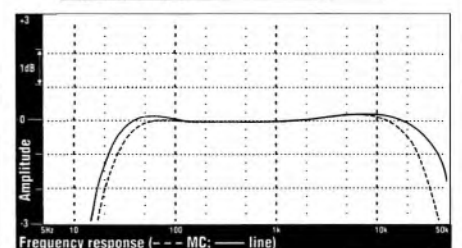
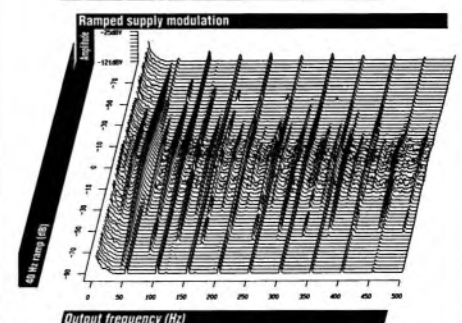
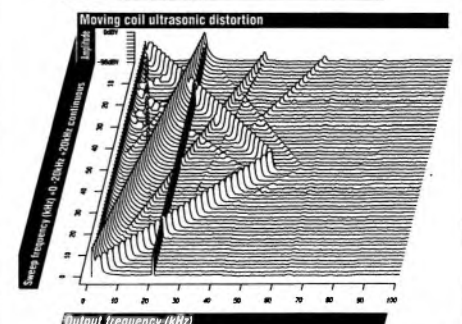
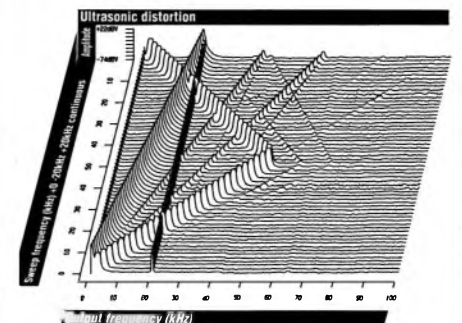
Exposure's dual-supply pre/power combination can be happily recommended for its civilised and thoroughly captivating sound quality despite there being a clear hierarchy in the performance of the line, MM and MC inputs. I imagine this combo will be most at home with quick, lucid and perhaps slightly bright loudspeakers; either way I would suggest that overly rich or 'plummy' sounding models be avoided.

## TEST RESULTS

### PREAMPLIFIER

	Aux/CD	MM	MC
<b>Stereo separation (20Hz)</b>	115.8dB	92.8dB	85.3dB
(1kHz)	83.4dB	83.1dB	82.9dB
(20kHz)	58.4dB	58.3dB	58.2dB
<b>Channel balance (1kHz, 0dBV)</b>	0.02dB	0.01dB	0.04dB
(-20dBV)	0.21dB	0.28dB	0.25dB
(-60dBV)	0.13dB	0.13dB	0.14dB
<b>Total harmonic dist. (0dBV, 1kHz)</b>	-88.9dB	-79.9dB	-72.9dB
(20kHz)	-89.7dB	-77.4dB	-48.5dB
<b>CCIR intermod. dist. (1:1)</b>	-79.3dB	-70.6dB	-41.6dB
<b>Phase shift (20Hz)</b>	5°24'	36°0'	36°30'
(1kHz)	0°	313°12'	313°12'
(20kHz)	340°12'	255°36'	259°30'
<b>Squarewave linearity</b>			-96.0dB
<b>Noise (A wtd, 20Hz-20kHz)</b>	-90.4dB	-65.4dB	-62.4dB
<b>Residual noise (unwtd)</b>	-90.5dB	-90.4dB	-90.1dB
<b>Input sensitivity (for 0dBV)</b>	66.15mV	2.081mV	125.6μV
<b>Disc overload (20Hz) (1kHz)</b>		47.26mV	3.099mV
		375.6mV	22.31mV

(20kHz)	3273mV	207.5mV	
(50kHz)	4406mV	199.9mV	
<b>Input loading</b>	9.06kohm	46.8kohm/500pF	468ohm
<b>Preamp output (max)/impedance</b>		11.97V/11.96ohm	
<b>Tape output (max)/impedance</b>		11.25V/569.6ohm	
<b>DC offset, L/R</b>		-55.1μV/-64.7μV	
<b>POWER AMPLIFIER</b>			
<b>Maximum Continuous Power Output - 8ohms</b>	20Hz	1kHz	20kHz
- 4ohms	58.4W	62.5W	58.7W
	77.7W	83.7W	76.7W
<b>Dynamic headroom (IHF)</b>			+1.03dB (79.2W)
<b>Output impedance</b>	0.235ohm	0.235ohm	0.242ohm
<b>Damping factor</b>	34.0	34.1	33.1
<b>Stereo separation (0dBV)</b>	129.1dB	117.9dB	67.4dB
<b>Total harmonic dist. (0dBV) (½ power)</b>	-74.9dB	-75.4dB	-65.7dB
	-77.8dB	-79.7dB	-68.7dB
<b>CCIR intermodulation distortion (0dBV)</b>			-81.9dB
<b>CCIR IM distortion (½ power)</b>			-73.9dB
<b>Rise time (@ 10kHz)</b>			6.5μsecs
<b>Power bandwidth (&lt;0.1% THD)</b>			15Hz - 25kHz
<b>Squarewave linearity</b>			-91.3dB
<b>Phase shift 20Hz</b>			10°48'
1kHz			0°
20kHz			340°12'
<b>Noise (A wtd, 20Hz-20kHz) 0dBV</b>			-77.4dB
(A wtd, 20Hz-20kHz) ½ power			-82.9dB
<b>Residual noise (unwtd)</b>			-85.6dB
<b>Input sensitivity (for 0dBV) (for full output)</b>			187.5mV
			1467mV
<b>Input loading</b>			96.5kohm
<b>DC offset, left/right</b>			-8.9mV/-9.5mV
<b>Typical price inc VAT</b>			£449/£219/£379



# ESSENTIAL NUMBERS.

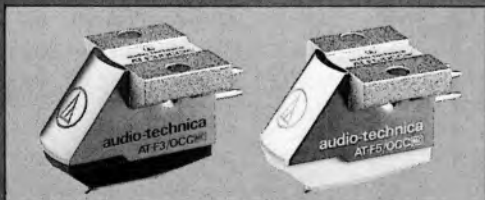
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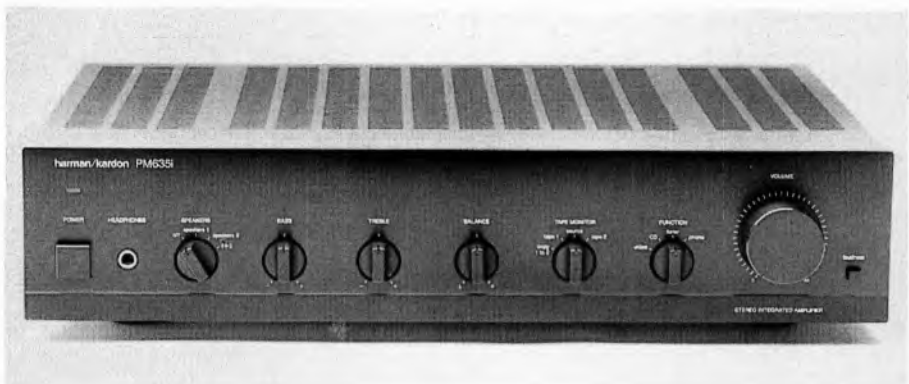
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# HARMAN KARDON PM635i

HARMAN (AUDIO) UK LTD, MILL STREET, SLOUGH, BERKS SL2 5DD. TEL: (0753) 76911.

RECOMMENDED



The first of two new HK integrated amplifiers launched late last year, the *PM635i* clearly takes over from the older *PM635*, though there are few visible differences between the two. Harman has sought to improve the *635* with binding posts rather than the tatty spring clip terminals fitted to the original model, though these do not include 4mm sockets. The styling of the *PM635i* is both luxurious and discrete - HK has abandoned all flashing lights while its dull gold lettering tastefully complements the satin black of the alloy fascia.

A small loudness button lurks to the right of the large rotary volume control which is joined by a series of six matching function knobs. Separate controls cater for input switching and full tape monitoring (the *635i* has provision for two tape machines), the remainder facilitate bass, treble and balance adjustment in addition to headphone and A/B speaker selection. This last function is a trifle careless as the small ALPS switch carries the full power of the amp from the output zobel network to the binding posts at the rear. Goodness knows what non-linearities might be introduced as the switch contacts begin to deteriorate.

HK has also equipped its new baby amp with inputs for video, tuner, CD and phono (MM) sources, the line inputs being routed directly to the volume control. The disc stage is composed of discrete transistors and benefits from its own separately regulated power supply as does the final power amp section which utilises two pairs of Toshiba *A1264<sub>N</sub>/C3181<sub>N</sub>* bipolar transistors.

## LAB REPORT

According to the literature Harman is still pursuing the ideals of high instantaneous power, though despite the appreciable +1.9dB increase in output between 8 and 40hm loads the IHF dynamic power result was not exactly mind-blowing at just +1.34dB. Perhaps more importantly the high 0.1ohm output impedance is likely to reduce detail resolution at low frequencies while the +0.6dB rise at 30Hz on the RIAA plot will hardly improve matters.

Noise, channel separation and distortion were all acceptable though 2nd-order

mechanisms dominated the disc stage while harsher 3rd-order artefacts were introduced by the non-linearities in the power amp. This is reflected in the ultrasonic plot which shows the 3rd harmonic of  $F_{0-20k}$  (0.056%) together with  $F_{20k} \pm 2F_{0-20k}$  and  $F_{0-50k-0} + 2F_{0-20k}$  3rd-order IMD routes. Similarly, third-order 50Hz field effects dominate the 40Hz supply modulation spectrum with products at 60Hz (-60dBV) and 140Hz (-60.5dBV or -85.3dB rel. to full output). Rectifier harmonics at 300Hz, 400Hz and 500Hz are well suppressed unlike the odd-order mains harmonics at 250Hz, 350Hz and 450Hz (at -70dBV to -77dBV).

## SOUND QUALITY

By popular consensus the moving magnet disc input was voted ahead of the standard line input which tended to sound dry and controlled but lacking in those emotive qualities of sparkle or 'magic'. CDs were slightly restricted in the dynamic sense as well as being a little reticent at high frequencies, a quality also linked to a reduction in stereo focus throughout the upper octaves. Stereo depth effects were better represented across the mid and upper bass but any sensation of deep, ambient low frequencies was missing.

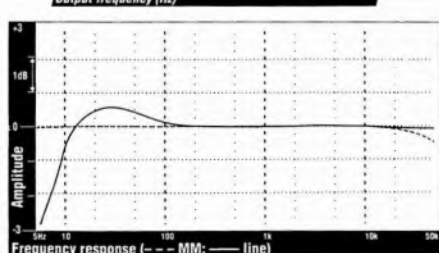
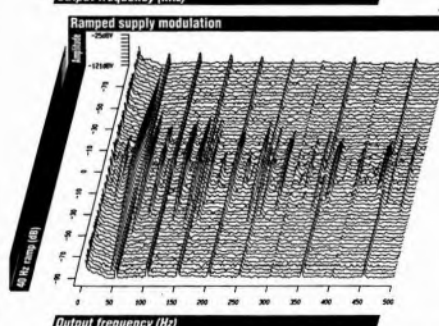
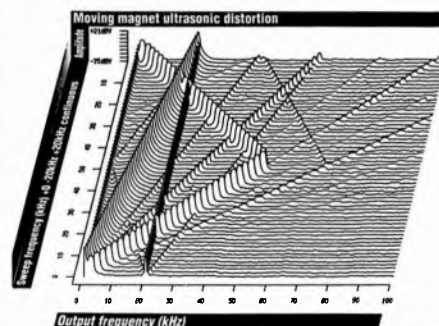
By contrast the MM stage elicited a stronger emotional reaction; vocals were clearly delineated even if the stereo images of accompanying guitars and percussion were somewhat less distinct. The overall balance was warmer than the line input with a less immediate though (to quote one listener) more fluid and 'authentic' presentation. I also feel the disc input offers a very enjoyable and fairly detailed sound though its flattening of depth perspectives could stand some improvement.

## CONCLUSIONS

Having frozen the price of the *PM635* amplifier HK should at least be commended on the build quality and perceived value of the product. Furthermore, a reappraisal of its unpleasant distortion mechanisms might reap further rewards. Better suited to the sweeter sounding CD players currently available, the new *PM635i* nevertheless comfortably achieves a Recommended status.

## TEST RESULTS

Maximum Continuous Power Output - 8ohms	20Hz	1kHz	20kHz
- 4ohms	42.1W	48.5W	43.9W
	66.0W	75.5W	65.8W
Dynamic headroom (IHF)			+1.34dB (66.0W)
Output impedance	0.105ohm	0.104ohm	0.127ohm
Damping factor	76.4	76.7	63.9
Stereo separation		CD/Aux	MM
(20Hz)		85.5dB	79.8dB
(1kHz)		77.1dB	74.8dB
(20kHz)		53.9dB	61.8dB
Channel balance			
(1kHz, -20dBV)		0.32dB	0.25dB
(-60dBV)		0.99dB	1.32dB
Total harmonic dist. (0dBW) (2/3 power)		-74.1dB	-71.4dB
CCIR intermod. dist. (0dBW)		-70.0dB	-69.4dB
CCIR 1M dist. (2/3 power)		-80.6dB	-66.8dB
Rise time			3μsec
Power bandwidth (<0.1% THD)			5Hz - 9kHz
Squarewave linearity			-79.8dB
Phase shift (20Hz)		0°0'	358°30'
(1kHz)		0°0'	311°24'
(20kHz)		347°24'	268°12'
Noise (A wtd, 0dBW) (2/3 power)		-84.9dB	-78.9dB
		-94.4dB	-80.9dB
Residual noise (unwtd)		-75.1dB	-74.9dB
Input sensitivity (for 0dBW) (for full output)		27.01mV	415.7μV
		182.4mV	2.895mV
Disc overload (20Hz)			12.95mV
(1kHz)			129.5mV
(20kHz)			975.8mV
(50kHz)			1299mV
Tape output/impedance		7.551V/1.998kohm	
Input loading		22kohm/47kohm/125pF	
DC offset, left/right			-9.8mV/+8.6mV
Typical price inc VAT			£159



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# HARMAN KARDON PM650Vxi

HARMAN (AUDIO) UK LTD, MILL STREET, SLOUGH, BERKS SL2 5DD. TEL: (0753) 76911.



Harman Kardon is responsible for a wide range of amps at present and one of the latest, the *PM650Vxi*, sits in the range between the established *PM645Vxi* and *PM655Vxi* designs. No trace of ICs are to be found in this amp which uses a proprietary low-noise FET moving coil input together with other discrete devices that constitute the active RIAA equalisation network. In some respects it resembles a beefier version of the preceding *PM635i*, though it only uses one pair of Toshiba *A1516/C3907* power transistors and (once again) the loudspeaker outputs are wired in a convoluted fashion via a speaker select facility on the amp's front panel.

Six identical control knobs lie in a row across the fascia catering for phono, tuner, CD and A/V sources, VCR/tape monitoring, bass, treble and balance adjustment. Provision has also been made for two tape/VCRs with separate video buffers for true A/V compatibility. Other features include loudness and subsonic contours, mono mode and MM/MC phono selection.

Once again, HK makes play of the high current capability of this amplifier yet equips the mains transformer with two secondaries together with a 4/8ohm loudspeaker switch. As any amp is more likely to voltage clip into higher (8ohm) loads but current clip into lower (4ohm) loads this facility should optimise the true peak power of the amp with a variety of speakers.

## LAB REPORT

Just achieving its rated 70watts spec into 8ohms the *PM650Vxi* managed a +1.88dB rise to 110watts into 4ohms even if its full power bandwidth did seem a trifle restricted. The output impedance was also rather high at 0.12ohm while the input/output phase shift through the line amp seems excessive at 353° (0° may also equal 360° of course). In general terms the distortion generated by the power output stage is moderate at around 0.02 per cent and is responsible for the 2nd and 3rd harmonics of  $F_{0-20k}$  seen on the ultrasonic plot.

However, both the MM and MC stages begin to slew-limit before 20kHz, the latter's headroom falling from +25.4dB at 1kHz to

+17.9dB at 20kHz which prompts the (audible) 2nd and 3rd-order in-band IMD also seen on the 3-D plot. Note the way that  $F_{0-50k-0} - yF_{0-20k}$  and  $F_{20k} - yF_{0-20k}$  [ $y = 1-2$ ] routes increase in amplitude according to the RIAA characteristic. Anyway, the disc responses are very flat and extended while the 40Hz supply modulation linearity settles in at a respectable -90.8dB.

## SOUND QUALITY

Compared to the cheaper *PM635i*, the *PM650Vxi* was slightly leaner and more neutral though there was a loss of detail resolution at the very top end. In overall terms the fine midband definition, tight upper bass and focused soundstaging made this amp difficult to criticise; it avoided any obvious high level colorations but sounded a little unemotive into the bargain. If you prefer a slightly cold, matter-of-fact presentation then it should not prove subjectively disturbing, nevertheless I felt that deep down some essential warmth or vitality was 'missing'.

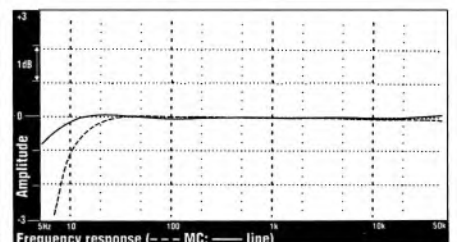
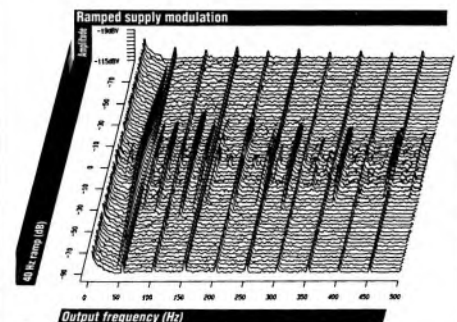
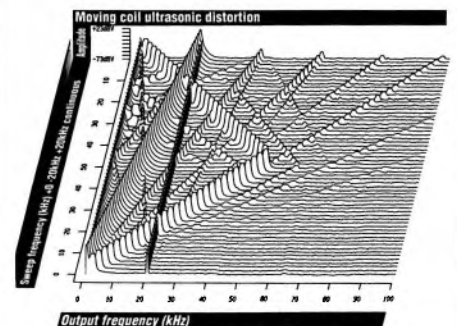
The disc inputs were thought to sound much richer and more seductive, while vocals were certainly well represented by the confident, bold character of the amplifier. One listener even correctly identified the unit by virtue of its characteristic 'HK sound' though went on to criticise it for lack of image depth and 'slam' at very low frequencies. Dynamic contrasts were confused at times, particularly via the MC stage which failed to resolve more complex passages with the same poise and instrumental separation enjoyed with solo guitar or vocals.

## CONCLUSIONS

While the *PM650Vxi* builds upon those positive qualities of the cheaper *PM635i* the improvement in detail resolution and soundstaging is not particularly dramatic and might simply be correlated with its higher power output. It remains a rugged enough amplifier but the premature slew-limiting of the MC input and nasty 3rd-order distortions that result need to be redressed before we can award it a Recommendation.

## TEST RESULTS

	20Hz	1kHz	20kHz
Maximum Continuous Power Output - 8ohms	69.3W	71.1W	66.8W
- 4ohms	102.5W	109.6W	103.2W
Dynamic headroom (IHF)		+1.44dB	(99.2W)
Output impedance	0.118ohm	0.130ohm	0.161ohm
Damping factor	67.6	61.5	49.7
Stereo separation	CD/Aux	MM	MC
(20Hz)	73.8dB	68.6dB	61.4dB
(1kHz)	80.8dB	66.7dB	58.4dB
(20kHz)	56.7dB	53.8dB	49.5dB
Channel balance			
(1kHz, -20dBV)	1.63dB	1.55dB	1.49dB
(-60dBV)	0.82dB	1.06dB	1.13dB
Total harmonic dist. (0dBV)	-72.8dB	-69.5dB	-66.1dB
(½ power)	-74.3dB	-68.9dB	-66.1dB
CCIR intermod. dist. (0dBV)	-81.2dB	-67.3dB	-36.4dB
CCIR IM dist. (½ power)	-77.4dB	-67.8dB	-36.3dB
Rise time			1.µsec
Power bandwidth (<0.1% THD)			5Hz - 11kHz
Squarewave linearity			-93.1dB
Phase shift (20Hz)	0°	349°12'	178°30'
(1kHz)	0°	311°24'	136°48'
(20kHz)	352°48'	270°0'	93°36'
Noise (A wtd, 0dBV)	-77.9dB	-78.7dB	-72.3dB
(½ power)	-90.2dB	-83.4dB	-71.8dB
Residual noise (unwtd)	-72.2dB	-72.3dB	-72.2dB
Input sensitivity (for 0dBV)	16.15mV	279.3µV	18.23µV
(for full output)	136.8mV	2.197mV	147.5µV
Disc overload (20Hz)		16.78mV	1.056mV
(1kHz)		158.7mV	9.306mV
(20kHz)		1173mV	39.36mV
(50kHz)		1745mV	36.10mV
Tape output/impedance			9.846V/1.969kohm
Input loading		22kohm/100pF	47kohm/130pF
DC offset, left/right			+9.75mV/+12.3mV
Typical price inc VAT			£369



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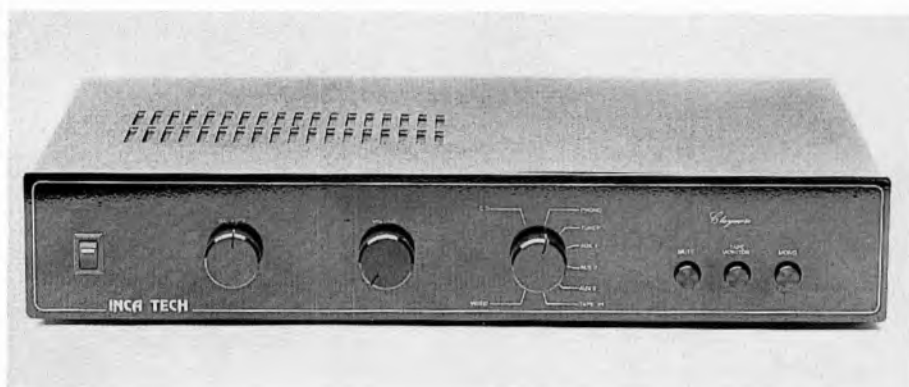
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RECOMMENDED



Following a brief internal reshuffle the disparate Inca Tech amplifier range has been rationalised into specific categories. The *Claymore S* does not supplant the last *Claymore* we reviewed but joins it below the costlier '2' version, its full-width alloy fascia featuring IT's characteristic glossy black and contrasting gold livery. A myriad inputs are offered including both MM and MC sources differentiated by a series of DIP switches on the underside of the case. The line inputs include CD, tuner, video, three aux, one tape-in and two tape-out functions.

In order to accommodate such a wide selection of inputs without recourse to several selector controls each input is routed via a common *TC4051* CMOS logic IC which is triggered using a conventional rotary selector on the front panel. This device and the *F4016* CMOS switch controlling the tape monitoring is buffered using a *TL072C* dual low noise op-amp. The rest of the facilities are straightforward and include volume and balance adjustment together with pushbuttons for mute, tape monitor and mono.

Internal construction is workmanlike with expensive *OP27* ceramic op-amps (better than *NE5534s*!) used in both the buffer and series-feedback disc input equalisation stages. One pair of *2SK414/2SJ119* MOSFET power transistors are used per channel, each device running at an enriched bias current of around 180mA.

## LAB REPORT

Where do I start? The power output is within specification, output impedance a little high, channel balance poor at -60dBV, stereo separation and line/MM noise good with a deterioration to -68dB through the MC input. Both disc stages are best used with very low output cartridges, not only because of the crazy 446 $\mu$ V/90 $\mu$ V sensitivities but also because of the restricted +8.6dB/+13.9dB headroom (MM/MC respectively). The high 30-35dB disc stage gain produces in excess of 5.6V which then clips the CMOS multiplexer - hence the seemingly low headroom! Gross distortion (32 per cent on MM and 62 per cent on MC) is the result, together with massive breakthrough on the adjacent line inputs.

This is demonstrated by the in-band  $F_{20k} - F_{0-20k}$  and  $F_{0-50k-0} - F_{0-20k}$  IMD routes that do not exhibit an RIAA characteristic. The 2nd-10th  $F_{0-20k}$  harmonics and multiple-order  $F_{0-50k-0} + yF_{0-20k}$  [ $y = 1.5$ ] IMD routes are a function of the high 0.28 per cent power amp distortion, together with the CMOS artefacts (which can be avoided with careful cartridge matching). The 40Hz ramp test shows a sudden increase in THD and IMD as the amp shifts out of its linear Class A/B envelope without sufficient feedback for correction.

## SOUND QUALITY

The *S* prompted a very enthusiastic reaction from the panel who suddenly began talking about music of all things! Its rich, wondrously deep and precisely focused soundstage captured everyone's imagination; music seemed to flow in a truly realistic fashion as individual instruments were heard to possess a poise and stature rarely encountered with other amps in this test.

There was no hint of aggression or forcefulness despite its big, bouncy and subjectively roguish character. Using an MC cartridge through the MM input to prevent overload, this same captivating acoustic was revealed once again. The *Claymore S* sounded quick, lucid, very transparent and rhythmically secure even though the MM response encouraged some additional 'slam' at very low frequencies.

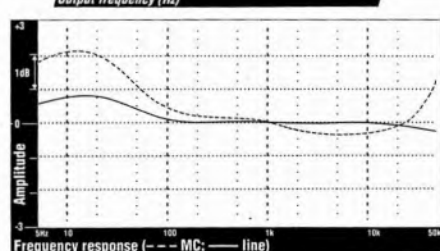
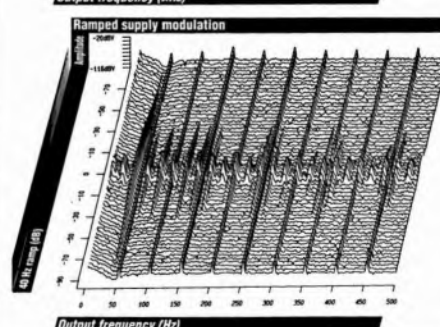
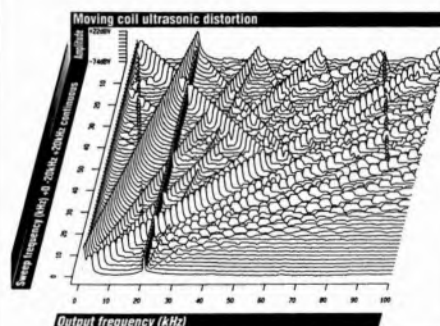
Vocals seemed to breathe from the speakers, delicate percussion was light of touch and strings seemingly quite pure. Overall, this amp succeeded if only because it did not try too hard, it simply covered its indiscretions with an uncommon dexterity.

## CONCLUSIONS

If the 8-channel multiplexer were swapped for a higher voltage CMOS selector and the gain of the disc stage reduced then the daft sensitivity and miniscule overload margins could be avoided. However even in its present state the *Claymore S* can still be made to sing a most beguiling and musically convincing tune. At the end of the day it was voted the best sounding integrated amp in our test, so who am I to argue?

## TEST RESULTS

Maximum Continuous Power Output - 8ohms	20Hz	1kHz	20kHz
	58.1W	59.9W	55.7W
- 4ohms	82.5W	86.9W	79.8W
Dynamic headroom (IHF)			+1.58dB (86.2W)
Output impedance	0.158ohm	0.158ohm	0.173ohm
Damping factor	50.8	50.8	46.2
Stereo separation	CD/Aux	MM	MC
(20Hz)	106.5dB	88.9dB	82.7dB
(1kHz)	85.3dB	78.5dB	79.5dB
(20kHz)	60.5dB	64.5dB	77.4dB
Channel balance			
(1kHz, -20dBV)	0.62dB	0.54dB	0.46dB
(-60dBV)	6.37dB	6.45dB	6.77dB
Total harmonic dist. (0dBW)	-51.5dB	-10.1dB*	-4.1dB*
( $\frac{1}{2}$ power)	-50.16dB	-10.3dB*	-4.3dB*
CCIR intermod. dist. (0dBW)	-51.2dB	-50.4dB	-40.8dB
CCIR IM dist. ( $\frac{1}{2}$ power)	-49.1dB	-50.7dB	-40.9dB
Rise time			7 $\mu$ sec
Power bandwidth (<0.1% THD)			5Hz - 14kHz
Squarewave linearity			-79.6dB
Phase shift (20Hz)	184°0'	178°30'	182°30'
(1kHz)	180°0'	133°12'	129°36'
(20kHz)	154°48'	93°36'	86°24'
Noise (A wtd, 0dBW)	-85.2dB	-81.6dB	-68.1dB
( $\frac{1}{2}$ power)	-95.7dB	-84.9dB	-68.3dB
Residual noise (unwtd)	-69.1dB	-69.5dB	-69.6dB
Input sensitivity (for 0dBW)	21.22mV	62.1 $\mu$ V	11.82 $\mu$ V
(for full output)	163.2mV	446.4 $\mu$ V	89.64 $\mu$ V
Disc overload (20Hz)		1.416mV	275.7 $\mu$ V
(1kHz)		13.47mV	2.485mV
(20kHz)		109.0mV	20.76mV
(50kHz)		92.5mV	50.23mV
Tape output/impedance			9.23V/5.25ohm
Input loading		10/20kohm	47kohm/50pF
DC offset, left/right			-4.29mV/+5.6mV
Typical price inc VAT			£414



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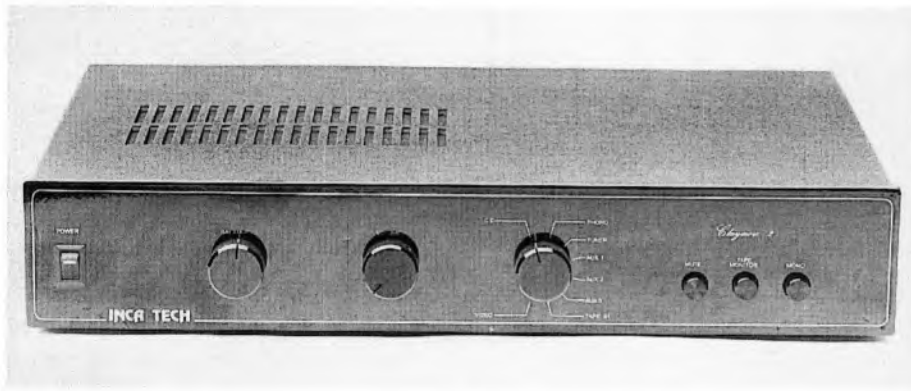
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# INCA TECH CLAYMORE 2

INCA TECH, UNIT 8, CHARFLEET HOUSE, CHARFLEET ROAD, CANVEY ISLAND ESSEX SS8 0PQ. TEL: (0268) 680550.



Side-by-side the *Claymore S* and *Claymore 2* are virtually indistinguishable, however the *2* is a more powerful and costlier amplifier. It shares the same attractive casework as the *Claymore S* with small, screen-printed gold legends dotted over its glossy black fascia. The same CMOS input switching topology is also employed, enabling up to six line sources, one video and one phono (either MM or MC) to be connected at any one time.

Two parallel pairs of tape-out sockets are provided on the rear of the case alongside a headphone port, and recessed 4mm sockets for the connection of speaker cables. This type of socket is particularly safe because it minimises the chances of stray wires shorting out on one another. Inside the amp Inca Tech has heeded previous warnings and reduced the gain of the disc stage, thereby delaying overload of the CMOS switch; why this change has not been implemented on the *Claymore S* is puzzling. Anyway, the same complementary MOSFET output stage is used but the power supply is commensurately larger and the bias current reduced to just 40mA through each device. Thermal tracking devices have been included alongside the power transistors because the heat-sink, fitted underneath the amp, still gets extremely hot. A good airflow under the amp is certainly to be recommended.

## LAB REPORT

Essentially phase-inverting via the line inputs, this amplifier attained its nominal 100W rating by the skin of its teeth, a point in its favour being the appreciable +1.94dB dynamic headroom which increases the 8ohm figure to a respectable 156W. Channel separation was good but the balance was some 1.5dB in error by the time the volume control was reduced to -60dBV. However, this is only ever a problem if the amp is very sensitive (of the *Claymore S*), the *Claymore 2* being blessed with sensible 2.76mV/261mV disc and line input sensitivities. This is also reflected in the improved headroom available on both MM and MC inputs, though +16.8dB and +22.3dB respectively is still way below the norm.

More important from the subjective viewpoint is the anomalous +3dB lift (and ris-

ing) at 20kHz which suggests somebody left a capacitor out of their RIAA network... Distortion-wise the *Claymore 2* fared better than the *S* but THD was not constant with either frequency or power output, exemplified by the 40Hz harmonics in the ramp test which increase then decrease and then increase again as the 40Hz input tracks from -96dB to 0dB peak level. Subjectively this can be disturbing as changes in harmonic structure are taking place in a non-linear fashion across the wide dynamic range of a piece of music.

## SOUND QUALITY

As expected the disc input sounded bright and up-front compared to the richer and smoother balance of the line stage. Vocal sibilance was exaggerated and this made long-term listening quite uncomfortable, especially when replaying potent female soloists when the sound became unduly fierce on occasions. Similarly, strings and percussive instruments were initially thought to possess great speed and attack but it soon became clear that the sound was being manipulated in a rather crude fashion by the amplifier.

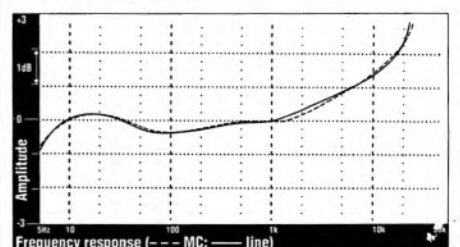
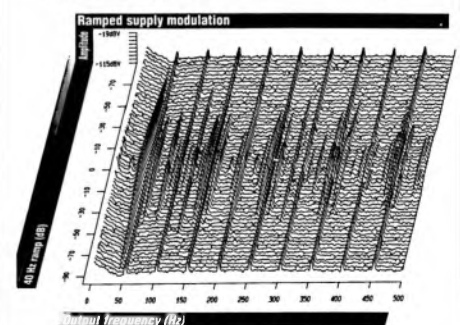
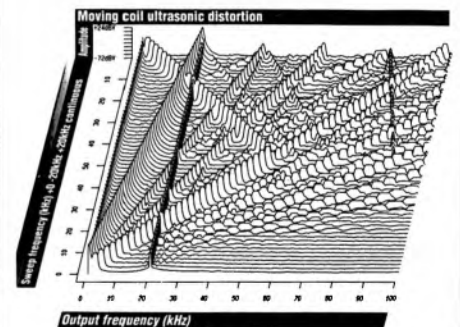
All this was a pity as the CD input fared considerably better. Typical of the *Claymore* range the *2* proffered a mellifluous, faintly soft and almost 'valve'-like quality - an embellishment that ensured all forms of music were suitably entertaining if not strictly accurate. Nevertheless, stereo images were not recreated with the same tactile focus experienced with the *Claymore S* just as the sense of depth and stage width were also less convincing.

## CONCLUSIONS

It's clear both from the subjective and technical viewpoints that something was amiss with this particular *Claymore 2*. I say this from the standpoint of having measured and listened to one of these amps in the recent past, the sonic prowess of that amp clearly warranting a Recommendation. On the basis of the results from this *Claymore 2* though, Recommendation will have to be shelved for the present.

## TEST RESULTS

Maximum Continuous Power Output - 8ohms	20Hz	1kHz	20kHz
- 4ohms	96.9W	99.9W	92.7W
	131.9W	137.5W	126.8W
Dynamic headroom (IHF)			+1.94dB (156.0W)
Output impedance	0.123ohm	0.118ohm	0.199ohm
Damping factor	65.2	76.7	40.2
Stereo separation (20Hz)	CD/Aux	MM	MC
(1kHz)	111.5dB	90.8dB	85.6dB
(20kHz)	82.3dB	84.8dB	87.7dB
	58.5dB	64.0dB	71.6dB
Channel balance (1kHz, -20dBV)	0.75dB	0.65dB	0.59dB
(-60dBV)	1.52dB	1.51dB	1.49dB
Total harmonic dist. (0dBV) (% power)	-52.5dB	-52.5dB	-52.6dB
CCIR intermod. dist. (0dBV)	-61.6dB	-62.0dB	-62.9dB
CCIR IM dist. (% power)	-71.9dB	-71.9dB	-71.4dB
Rise time			16µsec
Power bandwidth (<0.1% THD)			8Hz - 15kHz
Squarewave linearity			-88.8dB
Phase shift (20Hz)	180°0'	180°0'	178°30'
(1kHz)	180°0'	136°48'	134°30'
(20kHz)	133°12'	86°24'	88°0'
Noise (A wtd, 0dBV) (% power)	-90.7dB	-85.8dB	-68.5dB
	-96.4dB	-85.9dB	-66.8dB
Residual noise (unwtd)	-79.9dB	-79.6dB	-80.0dB
Input sensitivity (for 0dBV) (for full output)	26.97mV	278.3µV	53.32µV
	261.5mV	2.75mV	524.7µV
Disc overload (20Hz) (1kHz)	3.563mV	34.64mV	6.528mV
(20kHz)	227.6mV	44.90mV	
(50kHz)	316.2mV	67.53mV	
Tape output/impedance			3.997V/5.5ohm
Input loading			10/30kohm 4.7kohm/50pF 470ohm
DC offset, left/right			+2.2mV/+3.5mV
Typical price inc VAT			£515



# LINN LK1/LK280

LINN PRODUCTS LTD, FLOORS ROAD, WATERFOOT, EAGLESHAM, GLASGOW G76 DEP. TEL: (041) 644 5111.



Before Linn ever thought of producing an amplifier the typical audio enthusiast's conception of what a Linn amp might be was one of minimalism, an unpretentious straight-line device designed with just one goal: the best possible sound quality. In which case the original *LK1/LK2* pre/power combination must have brought a few people down to earth with a bump; a Linn amp filled to the brim with digital CMOS chips, and with the added benefit of remote control operation must have shaken some analogue diehards to the core!

The *LK1* preamp is neatly built into a slim black case with all the volume, balance, mute and input selection keys sited to the left of the fascia. The MM/MC, tuner, aux (CD) and two tape inputs are all controlled via an Hitachi microprocessor that sends a control signal to a *DG309* line switch mounted half-way towards the Cannon-type sockets on the rear of the preamp. Phono-XLR adaptors are available while Linn supplies its own XLR-XLR interconnect for use between the pre- and power amp.

The MC disc stage uses a cascoded differential input (*ZTX753*) which runs under open-loop conditions prior to  $75\mu\text{sec}$  (HF) equalisation; stability is ensured by a DC servo. The gain of this stage is optimised for low output cartridges, outputs any higher than  $0.5\text{mV/cm/sec}$  requiring you to snip out a couple of links on the circuit board. Both MM and MC inputs are separate at this stage but then run into a common LF equalisation section via a high-ish voltage *DG309* CMOS switch. The up/down volume control uses a bank of CMOS switches and a resistive ladder in the form of an *AD7528* multiplying D/A converter whose current output is fed to an I/V converter in the form of a limited (20dB) feedback diff. amp.

Complementing both the style and engineering content of the *LK1* preamp is the revised version of Linn's *LK2* power amp, now called the *LK280*. Connections to this very dense little power amp are made using Linn's XLR leads; I found the naked 4mm output sockets to be undersized and therefore overly tight. Much of its bulk is accounted for in the 500VA toroid which can, by the way, induce hum in the preamp's disc stage if the two are placed too close to each other.

An input filter bandlimits the signal to around 70kHz and feeds a very fast input diff. amp and subsequent differential gain block which appears to be operating with minimal corrective feedback. One pair of 15A Sanken output transistors are used per channel which are bolted to two separate and very efficient heatsinks on either side of the amp's carcass. A thick-film hybrid monitors the power supply current with time, shutting off the monolithic regulators if an overload condition seems imminent.

## LAB REPORT

Despite Linn's use of a potentially very accurate digital volume control (see *Ariston Amplifier* review in this issue), the channel balance deteriorated to just over 4dB at  $-60\text{dBV}$  through all inputs. Stereo separation was much more impressive as this is also usually determined by the quality and topology of the CMOS devices (again, see *Ariston Amplifier*), reaching a high of 88.9dB on the MC input with a fine 'low' of 72.8dB at 20kHz via the line stage. Noise was very low on all the inputs but particularly good via MC which possessed an A-wtd figure of  $-84.8\text{dB}$ . This is one of the best – if not *the* best – results recorded in this month's tests.

Measurements indicate that the *LK1* preamp is essentially phase inverting, so

some experimentation with the phasing of cables at the loudspeaker end of the system will probably prove worthwhile. The phase shift through both MM/MC disc inputs was remarkably consistent though the values will inevitably deviate from  $180^\circ$  because of the poles used in the RIAA network. The RIAA accuracy of both disc inputs was also accurately matched between 50Hz and 10kHz, though the MM stage possessed a slightly shallower LF roll-off ( $-1\text{dB}$  at 35Hz,  $-3\text{dB}$  at 23Hz).

Subjectively unpleasant odd-order THD and IMD mechanisms are at work in the MC disc stage – the MM input with its reduced  $+22\text{dB}$  headroom is even worse in this respect. The 3D MC ultrasonic distortion plot highlights  $3F_{0-20k}$  ( $< -53\text{dB}$ ) together with  $F_{0-50k-0} \pm 2F_{0-20k}$  and  $F_{20k} \pm 2F_{0-20k}$  3rd-order IMD routes. Also shown on this plot are two extremely rare and subjectively disturbing (according to my computer . . .) multiple-order 3-frequency IMD routes defined by the equation  $F_{0-50k-0} \pm [F_{20k} - F_{0-20k}]$ .

The moving-magnet input incurred higher levels of all these artefacts, most notably at increasing frequency where the disc overload margins fell relative to the headroom available at 1kHz. THD increased from 0.056 per cent (at 1kHz) to 0.54 per cent (at 20kHz) as a result while THD through the MC stage increased from 0.079 per cent to 0.22 per cent over the same bandwidth. By contrast the CD input reached a low of 0.025 per cent at 20kHz, the CCIR IM distortion proving to be of a similar level.

Linn's power amp also provides food for thought. In testament to the superb regulation of the power supply, the power output very nearly doubles ( $+2.84\text{dB}$  instead of the theoretical  $+3\text{dB}$ ) from 8 to 40hms while the dynamic headroom is restricted to  $+0.55\text{dB}$



because the supply simply cannot respond fast enough. Stereo separation is extremely good but the A-wtd noise figure (in the presence of a driving signal) is inevitably compromised by THD artefacts. Talking of which, note how the level of THD degrades with frequency rather than level while the wonderfully low output impedance remains a constant 0.0044ohm between 1kHz and 20kHz. This implies that most of the distortion is generated by uncorrected non-linearities in the differential input stage, distortions which are then preserved by the low impedance output stage which does have lashings of feedback.

The 2nd to 8th harmonics can be readily observed in the power amp's 3-D ultrasonic plot – though, once again, it is the odd-order products that tend to stand out. Intermodulation is characterised by summation only mechanisms that keep the distortion products out of the audio band but demonstrate the very restricted linearity bandwidth of the power amp and provide some evidence of premature slew-limiting. 3rd and 5th-order IMD routes  $F_{0-50k-0} + yF_{0-20k}$  [ $y = 2$  and  $4$ ] predominate. These mechanisms are highly specific and must surely contribute to the consistent, if uninspiring, sound quality heard via all the inputs.

## SOUND QUALITY

Our listeners identified a sort of vague 'transitory' quality that pervaded through both the MM and MC disc inputs, though we did not consider this unpleasantly harsh or fatiguing. In truth the amplifiers sounded 'ordinary' rather than spectacular or awe-inspiringly musical; they presented a comfortable amount of detail that populated a pleasantly broad and deep soundstage but lacked that indefinable 'spark' of magic that can transcend any obvious technical distortions. Vocal diction was thought to be more precise, if not wholly realistic, via the MM input although the overall sound was thinner and more strident than that obtained via the MC stage.

It did prove fairly difficult to isolate the properties of the two disc inputs, though the

CD (read 'aux') input was marginally freer of the misty veil that cloaked the low-level inputs. I considered the aux stage to offer slightly more punch or 'drama' than the disc inputs but the same dry and very controlled delivery of the power amp was indomitable. To its credit the combo did perform very consistently – almost predictably so – regardless of the musical content. It was unruffled by the dynamic complexities of large-scale orchestral works which it took in its stride the same way it would the subtle harmonic textures of a solo guitar, for instance.

## CONCLUSIONS

In fairness to Linn I must stress that these are a most professionally constructed pair of amplifiers, beautifully laid out and finished in a way quite alien to the majority of UK specialist products. Nevertheless, despite the best of intentions both products display a range of high level distortion phenomena that could (and should, in my view) be ameliorated. With improvements made to both the disc headroom and overall linearity of the amplifiers I feel sure we would have enjoyed a better sense of transparency and detail resolution. Music might have sounded much better too.

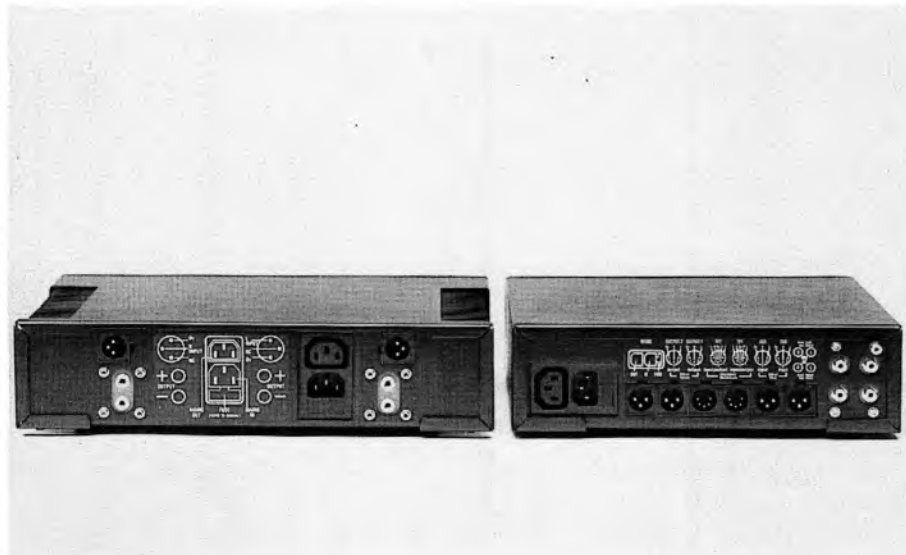
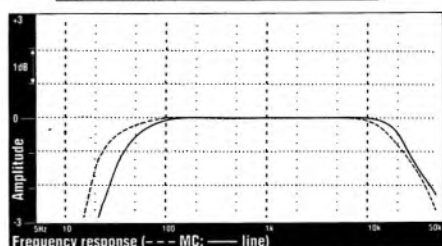
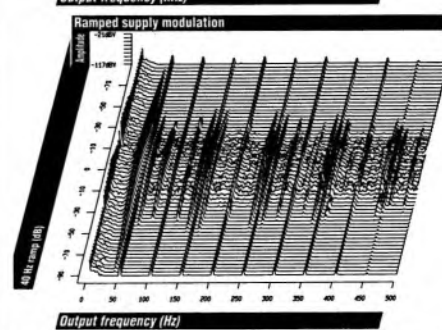
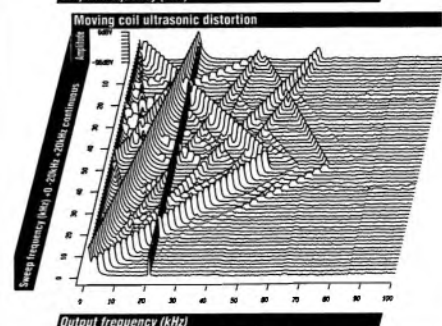
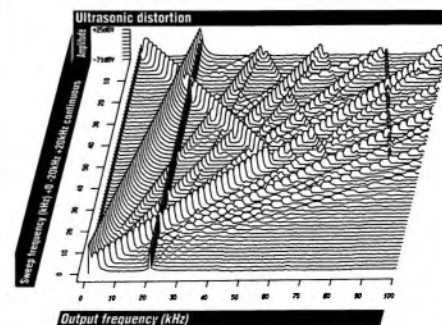
## TEST RESULTS

PREAMPLIFIER			
<b>Stereo separation</b>	Aux/CD	MM	MC
(20Hz)	88.7dB	83.5dB	85.7dB
(1kHz)	88.5dB	86.5dB	88.9dB
(20kHz)	72.8dB	75.4dB	81.1dB
<b>Channel balance</b>			
(1kHz, 0dBV)	0.05dB	0.06dB	0.08dB
(-20dBV)	0.10dB	0.11dB	0.19dB
(-60dBV)	4.18dB	4.24dB	4.22dB
<b>Total harmonic dist.</b>			
(0dBV, 1kHz)	-69.1dB	-65.4dB	-62.3dB
(20kHz)	-71.9dB	-45.3dB	-53.2dB
<b>CCIR intermod. dist. (1:1)</b>	-69.7dB	-36.3dB	-52.5dB
<b>Phase shift (20Hz)</b>			
(1kHz)	223°12'	195°12'	200°0'
(20kHz)	180°0'	144°0'	145°12'
<b>Squarewave linearity</b>			
(20kHz)	162°0'	72°30'	70°30'
<b>Noise (A wtd, 20Hz-20kHz)</b>	-100.3dB	-87.7dB	-84.8dB
<b>Residual noise (unwtd)</b>	-97.6dB	-97.7dB	-97.5dB
<b>Input sensitivity (for 0dBV)</b>	506.4mV	4.789mV	332.7µV
<b>Disc overload (20Hz)</b>			
(1kHz)		8.954mV	532.1µV
(20kHz)		64.08mV	4.436mV
		226.3mV	54.45mV

(50kHz)	205.6mV	81.99mV
<b>Input loading</b>	9kohm 50kohm/77pF 100ohm/4.7nF	
<b>Preamplifier output (max)/impedance</b>	5.236V/45.88ohm	
<b>Tape output (max)/impedance</b>	5.24V/70ohm	
<b>DC offset, L/R</b>	-27.6µV/-31.9µV	

### POWER AMPLIFIER

<b>Maximum Continuous Power Output</b>	20Hz	1kHz	20kHz
- 8ohms	84.3W	84.4W	82.6W
- 4ohms	163.9W	162.4W	156.4W
<b>Dynamic headroom (IHF)</b>			+0.55dB (95.8W)
<b>Output impedance</b>	0.0017ohm	0.0044ohm	0.0044ohm
<b>Damping factor</b>	4839	1834	1834
<b>Stereo separation (0dBW)</b>	119.5dB	101.8dB	97.3dB
<b>Total harmonic dist. (0dBW)</b>	-82.8dB	-73.5dB	-54.1dB
(½ power)	-69.7dB	-73.2dB	-52.7dB
<b>CCIR intermodulation distortion (0dBW)</b>			-87.2dB
<b>CCIR IM distortion (½ power)</b>			-86.1dB
<b>Rise time (@ 10kHz)</b>			7.5µsecs
<b>Power bandwidth (&lt;0.1% THD)</b>			3Hz - 39kHz
<b>Squarewave linearity</b>			-91.8dB
<b>Phase shift 20Hz</b>			23°0'
1kHz			0°
20kHz			334°48'
<b>Noise (A wtd, 20Hz-20kHz) 0dBW</b>			-74.3dB
(A wtd, 20Hz-20kHz) ½ power			-84.9dB
<b>Residual noise (unwtd)</b>			-78.7dB
<b>Input sensitivity (for 0dBW)</b>			109.2mV
(for full output)			981.7mV
<b>Input loading</b>			5.8kohm
<b>DC offset, left/right</b>			-39.6mV/-36.7mV
<b>Typical price inc VAT</b>			£459/£595



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# MARANTZ PM-75

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



This is the second integrated amplifier in this month's amp tests to incorporate D/A conversion circuitry, the *PM-75* being the cheaper of two such models in the current Marantz range.

The smooth matt fascia and contoured function controls of the *PM-75* are certainly pleasing to the eye, while a pull-down flap on the base of the unit is used to conceal peripheral functions such as bass, treble, loudness, balance and record-out selection.

Logic switching is used for all inputs, source-direct and muting facilities, while the digital inputs are distinguished on the rear by individual sockets for CD, DBS (satellite) and DAT rec/play. Once connected the appropriate 32/44/48kHz sampling LED is then illuminated by the amp. Marantz has not forgotten to include plenty of analogue inputs though, and these include provision for two tape decks, two aux, tuner, CD and both MM/MC phono sources.

Marantz's digital section is screened behind an alloy heatsink and comprises Philips' *YM3623B* interface chip with the latest *SAAT22CP/B* four-times oversampling filter and *TDA1541A* dual-channel 16-bit D/A convertor. The mains transformer includes three secondaries to isolate the pre/power and digital sections but, unfortunately, the D/A circuitry still lies immediately parallel to the dedicated MM/MC equalisation and line buffer stages.

## LAB REPORT

The on-board convertor appears to be slightly misaligned according to the 3-D plot (0dB in, 2/3 power out), the resulting broad carpet of 2nd-14th  $F_{0-20k}$  harmonics (-73dB at 5kHz) being quite uncharacteristic of a Marantz CD player for instance. Furthermore, the obvious attenuation of 44.1kHz  $\pm F_{0-20k}$  stop-band IMD products is also atypical of a Philips/Marantz CD player. Nevertheless, the true linearity of the *A1265N/C3182N* output devices is shown in the ultrasonic plot where only a trace of  $2F_{0-20k}$  is visible. Into 8ohms the moving coil THD falls to 0.0014 per cent while CCIR IMD is only slightly worse at 0.022 per cent.

Supply modulation artefacts are limited to 60Hz (-73.5dBV), 140Hz (-69dBV) and

240Hz (-72dBV), the hum and rectifier components rising by some 8dB with the 'source direct' facility in use. The amp is also very load tolerant, providing some 136watts into 8ohms with a +2.05dB rise to 217watts into 4ohms. Unfortunately the -85mV DC offset is a little too high.

## SOUND QUALITY

Slightly overblown across the upper midband but luxuriously smooth thereafter, the analogue CD input may have lost a trace of crisp definition at very high frequencies - but this faintly muted air did not seem to restrict the sense of *ambient* space. Stereo images were soft in focus though, impairing the sense of vocal articulation at the same time as muting much of the natural scale and dynamics contained within the music.

The digital input did realise gains in transparency and frequency extension though an increase in 'tizzyness' accompanied this opening of the soundstage. Disc (MM) was similarly sweet but slightly more muddled than the analogue CD input, the soundstage appearing bunched and devoid of clarity and freshness. A harder sound with a little extra bite was obtained via MC though piano seemed to have an odd, 'clanky' quality.

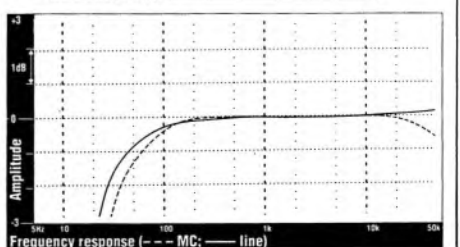
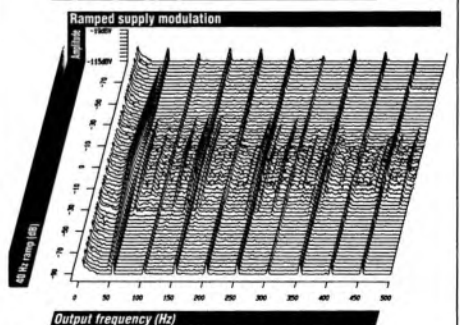
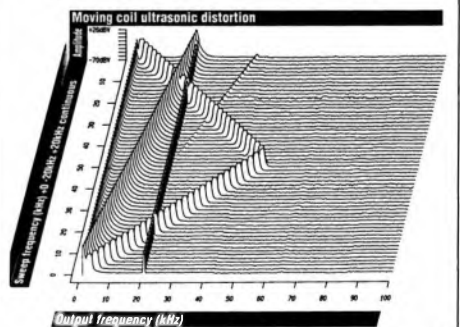
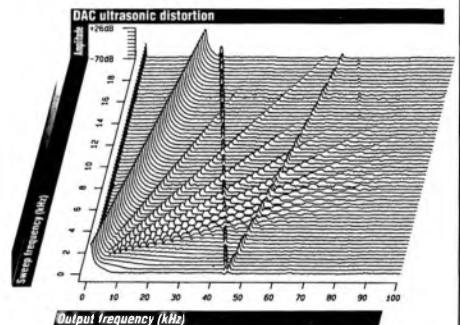
## CONCLUSIONS

The vague imagery and limited substance afforded by this amplifier must compromise its value even if it was considered more successful than the other 'digital amplifier' in this test. Worth considering, then, but bear in mind that Marantz has superior sounding amplifiers in its current range.

## TEST RESULTS

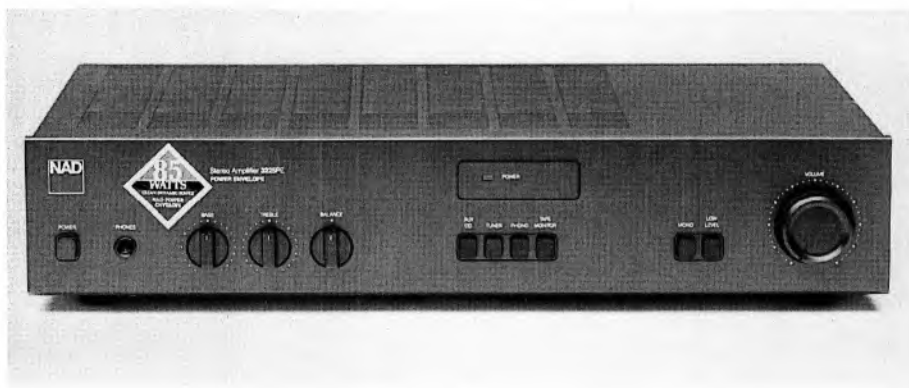
	20Hz	1kHz	20kHz
Maximum Continuous Power Output - 8ohms	133.5W	135.6W	129.6W
- 4ohms	203.6W	217.0W	215.6W
Dynamic headroom (IMF)		+ 1.36dB (185.6W)	
Output impedance	0.089ohm	0.086ohm	0.106ohm
Damping factor	90.1	93.5	75.8
Stereo separation	CD/Aux	MM	MC
(20Hz)	106.8dB	95.7dB	92.1dB
(1kHz)	74.7dB	74.1dB	74.2dB
(20kHz)	49.3dB	49.1dB	48.6dB
Channel balance			
(1kHz, -20dBV)	0.69dB	0.68dB	0.65dB
(-60dBV)	0.92dB	0.89dB	0.87dB

Total harmonic dist. (0dBW) (2/3 power)	-92.0dB	-93.7dB	-94.5dB
CCIR intermod. dist. (0dBW)	-87.8dB	-77.7dB	-73.6dB
CCIR IM dist. (2/3 power)	-89.3dB	-79.9dB	-74.4dB
Rise time			4μsec
Power bandwidth (<0.1% THD)			6Hz - 45kHz
Squarewave linearity			-93.5dB
Phase shift (20Hz)	3°36'	36°0'	40°36'
(1kHz)	355°30'	309°36'	306°0'
(20kHz)	334°48'	255°36'	259°30'
Noise (A wtd, 0dBW) (2/3 power)	-86.1dB	-85.3dB	-73.9dB
Residual noise (unwtd)	-98.3dB	-90.4dB	-73.2dB
Input sensitivity (for 0dBW) (for full output)	14.87mV	264.7μV	26.33μV
Disc overload (20Hz) (1kHz)	169.1mV	2.856mV	298.2μV
(20kHz)		30.69mV	3.635mV
(50kHz)		188.1mV	19.36mV
Tape output/impedance			111.4V/638ohm
Input loading			20kohm/47kohm/200pF/100ohm
DC offset, left/right			-84.6mV/-64.2mV
Typical price inc VAT			£400



# NAD 3225PE

HI-FI MARKETS LTD, AXIS 4, RHODES WAY, WATFORD, HERTS WD2 4YW. TEL: (0923) 226499.



NAD has recently launched a new series of integrated amplifiers featuring 'PE' or Power Envelope technology – of which more in a minute. The *3225PE* reviewed here is finished in the traditional NAD grey plastic and includes a series of rotary controls for bass, treble and balance adjustment together with a row of light pushbuttons catering for input selection. Tape, CD, tuner and phono (MM) sources are handled together with additional facilities for mono and low-level listening.

NAD has chosen to uprate the power of the *3225PE* for a matter of a few seconds (rather than milliseconds) in order to accommodate protracted dynamic signals, a thermal sensor switching in an alternate *lower* voltage supply rail if the *continuous* output rises above 40W or so. Other features include a 4/8ohm speaker switch and a 'Soft Clipping' option that progressively attenuates the output voltage in order to avoid the harsh sound of sudden clipping. The disc stage features a degree of inductive RF decoupling with a low noise differential amplifier feeding a discrete RIAA equalisation stage while complementary 15A Motorola *2N3055H/MJ2955* TO-3 bipolar devices are used in the final power output stage.

Apparently assembled by Tatung in the Far East, the amplifier's internal construction is both overly complex and untidy.

## LAB REPORT

NAD's PE circuit appears to vary with both frequency and load so continuous output fell from 50W to 42W from 20Hz to 1kHz while rising only +0.67dB between 8ohms and 4ohms. Up to 50W/71W (at 1kHz) could be sustained into 8/4ohm loads for up to five seconds. The IHF dynamic headroom test revealed a burst of power of some 110 (<1 per cent THD) into 8ohms, thereby exceeding NAD's specification of +4dB by an extra +0.21dB. The *3225PE* therefore displayed the highest continuous/dynamic power ratio of any amplifier in this test.

On the debit side its 0.2ohm output impedance is simply too high and will render the amp more susceptible to non-linearities inherent in any speaker load. CCIR IMD increased from -86dB to -83dB at low

power levels while THD elevated from -85dB (line) to -74dB between 1kHz-20kHz at the same power output by virtue of certain crossover non-linearities. The 40Hz supply modulation test revealed a mass of subjectively disturbing IMD products at 90Hz (-66.1dBV), 130Hz (-85.7dBV), 140Hz (-74.8dBV), 190Hz (-75.8dBV) etc. A function of the PE circuitry perhaps?

## SOUND QUALITY

Though lacking in ambient weight and drive at very low frequencies the upper octaves seemed comparably light and fresh. Powerful brass instruments were generally projected with convincing verve, though the highest harmonics often sounded a trifle rough around the edges. The amp had a tendency to shout on occasions but it was generally fast, clean and proffered a convincing 'grip' over musical transients.

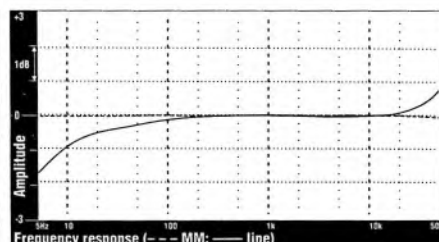
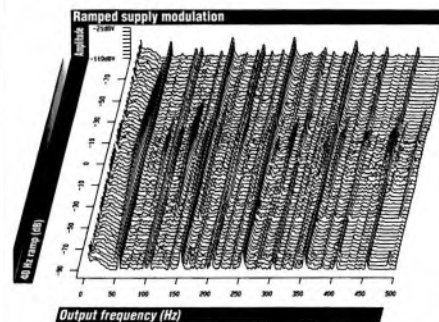
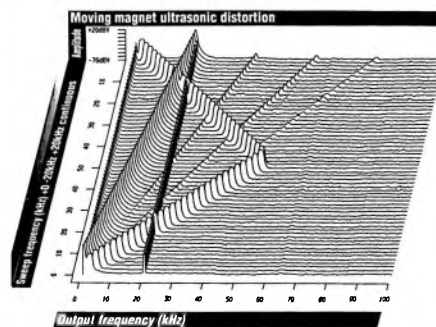
Everyone agreed the moving magnet disc stage was slightly warmer in balance but that stereo images were that much softer in focus. Nevertheless, its spritely character lent some extra bounce and tunefulness to the bass registers, exciting a subconscious (foot-tapping) reaction from the audience. There was some suggestion that it was a rather 'British' sounding amp, particularly in view of its warm and essentially un-fatiguing sound quality via disc.

## CONCLUSIONS

Subjectively the *3225PE* fared rather better via disc than CD but in overall terms the panel considered a Recommendation to be appropriate. Personally, I remain to be convinced that NAD's 'PE' technology is not simply trading one set of problems for another; a return to the 'straight-line' minimalist topology of the original *3020* amplifiers might just have won them a Best Buy!

## TEST RESULTS

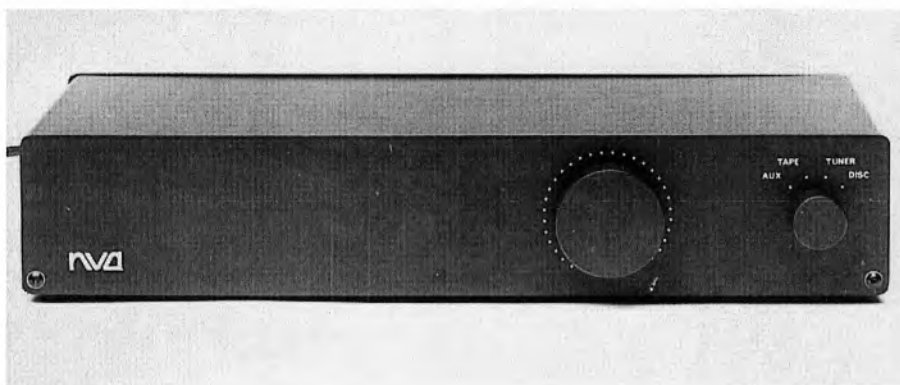
Maximum Continuous Power Output – 8ohms	20Hz	1kHz	20kHz
– 4ohms	50.5W	41.8W*	40.9W
	66.6W	48.8W*	48.9W
Dynamic headroom (IHF)		+4.21dB	(110.1W)
Output impedance	0.205ohm	0.20ohm	0.215ohm
Damping factor	38.9		37.1
Stereo separation		CD/Aux	MM
(20Hz)		71.5dB	70.6dB
(1kHz)		73.6dB	72.6dB
(20kHz)		56.4dB	66.5dB
Channel balance			
(1kHz, -20dBV)		1.23dB	1.01dB
(-60dBV)		2.34dB	2.94dB
Total harmonic dist. (0dBV)		-88.5dB	-91.5dB
( $\frac{1}{2}$ power)		-84.9dB	-85.2dB
CCIR intermod. dist. (0dBV)		-82.8dB	-82.9dB
CCIR IM dist. ( $\frac{1}{2}$ power)		-86.5dB	-84.6dB
Rise time			10 $\mu$ sec
Power bandwidth (<0.1% THD)			28Hz – 17kHz
Squarewave linearity			-93.7dB
Phase shift (20Hz)		129°36'	115°12'
(1kHz)		0°	309°36'
(20kHz)		316°48'	244°48'
Noise (A wtd, 0dBV)		-82.6dB	-81.6dB
( $\frac{1}{2}$ power)		-90.3dB	-84.8dB
Residual noise (unwtd)		-65.6dB	-65.6dB
Input sensitivity (for 0dBV)		27.94mV	506.4 $\mu$ V
(for full output)		217.3mV	3.694mV
Disc overload (20Hz)			26.30mV
(1kHz)			230.8mV
(20kHz)			1931mV
(50kHz)			3323mV
Tape output/impedance		14.96V/1.696kohm	
Input loading		25kohm/100pF	47kohm/100pF
DC offset, left/right		+1.71mV	-2.45mV
Typical price inc VAT			£150



# NVA AP30mc

NENE VALLEY AUDIO, 1 CHURCH FARM, HATLEY ST. GEORGE, NR. SANDY, BEDS. TEL: (0767) 50532.

RECOMMENDED



Nene Valley Audio offers a wide range of very personalised integrated, pre and power amps. The *AP30* is the baby of the range and is available in CD, MM or MC guises. The latter two also include a CD input of course because this is routed directly to the volume control and only requires selection from the knob on the front panel. NVA's styling harks back to the days of good old utilitarian black boxes and is representative of minimalism taken to extremes. Not that there is anything wrong with this approach from the sonic viewpoint, but the *AP30mc* can hardly compete with most Far Eastern amps in terms of perceived value or hi-tech aesthetics.

So, apart from the selector that accommodates the MC, tuner, tape and aux (CD) inputs the only other control NVA offers is a huge volume knob connected, incidentally, to a decent LESA potentiometer. Inside the construction is neat enough with separate variable-voltage regulators used for the three-stage disc equalisation network. Single channel op-amps are used (inked over to prevent identification . . .) to provide first stage gain and LF equalisation followed by passive HF equalisation. Decent polypropylene and metallised polyester caps are employed throughout. The power amp section uses *TIP29/30* drivers and two pairs of Philips *BDV64B/65B* bipolars mounted on an alloy strip at the rear of the amp.

## LAB REPORT

NVA call the *AP30* a 'high current' amplifier but the adequate +1.47dB rise from 22W to 31W into 4ohms together with its +1.1dB dynamic headroom is hardly a monumental result. Similarly, the sluggish rise time and high HF phase shifts are probably related. The 0.09ohm output impedance is also slightly high but will pale into insignificance bearing in mind the series resistance of NVA cables that are likely to partner the amp. Channel separation was maintained to 57dB at 20kHz which is a fine result even if the 6dB channel imbalance at -60dBV is less impressive.

The RIAA response proved to be a little lumpy with some subtle tailoring of +0.85dB at 40Hz and +0.5dB at 10kHz while the MC headroom stayed remarkably constant at 23-

24dB across the audio band. In any event both THD and IMD are determined solely by the output stage in this amplifier which measures 0.021 per cent and 0.089 per cent respectively at two-thirds power. Interestingly it is the subjectively pleasant even-order THD and IMD products that dominate: 2nd and 4th  $F_{0-20k}$  together with  $F_{20k} + yF_{0-20k}$ ,  $F_{0-50k-0} + yF_{0-20k}$  [ $y = 1, 3$  and  $5$ ].

Unfortunately the 40Hz ramp test revealed extensive supply modulation with IMD products at 10Hz (-86dB), 20Hz (-71.8dB), 60Hz (-75.7dB), 140Hz (-80.4dB) and 180Hz/220Hz (-90dB) etc. Sampling harmonics, spaced at 100Hz intervals, appear to dominate.

## SOUND QUALITY

The limitations of this amp's power output were manifest in its slightly anticlimatic presentation of orchestral crescendos but with less demanding works the *AP30* could really sing. It provided a laid-back but extremely detailed musical picture, 'backward' rather than 'forward' was how one of our panel described the sound such was its resolution of stereo depth. Subtle treble harmonics were faithfully revealed while the subjectively 'dark' acoustic seemed to add extra air and insight to the highest octaves without it ever sounding harsh or clinical. All the listeners commented on the excellent tonal integration, stable imagery and civilised manner of the *AP30*.

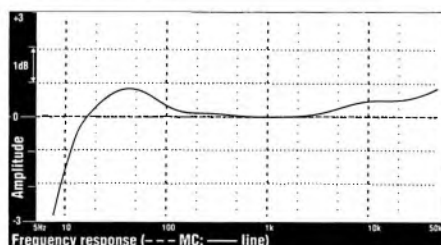
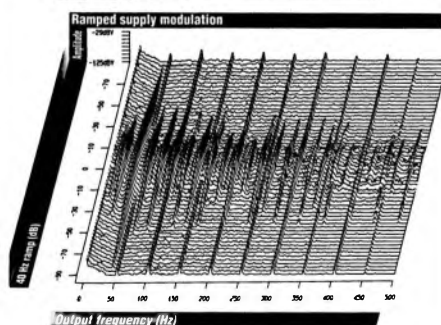
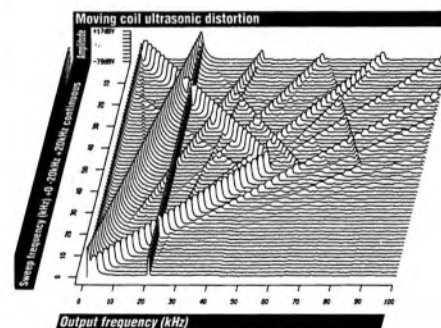
Similarly, the MC input was also applauded for its smooth and beguilingly 'musical' presentation which steadily grew on the listeners throughout the auditioning period. I found the central image to be marginally softer of focus than via the line input but the differentiation between similar vocals of a duet still proved exceptionally good - it is slightly soft but not muddled.

## CONCLUSIONS

Basic and utilitarian it may be, but the *Choice* debut of NVA's *AP30mc* has been quite auspicious. I would suggest it be partnered with fairly sensitive speakers to make the most of its limited power reserves, in which case the *AP30* earns itself a confident Recommendation.

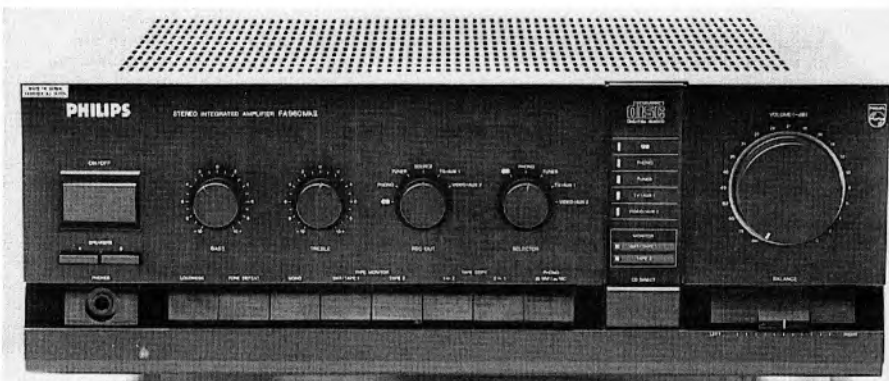
## TEST RESULTS

Maximum Continuous Power Output - 8ohms	20Hz 19.1W	1kHz 21.9W	20kHz 21.5W
- 4ohms	23.7W	30.7W	31.6W
Dynamic headroom (HF)		+1.12dB	(28.3W)
Output impedance	0.091ohm	0.094ohm	0.264ohm
Damping factor	87.5	84.9	30.3
Stereo separation		CD/Aux	MC
(20Hz)		110.4dB	82.1dB
(1kHz)		94.4dB	86.3dB
(20kHz)		69.7dB	57.1dB
Channel balance			
(1kHz, -20dBV)		0.19dB	0.16dB
(-60dBV)		6.15dB	6.75dB
Total harmonic dist. (0dBV)		-64.1dB	-65.1dB
( $\frac{1}{2}$ power)		-73.4dB	-74.0dB
CCIR intermod. dist. (0dBV)		-73.2dB	-72.6dB
CCIR IM dist. ( $\frac{1}{2}$ power)		-61.4dB	-61.4dB
Rise time			21 $\mu$ s/Sec
Power bandwidth (<0.1% THD)			40Hz - 16kHz
Squarewave linearity			-79.3dB
Phase shift (20Hz)		18°0'	350°30'
(1kHz)		355°30'	216°0'
(20kHz)		316°48'	255°36'
Noise (A wtd, 0dBV)		-89.8dB	-68.6dB
( $\frac{1}{2}$ power)		-99.0dB	-67.8dB
Residual noise (unwtd)		-82.8dB	-82.9dB
Input sensitivity (for 0dBV)		73.24mV	47.32 $\mu$ V
(for full output)		344.5mV	205.8 $\mu$ V
Disc overload (20Hz)			823.7 $\mu$ V
(1kHz)			8.235mV
(20kHz)			77.94mV
(50kHz)			141.0mV
Tape output/impedance			13.29V/5ohm
Input loading			48kohm 466ohm
DC offset, left/right			+69.4mV/+43.7mV
Typical price inc VAT			£290



# PHILIPS FA960 MkII

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



The original *FA960* was covered in a previous issue of *Choice*, the main difference between the *MkI* and *MkII* being a different phono stage. The layout of bass and treble tone controls, record-out and input selection remains unchanged as does the sliding balance potentiometer and large illuminated volume control. As before, the CD, phono (MM/MC), tuner and two aux inputs are all indicated on a vertical status display though for the *MkII* version one of the two tape inputs has also been labelled 'DAT'. (Groan).

A row of peripheral controls underline the solid black alloy fascia, providing tone defeat, a loudness contour, full tape monitoring and one-to-two copying in addition to distinguishing between the MM and MC phono inputs. A CD-direct switch routes the high level output from a CD player direct to the volume control and then to the power amp section.

According to Philips' literature this *MkII FA960* is 'unique in the field of audio engineering'. Fact is, it uses the same *A1265NIC3182N* complementary output devices as the Marantz *PM-75* amplifier, while its heavily regulated power supply is used in conjunction with an *STK3102* hybrid that feeds the drivers and output – shades of the Marantz *PM-45*. The MC disc stage benefits from a discrete low noise differential FET input while RIAA equalisation is affected by series feedback around a high quality *LM833N* op-amp.

## LAB REPORT

As expected, the LF roll-off on the MM/MC RIAA response (–3dB at 20Hz) proved very similar to the Marantz *PM-75* while the 3rd, 5th and 7th harmonics derived from the 3D ultrasonic plot almost exactly matched that taken from an older Marantz *PM-45*. More worrying is the strong IMD seen on the 40Hz ramp test, highlighting a subsonic product at 20Hz (–76.7dBV or –105.9dB rel. to full output) together with multiple-order rectifier artefacts spaced at 100Hz intervals.

These are: 60Hz (–60dBV), 140Hz/160Hz (–54dBV), 240/260Hz (–59.6dBV), 340Hz/360Hz (–64.8dBV) etc. Each of these IMD routes becomes progressively less linear with increasing frequency, a fact that doesn't bode

well for bass/lower midband detail resolution. Otherwise the *FA960 MkII* is very competent – just look at the distortion, channel balance, noise and overload figures. Furthermore it offers a substantial +2.4dB increase in output between 8 and 40ohm loads even if its stringent regulation has squashed the dynamic headroom to just +0.96dB.

## SOUND QUALITY

Initially the *MkII* evoked a favourable reaction, its quiet background and sparkingly detailed presentation coupled with a lively tempo undoubtedly helped to turn the listener's heads (ears). Unfortunately this early impression was not sustained, for a sterile or 'bland' quality was perceived making long term listening uncomfortable. Its open and boppy character also seemed to alter with the content and level of the music, simple rock tracks sounding punchy and immediate while orchestral works – a mass of entwined harmonic details – began to appear constricted and unnaturally hurried.

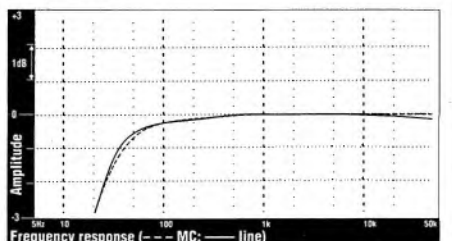
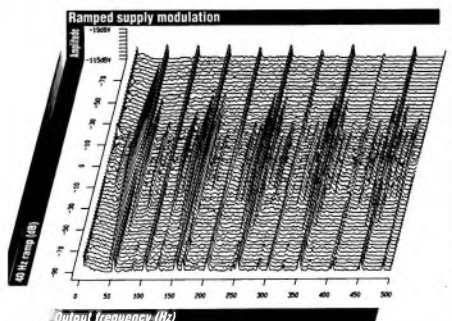
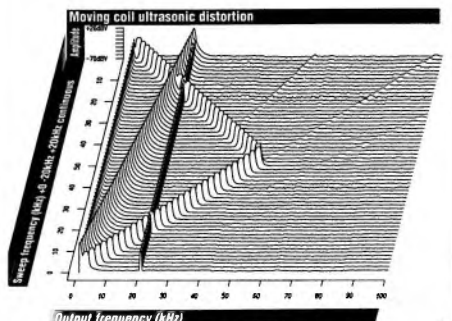
This air of superficiality pervaded more obviously once the MM input was brought into play. Sharper and more accurate than the loose, wallowing quality of the MC stage, the listeners still rated the vocal diction and freedom of the MM input close to that of the CD source. The MC stage did tend to blur any sense of tight rhythm, not through any boomy quality but because of a general vagueness that persisted with most types of music.

## CONCLUSIONS

This is a very solidly built and technically flexible amplifier that deserved to do better in the listening tests. The strong supply intermodulation could do with some investigation by Philips' engineers but other than this I find the amp hard to criticise. To quote one of our more eloquent listeners, it is 'just not that fab'...

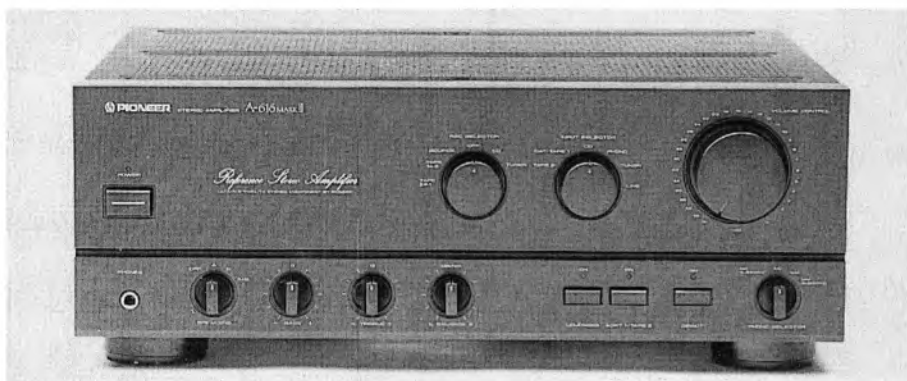
## TEST RESULTS

Maximum Continuous Power Output – 8ohms	20Hz 109.7W	1kHz 122.4W	20kHz 120.0W
– 4ohms	166.7W	210.1W	204.3W
Dynamic headroom (1HF)		+ 0.96dB	(152.8W)
Output impedance	0.044ohm	0.043ohm	0.052ohm
Damping factor	182.7	188.4	154.5
Stereo separation	CD/Aux	MM	MC
(20Hz)	83.2dB	74.5dB	69.7dB
(1kHz)	80.7dB	79.6dB	79.9dB
(20kHz)	56.2dB	55.9dB	55.2dB
Channel balance			
(1kHz, –20dBV)	0.39dB	0.45dB	0.51dB
(–60dBV)	0.41dB	0.66dB	0.26dB
Total harmonic dist. (0dBV)	–95.4dB	–92.6dB	–90.3dB
(½ power)	–93.3dB	–92.7dB	–92.3dB
CCIR intermod. dist. (0dBV)	–85.3dB	–79.5dB	–74.6dB
CCIR IM dist. (½ power)	–83.9dB	–78.6dB	–74.3dB
Rise time			3.7µsec
Power bandwidth (<0.1% THD)			11Hz – 110kHz
Squarewave linearity			–97.3dB
Phase shift (20Hz)	18°0'	43°12'	43°12'
(1kHz)	0°0'	313°12'	315°0'
(20kHz)	343°48'	264°36'	262°48'
Noise (A wtd, 0dBV)	–89.5dB	–84.6dB	–72.2dB
(½ power)	–101.2dB	–89.8dB	–72.8dB
Residual noise (unwtd)	–75.6dB	–76.1dB	–77.9dB
Input sensitivity (for 0dBV)	16.14mV	259.0µV	22.53µV
(for full output)	178.3mV	2.867mV	259.4µV
Disc overload (20Hz)		26.99mV	2.785mV
(1kHz)		252mV	17.32mV
(20kHz)		1142mV	126.4mV
(50kHz)		1102mV	130.3mV
Tape output/impedance			10.92V/220ohms
Input loading			25kohm 47kohm/100pF 100ohm
DC offset, left/right			–4.89mV/+9.8mV
Typical price inc VAT			£300



# PIONEER A-616 MkII

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



Over the last year or so Pioneer seems to have been making a genuine attempt to improve the sound quality of many of its products in addition to offering a wide variety of facilities. This has certainly been the case with its tuners, most of which offer superb value, even if Pioneer's success on the amplifier front has been less distinguished. The '616 MkII' is an appropriate example, it is built to exacting standards on a non-resonant honeycomb chassis and features a broad range of controls.

The upper portion of its satin black fascia holds court to a large rotary volume control (so-called 'midship' control because the potentiometer actually lies some way into the amp) together with chunky input and record-out selectors. Provision is made for three tape machines, CD, tuner, 'line' and both MM and MC phono sources. The two disc inputs are selected by a knob on the front panel which also includes the option of a subsonic (rumble) filter. Pioneer has equipped the lower half of the fascia with peripheral controls for CD direct, loudness, balance and bass/treble tone adjustment.

Pioneer's use of isolated PCBs, 'trapped' in their own non-resonant honeycomb boxes, made internal inspection fairly difficult. Nevertheless it is clear the company's aiming for a low source impedance power supply (featuring two 12,000µF electrolytics) while the complementary output stage is based around rugged 2SA1302/2SC3281 devices on a honeycomb-shaped alloy heatsink.

## LAB REPORT

The standard numerical test procedure indicates a high degree of linearity, the 1kHz THD figure of 0.0013 per cent via the MC input at two-thirds power being almost too good to credit. Nevertheless, in accordance with the higher 0.018 per cent IMD, the overall THD did increase with both frequency and decreasing load. Hence the 2nd and 3rd harmonics clearly revealed on the 3-D ultrasonic plot. The 40Hz ramp supply test also hints at good linearity with low-order IMD products at 60Hz (-83dBV) and 140Hz (-85.6dBV) partnering an unusual distribution of 50/100Hz harmonics that peak at 250Hz, 350Hz and 450Hz.

Nevertheless – and perhaps most important from the subjective viewpoint – is the 'rippling' of the ultrasonic and LF white noise floor on both plots that may indicate an above average susceptibility to broadband RF noise intermodulation, a mechanism that can give rise to added harshness. Other than this the RIAA equalisation was commendably flat and even, channel balance and separation fine, while noise was very low. Only the high phase shifts at 1kHz and above give any cause for concern.

## SOUND QUALITY

Despite offering a respectable measured performance the sonic qualities of the A-616 MkII were less memorable. Listeners commented that the CD input sounded harsh, synthetic and 'digital'; percussion was a trifle harsh and cold, the overall effect one of superficial detail.

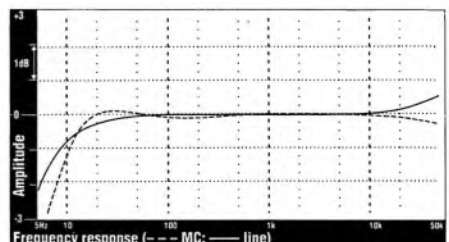
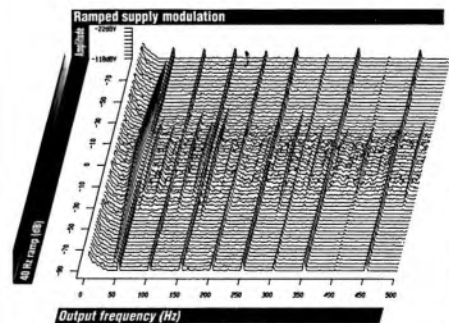
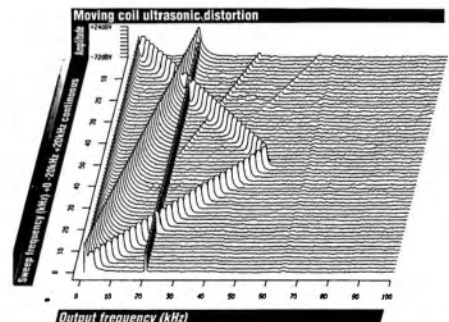
Our piano CD sounded hard and clanky just as the attack and decay of notes was compromised by a softened image focus that also affected the projection of the tenor's voice. Once again it seemed too flat and unemotional. Things improved somewhat once the MM disc input was brought into play, the phono stage providing a smoother and less aggressive balance than the line stage. Vocal inflections were more easily discerned via disc but the sense of rhythm was hampered by a slightly sterile, one-note bass. Unfortunately the MC stage was thought to sound smoother to the point of sluggishness, treble sounds lacking the air and extension necessary for a truly free and lucid presentation. Music simply failed to breathe, the thick and obstructive nature of the MC input being inoffensive but equally uninspiring.

## CONCLUSIONS

With a disparate sound quality via CD and disc the Pioneer A-616 MkII may quite easily appear up-front and detailed if auditioned with a quick burst of pop music. Unfortunately the long term satisfaction provided by this amplifier is less certain, its performance seemingly too mixed up for a considered Recommendation.

## TEST RESULTS

Maximum Continuous Power Output – 8ohms	20Hz	1kHz	20kHz
– 4ohms	92.8W	94.5W	91.2W
Dynamic headroom (IHF)	136.7W	147.8W	138.2W
Output impedance		+1.27dB	(126.7W)
Damping factor	0.037ohm	0.038ohm	0.133ohm
Stereo separation (20Hz)	215.6	211.8	60.3
(1kHz)	CD/Aux	MM	MC
(20kHz)	74.5dB	79.8dB	64.5dB
Channel balance (1kHz, -20dBV)	74.7dB	80.9dB	79.9dB
(-60dBV)	59.9dB	60.1dB	58.5dB
Total harmonic dist. (0dBV) (1/3 power)	0.24dB	0.24dB	0.23dB
CCIR intermod. dist. (0dBV)	0.65dB	0.66dB	0.63dB
CCIR IM dist. (1/3 power)	-91.4dB	-92.8dB	-93.9dB
Rise time	-94.8dB	-97.6dB	-98.1dB
Power bandwidth (<0.1% THD)	-83.5dB	-78.9dB	-75.1dB
Squarewave linearity	-84.6dB	-77.9dB	-74.8dB
Phase shift (20Hz)		2.8µsec	6Hz – 24kHz
(1kHz)	23°24'	36°0'	-92.9dB
(20kHz)	0°	311°24'	313°12'
Noise (A wtd, 0dBV) (1/3 power)	349°12'	255°36'	259°12'
Residual noise (unwtd)	-86.7dB	-85.0dB	-73.6dB
Input sensitivity (for 0dBV) (for full output)	-98.1dB	-93.4dB	-76.5dB
Disc overload (20Hz) (1kHz)	-78.7dB	-79.0dB	-78.9dB
(20kHz)	18.33mV	326.8µV	26.23µV
(50kHz)	176.1mV	3.135mV	251.1µV
Tape output/impedance		27.32mV	2.023mV
Input loading		247.6mV	18.63mV
DC offset, left/right		743.4mV	54.80mV
Typical price inc VAT		6559mV	794.7mV
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# QED A270

QED AUDIO PRODUCTS LTD, UNIT 12, ASHFORD IND EST, ASHFORD, MIDDX TW15 1AU. TEL: (07842) 46236.

RECOMMENDED



A big 'n' beefy version of the established A240 amplifier has been on QED's drawing board for some time, only coming to fruition in the new A270 very recently. This black and gold amplifier is equipped with the same inputs and stylised function knobs as its cheaper brother, but its case is considerably taller in order to accommodate the large mains toroid and supply capacitors.

Both preamp output and conventional loudspeaker outputs are provided, the latter coping with two pairs of speakers in either switched or unswitched mode. In switched mode the output to the speakers is muted if the headphone socket is in use.

Two identical function knobs suffice for input and independent record-out selection. There are a total of five line inputs, labelled CD, tuner, video, tape and DAT, while a single select position marked 'disc' is used for both MM and MC cartridges. Separate phono inputs are fitted at the rear but it's necessary to delve into the amp in order to adjust the disc loading and gain setting on QED's proprietary 'SA' ('Super Analogue') board. This is the same board used in the A240-SA and previous tests on that model revealed that the single rail resistively-loaded MC circuit was slew-limiting rather prematurely and giving rise to very characteristic (sounding) distortions. QED now recognises this problem and a revised version of the plug-in SA board will soon be available by way of an upgrade.

## LAB REPORT

As testament to QED's heavily regulated supply the A270 furnished some +1.9dB extra power into the 4ohm load though was unable to respond quickly enough under dynamic conditions - hence the IHF figure of +0.9dB. Output impedance was suitably low at 0.024ohm, noise excellent, separation adequate at HF but the channel balance did deteriorate via disc to 3-4.8dB at -60dBV. At two-thirds power the squarewave linearity dropped to -77.6dB, rise time increased to 8µsecs and IMD increased to -53dB (0.22 per cent); all probably related to the SGS D100/D200 Darlingtons used in the low feedback output stage.

As the MC headroom runs out on QED's SA

board the 3-D ultrasonic plot shows various IMD routes rising to 2-3 per cent in accordance with the RIAA characteristic. Nevertheless despite some 3rd-order IMD ( $F_{20k} - 2F_{0-20k}$  and  $F_{0-50k-0} - 2F_{0-20k}$ ) the mechanisms are principally 2nd-order ( $F_{0-50k-0} \pm F_{0-20k0}$ ) and therefore subjectively innocuous. QED also has a problem with its 8A rectifier as the supply IMD artefacts (140Hz = -57.6dBV) are mostly based on a 100Hz (-43.4dB or -68.5dB rel. full output) 'sampling' frequency.

## SOUND QUALITY

This was another amplifier that elicited a strong reaction from our panel, everyone expressing their delight at its dark and expansive acoustic populated with wonderfully alive - if slightly larger-than-life - stereo images. Via CD it sound very boppy, punchy and dynamic despite there being some added warmth or 'looseness' at low frequencies. In many respects it sounded similar to the favoured Inca Tech amplifier, rich and mellifluous but still musically captivating despite its obvious colorations.

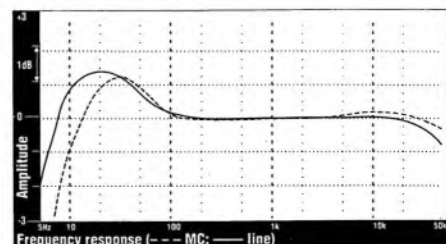
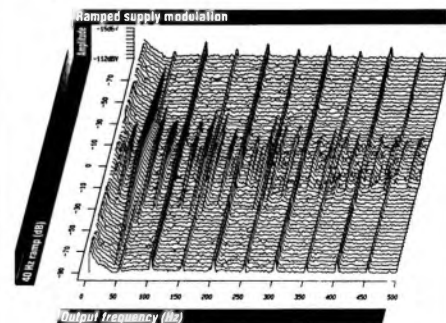
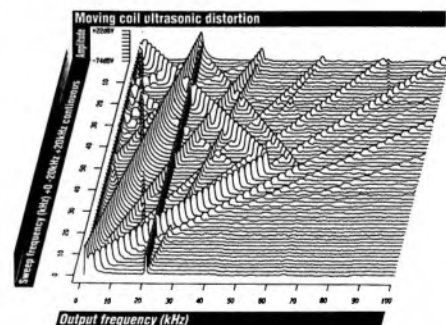
Via the disc input the dynamic and expansive character of the amplifier worked slightly against it, the soundstage swelling in a slightly unnatural and ill-controlled fashion. The bass hump revealed on both MM and MC response traces must surely encourage this sonic trend. Anyway, its good sense of scale and dynamics proved ideal either when reproducing grand orchestral works or punchy pop tracks. It could sound slightly thick or slow at very low frequencies but this rarely detracted from the sense of timing and rhythm.

## CONCLUSIONS

In many respects the warm and thoroughly beguiling character of the A270 brought to mind those positive qualities of the cheaper A240-SA, any slight loss of treble 'air' rendering it more compatible with the brighter speakers that prevail. Overall it deserves a firm Recommendation but keep an ear open for the new SA boards.

## TEST RESULTS

Maximum Continuous Power Output - 8ohms	20Hz	1kHz	20kHz
- 4ohms	45.6W	51.4W	51.3W
	63.7W	81.0W	80.3W
Dynamic headroom (IHF)			+0.92dB (63.5W)
Output impedance	0.024ohm	0.023ohm	0.029ohm
Damping factor	332.3	352.1	280.0
Stereo separation	CD/Aux	MM	MC
(20Hz)	102.8dB	85.7dB	80.2dB
(1kHz)	72.9dB	72.7dB	72.5dB
(20kHz)	47.5dB	49.6dB	50.2dB
Channel balance			
(1kHz, -20dBV)	0.08dB	0.98dB	1.17dB
(-60dBV)	0.43dB	3.32dB	4.87dB
Total harmonic dist. (0dBV)	-83.6dB	-85.7dB	-61.9dB
(½ power)	-70.6dB	-71.1dB	-59.6dB
CCIR intermod. dist. (0dBV)	-69.5dB	-52.7dB	-32.1dB
CCIR IM dist. (½ power)	-52.7dB	-47.3dB	-32.4dB
Rise time			8.1µsec
Power bandwidth (<0.1% THD)			22Hz - 18kHz
Squarewave linearity			-77.6dB
Phase shift (20Hz)	205°12'	18°0'	225°12'
(1kHz)	180°0'	309°36'	129°36'
(20kHz)	205°12'	248°24'	68°36'
Noise (A wtd, 0dBV)	-82.2dB	-80.1dB	-73.6dB
(½ power)	-90.7dB	-85.0dB	-72.1dB
Residual noise (unwtd)	-65.5dB	-65.8dB	-65.3dB
Input sensitivity (for 0dBV)	36.60mV	606.7µV	26.45µV
(for full output)	257.3mV	4.195mV	184.2µV
Disc overload (20Hz)		19.49mV	1.035mV
(1kHz)		242.1mV	12.65mV
(20kHz)		1429mV	40.39mV
(50kHz)		1339mV	29.61mV
Tape output/impedance			9.252V/4.74kohm
Input loading			15kohm/47kohm/150pF/47ohms/10nF
DC offset, left/right			-10.1mV/-11.6mV
Typical price inc VAT			£329





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**BADA**

# REVOX B150

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



Although Revox has never targeted its products at the mass consumer market it now has a cheaper digital tuner (the *B160*) and matching integrated amplifier on its books. The *B150* amplifier has a slightly less sophisticated power supply and is less flexible in its switching options than the costly *B250*, but with inputs for disc (MM only), CD, tuner, aux and two tape decks together with independent tape monitoring the amp could hardly be described as 'minimalist'.

The silver alloy fascia is peppered with large pushbuttons that cater for all these inputs as well as tone operation, a  $-20\text{dB}$  stepwise mute facility and fast or slow up/down volume adjustment. The lower portion of the fascia is recessed and finished in a matt black effectively contrasting with its 20-segment fluorescent green status display. Depending on the mode of the amplifier this display provides a guide to the volume, bass or treble level, balance position, input and record output selection. Chunky gold plated 4mm terminals are included for the connection of two pairs of loudspeakers, while a serial-link port enables the amp to be operated under remote control.

All input switching is effected through a bank of *DG201* CMOS devices each buffered using an *RC5532A* op-amp. An additional *MC14094* IC selects between the record out signals and desired input while discrete transistors and FETs populate the disc RIAA network. The volume control is based around an *MP7528* multiplying D/A convertor feeding the power amp section, comprising *A968/C2238* drivers and three pairs of *NEC A1232/C3012* output devices per channel.

## LAB REPORT

The *B150* afforded a substantial 117W on test, rising by  $+1.8\text{dB}$  to 177W into 4ohms together with an additional  $+1.6\text{dB}$  available over short term peaks ( $<1$  per cent THD) across an exceptional 7-49kHz power bandwidth. Channel separation was superb but fell to around 58dB at 20kHz via MM just as the CCIR IMD product increased from  $-89\text{dB}$  to  $-75\text{dB}$  from line to disc.

Both the noise ( $-99\text{dB}$ ) and THD (0.0013 per cent at 0dBW) were excellent, the 3D ultrasonic plot highlighting a slight increase

in the 2nd harmonic of  $F_{0-20k}$  (via MM) with both power and frequency into the reduced 4ohm load. Operating over a maximum dynamic range of 147.5dB, the 40Hz ramp test reveals 50Hz as the predominant field frequency and traces of supply IMD at 140Hz/160Hz ( $-96.2\text{dB}$  rel. full output), 240Hz/260Hz and 340Hz/360Hz.

Revox has clearly adopted the more recent IEC RIAA amendment, as the MM input is sensibly tailored below 100Hz to a  $-3\text{dB}$  point of 20Hz. The line input is totally flat but still incurred a substantial  $351^\circ$  phase shift at 20Hz. Disc headroom is also more than adequate at  $+32.8\text{dB}$  (1kHz) and the input sensitivity fine at 2.8mV.

## SOUND QUALITY

Not as vague or listless sounding as previous Revox amplifiers, the *B150* afforded a surprisingly clear cut and dynamic picture of events. This new found openness was curtailed via the MM input though, which sounded curiously damped and slightly feathery at high frequencies. Simple tracks fared rather better than full-blown orchestral recordings which tended to sound a little coarse or edgy on occasions.

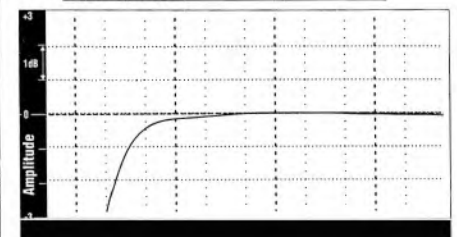
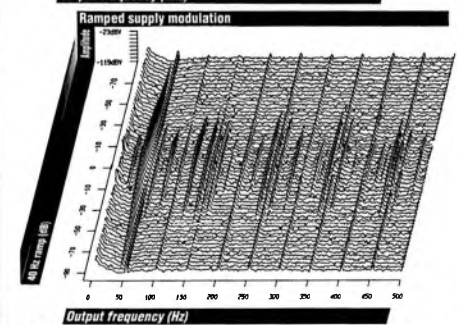
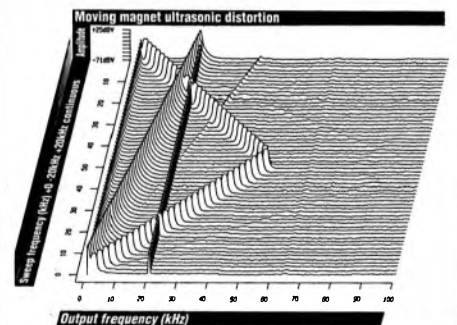
Returning to the CD input the listeners appreciated the way it handled the ebb and flow of music, detail resolution was pretty good and soundstages were reconstructed with a fair sense of stereo width and depth. There was always an underlying solidity to the performance which maintained a realistic musical tempo, despite any instrumental muddling that might be precipitated at higher frequencies.

## CONCLUSIONS

Clearly Revox has been making a determined effort to improve the sound quality of its electronics without encroaching upon those logic-controlled facilities synonymous with all its products. As a result the *B150* represents the company's best sounding amplifier to date. So, even if its high cost militates against a formal Recommendation the well-heeled enthusiast could still do worse than audition this masterpiece of modern engineering.

## TEST RESULTS

Maximum Continuous Power Output – 8ohms	20Hz 112.5W	1kHz 117.1W	20kHz 112.6W
– 4ohms	172.2W	176.8W	170.6W
Dynamic headroom (IHF)		+1.59dB (169.0W)	
Output impedance	0.052ohm	0.053ohm	0.125ohm
Damping factor	154.2	151.9	63.9
Stereo separation		CD/Aux	MM
(20Hz)		95.1dB	97.5dB
(1kHz)		94.8dB	79.8dB
(20kHz)		84.6dB	58.3dB
Channel balance			
(1kHz, $-20\text{dBV}$ )		0.04dB	0.01dB
( $-60\text{dBV}$ )		0.11dB	0.02dB
Total harmonic dist. (0dBW)		$-98.1\text{dB}$	$-97.0\text{dB}$
( $\frac{1}{2}$ power)		$-92.1\text{dB}$	$-95.1\text{dB}$
CCIR intermod. dist. (0dBW)		$-88.5\text{dB}$	$-74.6\text{dB}$
CCIR IM dist. ( $\frac{1}{2}$ power)		$-83.6\text{dB}$	$-73.9\text{dB}$
Rise time		2.5 $\mu\text{s}$ sec	
Power bandwidth ( $<0.1\%$ THD)		7Hz – 49kHz	
Squarewave linearity		$-90.5\text{dB}$	
Phase shift (20Hz)		351°0'	320°24'
(1kHz)		0°	313°12'
(20kHz)		9°21'	262°48'
Noise (A wtd, 0dBW)		$-98.8\text{dB}$	$-82.4\text{dB}$
( $\frac{1}{2}$ power)		$-106.3\text{dB}$	$-83.6\text{dB}$
Residual noise (unwtd)		$-86.9\text{dB}$	$-85.3\text{dB}$
Input sensitivity (for 0dBW)		25.63mV	267.3 $\mu\text{V}$
(for full output)		273.1mV	2.797mV
Disc overload (20Hz)			24.62mV
(1kHz)			218.1mV
(20kHz)			1982mV
(50kHz)			3739mV
Tape output/impedance		11.02V/44ohm	
Input loading		47kohm/15pF 47kohm/150pF	
DC offset, left/right		$+20.6\text{mV}/-18.9\text{mV}$	
Typical price inc VAT		£875	



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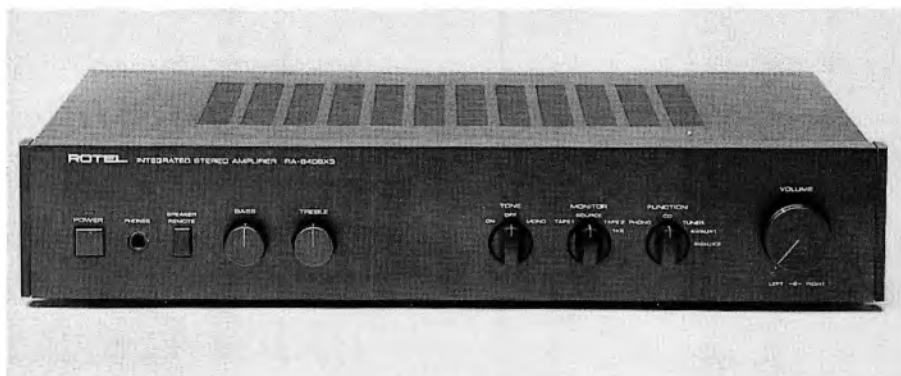
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# ROTEL RA-840BX3

ROTEL HI-FI, 25 HEATHFIELD, STACEY BUSHES, MILTON KEYNES MK12 6HR. TEL: (0908) 317707.

RECOMMENDED



Along with NAD, Rotel is one of the few companies to have really stimulated interest in the budget amplifier scene. Since the launch of the original RA-820 integrated amplifier, Rotel's diligence in this area has been recognised (appropriately in my view) within the pages of *Choice*. Consequently it comes as no surprise that the latest RA-840BX3 is yet another fine product.

Technically there are several Rotel hallmarks; low noise Signetics NE5534AN op-amps in the disc gain and equalisation stages, Mullard resistors and Siemens layer capacitors in critical positions and low-ESR Rubycon electrolytics in the power supply. No less than four pairs of 12A Sanyo B817/D1047 power transistors are in the output section despite its modest 50W rating.

A slightly smoother Rotel 'look' is in evidence with black plastic end caps terminating the sides of the solid alloy fascia, while the inclusion of defeatable bass/treble tone controls and full tape monitoring facilities improve the flexibility of this amp over its cheaper brother, the RA-820BX3. A dual-concentric volume control does away with the need for a separate balance knob though I do consider these controls a little fiddly in use. Anyway, Rotel has provided inputs for both MM and MC cartridges, CD, tuner, two tape and two A/V sources while also including a separately buffered video input. Two sets of speakers are accommodated by a row of substantial 4mm binding posts fitted on the rear of the amp.

## LAB REPORT

Small running production changes have resulted in a few measured differences (and an appreciable sonic improvement) over very early samples of the RA-840BX3. It still offers a substantial +2.1dB boost in power between 8 and 4ohms loads but the output impedance has been reduced to 0.024ohm - an excellent result. A 4.6dB channel imbalance remains at -60dBV because of poor tracking within Rotel's volume control, while the A-wtd noise via the CD input has mysteriously risen to -93.4dB (3/4 power); not a poor result anyway.

THD reaches a maximum of 0.04 per cent via the MC input (at 1kHz) but increases to

around 0.11 per cent at 20kHz. Healthy +32.5dB/+33dB MM/MC overload margins mean that distortions in the line and power output stages tend to dominate. The ultrasonic plot shows an increase in  $3F_{0-20k}$  with frequency and reducing load while the IMD routes are almost all derived from 2nd and 3rd-order summations:  $F_{20k} + yF_{0-20k}$  and  $F_{0-50k-0} + yF_{0-20k}$  [ $y = 1$  and  $2$ ]. Similar mechanisms are at work at very low frequencies, the 40Hz ramp spectrum depicting strong 10Hz (-48.7dBV) and 140Hz/160Hz (-65.4dBV) residues together with an increase in the 3rd harmonic at 120Hz.

The MM and MC responses are accurately matched and both show a sensible -3dB tailoring at 10Hz.

## SOUND QUALITY

Offering a smooth, richly textured balance the RA-840BX3 captured the listening panel's attention, not because it was superficially detailed in the 'electronic hi-fi' sense but because it proved to be *musically* convincing. It avoided any harsh or shouty colorations but could sound slightly repressed or even muddled with very complex passages. By contrast, strong vocals benefitted from a dark background acoustic that created a fine sense of stereo space; the finest details may have been surreptitiously obscured but this didn't disturb the inherent fluidity or rhythm of a piece of music.

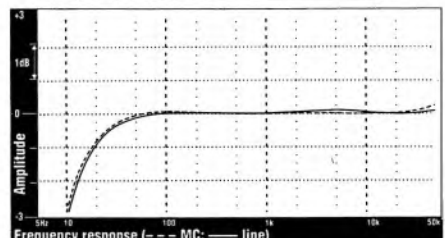
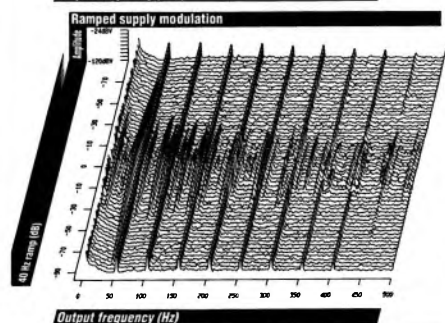
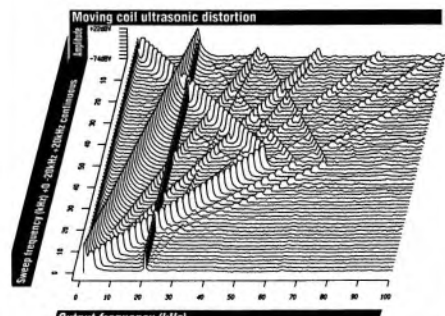
Some subjective bandlimiting was detected via the MM input which was thought to sound drier, fresher and less coloured than the MC stage. Solo guitar and vocal recordings were actually preferred through the MC input if only because of its added warmth and 'bloom'. However, the extra transparency and spaciousness offered by the simpler MM stage earned it a vote of confidence with more complex recordings.

## CONCLUSIONS

Rotel has reached something of a crossroads with the RA-840BX3 for in many respects it represents a logical conclusion to the traditional 'Rotelsound'. Whether future products will be appreciably different is hard to tell, but for now the 840BX3 can rest on its laurels and receive Recommendation.

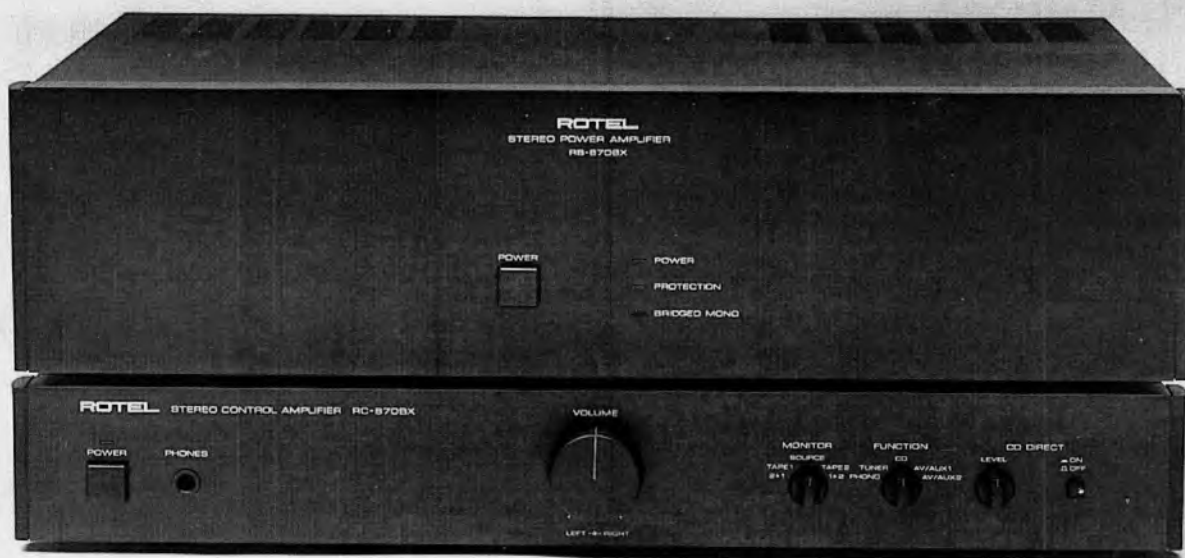
## TEST RESULTS

	20Hz	1kHz	20kHz
Maximum Continuous Power Output - 8ohms	56.0W	59.1W	54.8W
- 4ohms	90.1W	95.4W	89.1W
Dynamic headroom (IHF)		+ 1.04dB (75.2W)	
Output impedance	0.024ohm	0.022ohm	0.022ohm
Damping factor	335.7	366.3	360.0
Stereo separation	CD/Aux	MM	MC
(20Hz)	95.7dB	90.6dB	69.0dB
(1kHz)	74.9dB	75.6dB	66.9dB
(20kHz)	49.5dB	48.7dB	48.4dB
Channel balance			
(1kHz, -20dBV)	0.48dB	0.28dB	0.45dB
(-60dBV)	4.06dB	5.10dB	6.78dB
Total harmonic dist. (0dBW)	-81.0dB	-76.9dB	-75.0dB
(3/4 power)	-71.1dB	-69.8dB	-68.5dB
CCIR intermod. dist. (0dBW)	-78.5dB	-79.9dB	-77.5dB
CCIR IM dist. (3/4 power)	-75.5dB	-64.7dB	-63.6dB
Rise time			1.1μsec
Power bandwidth (<0.1% THD)			5Hz - 18kHz
Squarewave linearity			-81.9dB
Phase shift (20Hz)	201°36'	32°24'	35°30'
(1kHz)	180°0'	309°36'	313°12'
(20kHz)	172°48'	273°36'	273°30'
Noise (A wtd, 0dBW)	-80.6dB	-78.8dB	-69.4dB
(3/4 power)	-93.4dB	-86.2dB	-72.1dB
Residual noise (unwtd)	-58.4dB	-56.6dB	-56.8dB
Input sensitivity (for 0dBW)	22.95mV	361.9μV	36.06μV
(for full output)	177.1mV	2.662mV	276.6μV
Disc overload (20Hz)		24.56mV	2.585mV
(1kHz)		211.3mV	22.35mV
(20kHz)		2002mV	211.4mV
(50kHz)		2170mV	223.4mV
Tape output/impedance			12.82V/1.13kohm
Input loading		20kohm/90pF	47kohm/160pF 180kohm
DC offset, left/right			-3.77mV/+2.85mV
Typical price inc VAT			£220



# ROTEL RC-870BX/RB870BX

ROTEL HI-FI, 25 HEATHFIELD, STACEY BUSHES, MILTON KEYNES MK12 6HR. TEL: (0908) 317707.



If Rotel rank as one of the success stories of the budget amp boom then it must also represent one of the few companies who successfully achieved the jump into the costlier pre/power sector. Nevertheless, Rotel's two preamps and three power amps are not exactly vying with the imported esoterica; this company has its feet planted securely on *terra firma*. The cheapest RC/RB-850 pre/power combination has been so hugely popular that the price of the RC/RB-870BX components has had to be reduced in order for them to remain competitive.

The RC-870BX preamp now benefits from revised signal routing with higher quality OF copper wire, while the Dubilier coupling caps between the disc and line stages have been traded in for Rubycon BGF electrolytics which, apparently, sound better. Both pre and power amp are styled according to the Rotel tradition of chunky black-anodised fascias, rounded plastic end caps and a slightly hollow-sounding metal bonnet.

A friction-locked dual-concentric volume control dominates the centre of the preamp while a series of smaller plastic control knobs are located over to the right. These cater for the two aux, two tape, CD, tuner and phono inputs (MM and MC cartridges are selected at the rear of the case) together with full tape dubbing and monitoring. The remaining control is actually an unbuffered volume potentiometer to be used with the CD direct facility. As a result of its high and variable output impedance it will be more sensitive to the vagaries of interconnect cable than the conventional active output. Rotel has also equipped this preamp with two dedicated and independently buffered video inputs – yes, A/V flexibility in a true 'minimalist' amplifier!

Inside, the standard of construction is

very high indeed using remote input switches (to shorten the signal path and maximise separation) together with a single high quality PCB. Built almost as a dual-mono preamp the RC-870BX features a chunky 4x4700 $\mu$ F supply fed from separate secondary windings on the mains transformer. Two Signetics NE5534AN op-amps per channel are employed in the disc stage both as input buffers and as part of the shunt-feedback network that effects the RIAA equalisation.

High quality passive components, such as 1 per cent metal film resistors and the extended-foil polystyrene capacitors exert a considerable influence on the final 'sound' of the unit and so have been chosen with deliberate care. Slightly noisier NE5534N op-amps are used in the line stage together with a Sanyo LA4170 headphone amp which when not in use is actually disconnected by a relay, thereby reducing any in-line interference.

Rotel's RB-870BX power amp is similarly styled and equally well built. Three red LEDs grace the matt black fascia indicating the user of 'power on', 'protection' and 'bridged mono' operation. The latter may be swiftly achieved at the flick of a switch on the rear panel of the amp, alongside its gold-plated phono inputs and rugged 4mm binding posts. Once in mono bridged mode the output of the 'left' channel is fed into the inverting input of the 'right', a superior method to the standard process of running the two channels in parallel and inverting one through an additional op-amp. Theoretically at least, bridging a stereo amp should yield an increase in power of some +6dB or x4 provided the amp can supply enough current to support the output voltage.

A single toroid and two pairs of 10,000 $\mu$ F electrolytics are employed in the power supply feeding the rugged Sanyo output stage

comprising three pairs of 12A complementary 2SD1047/2SB817 bipolars on two heavy alloy heatsinks. No inductive Zobel network is present at the output, a potential cause of degradation in some designs despite it being necessary to limit the vhf response and assure the stability of the unit.

## LAB REPORT

Taking the RC-870BX preamp first I have to say I was most impressed by the level and phase uniformity of the two disc RIAA responses, both falling to -0.4dB at 50kHz and sensibly tailored below 100Hz to a -3dB point of 10Hz. Stereo separation registered a spectacular 126dB at 20Hz via the line stage, averaging 90dB throughout the midband on all inputs and only falling to 66-72dB at 20kHz. Breakthrough from MC disc to the line input appeared at -52dB (at 20kHz). Channel balance fell to a fine 0.7dB at -60dBV while the exceptional linearity of this preamp, particularly in respect of THD, was nearly a match for the Deltec preamp.

Distortion was fairly consistent (0.0014 per cent to 0.00079 per cent) between inputs and with respect to frequency, an important subjective consideration in some circumstances. As expected, the 3-D ultrasonic plot only highlights the linearity of this preamp, any IMD equivalent to the -74dB CCIR residue being beneath the noise floor in this test. Rotel has managed to push down the residual noise to -105dB but the A-wtd noise figure of -68.3dB via the MC input is not quite so spectacular.

Rotel's RB-870BX power amp is also rendered fairly linear as a result of feedback, notable in the way that the low distortion (0.003 per cent) and the very low output impedance (0.0088ohm) are optimised at the same midband frequencies. Above the

dominant pole of the feedback network the open-loop non-linearities begin to play a more important role, hence the 0.016 per cent THD and higher 0.012ohm output impedance at 20Hz.

The 40Hz ramped supply modulation test threw up an unpleasant subsonic IM artefact at 20Hz (-60.7dBV or -90dB rel. to full o/p) together with 2nd and 3rd-order artefacts at 140Hz (-69dBV), 180Hz (-77dBV) and 220Hz (-76dBV). At 1kHz the amplifier offered a substantial 128W into 8ohms which was increased to 208W (+2.1dB) into 4ohms or 410W/8ohms and 531W/4ohms in bridged mono mode. Stereo separation is very consistent with frequency while the input sensitivities, loading and adequate 27kHz power bandwidth should ensure this unit is widely compatible.

## SOUND QUALITY

Rotel's subtle modifications to the *RC-870BX* preamplifier do appear to have improved the transparency and subjective 'speed' of the unit at low and midrange frequencies but a slightly phasey treble quality was discovered by all the listeners. This was very much program-dependent, affecting our percussive and brass (trumpet) recordings more than those containing piano or vocals for instance. Linked to this was a de-focusing of stereo images, the recreated soundstage was satisfyingly deep and transparent but the 'players' were less distinct. I would still attribute these colorations to the line stage of the preamp for the matching *RB-870BX* power amp suffered no such ills when auditioned in isolation.

The *RB-870BX* afforded a big but comfortable and non-aggressive sound that tended to flow from the speakers rather than be forcefully projected. It seemed to lose a touch of definition at the frequency extremes but this just added to the rich and beguilingly sweet character of the amp. The power amp alone should win many friends for Rotel, even if the preamp is not quite as balanced in its performance.

Strangely, the true calibre of the power amp only began to be revealed once the MM

disc input on the preamp was brought into play. The MC input was somewhat 'thicker' and slower sounding than the MM stage but nonetheless put in a fine performance considering the price of the unit. Via MM disc the combo sounded richer, better focused and 'enjoyably tuneful' as one listener put it. Vocals now possessed a more realistic presence and it proved easier to hear *through* the music and identify subtler events carrying on around the periphery of the sound-stage.

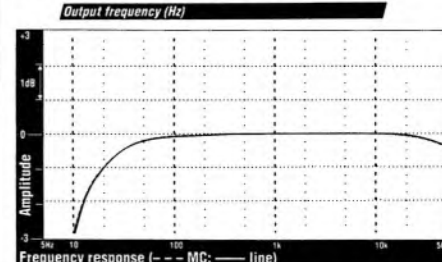
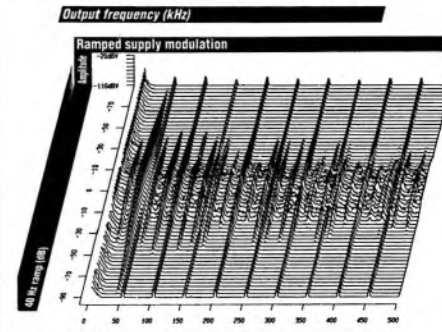
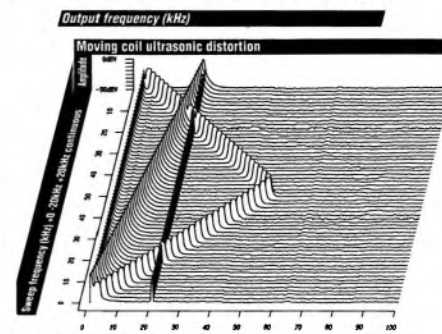
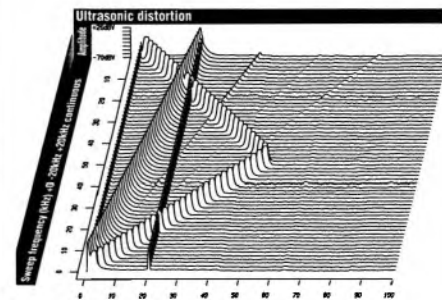
## CONCLUSIONS

Taking into account the recent price reductions and detail modifications made to the preamp, the overall performance of this duo - both technical and subjective - is clearly sufficient to earn it a Recommendation. Nevertheless, it is the *RB-870BX* power amp that shines the brightest in this combination and would certainly form the heart of a first-rate system in its own right. In fact, if memory serves me correctly, the delightful sound of this amp places it ahead of the costlier *RB-890* power amp from Rotel, while the bridging option opens up a whole new, and eminently affordable, area for exploration. Excellent value for money.

## TEST RESULTS

PREAMPLIFIER			
Stereo separation	Aux/CD	MM	MC
(20Hz)	126.1dB	99.7dB	85.7dB
(1kHz)	97.3dB	94.7dB	86.1dB
(20kHz)	71.6dB	68.9dB	66.2dB
Channel balance			
(1kHz, 0dBV)	0.01dB	0.04dB	0.06dB
(-20dBV)	0.10dB	0.11dB	0.12dB
(-60dBV)	0.69dB	0.70dB	0.72dB
Total harmonic dist.			
(0dBV, 1kHz)	-95.8dB	-101.9dB	-96.7dB
(20kHz)	-91.4dB	-98.7dB	-96.5dB
CCIR intermod. dist. (1:1)	-94.2dB	-85.9dB	-73.6dB
Phase shift (20Hz)			
(1kHz)	5°24'	185°30'	188°30'
(20kHz)	0°0'	133°12'	132°12'
(20kHz)	395°30'	93°36'	92°30'
Squarewave linearity			
Noise (A wtd, 20Hz-20kHz)	-99.6dB	-85.7dB	-68.3dB
Residual noise (unwtd)	-104.7dB	-104.9dB	-104.5dB
Input sensitivity (for 0dBV)			
Disc overload (20Hz)	150.5mV	2.192mV	234.7µV
(1kHz)		21.27mV	2.133mV
(20kHz)		175.1mV	18.45mV
		1678mV	174.1mV

(50kHz)	2179mV	222.6mV	
Input loading	24kohm/47kohm/150pF	180ohm	
Preamplifier output (max)/impedance		11.38V/102.6ohm	
Tape output (max)/impedance		11.93V/1.12kohm	
DC offset, L/R		-39.6µV/-42.9µV	
<b>POWER AMPLIFIER</b>			
Maximum Continuous	20Hz	1kHz	20kHz
Power Output - 8ohms	119.5W	128.3W	126.4W
- 4ohms	188.8W	208.1W	200.7W
Dynamic headroom (IHF)		+1.61dB	(185.8W)
Output impedance	0.0095ohm	0.0088ohm	0.0117ohm
Damping factor	838.6	906.3	680.9
Stereo separation (0dBW)	96.4dB	95.4dB	96.3dB
Total harmonic dist. (0dBW)	-82.2dB	-88.5dB	-76.4dB
(½ power)	-82.5dB	-91.1dB	-78.9dB
CCIR intermodulation distortion (0dBW)			-80.7dB
CCIR IM distortion (½ power)			-74.2dB
Rise time (@ 10kHz)			850nsecs
Power bandwidth (<0.1% THD)			12Hz - 27kHz
Squarewave linearity			-94.1dB
Phase shift 20Hz			28°48'
1kHz			0°
20kHz			2°12'
Noise (A wtd, 20Hz-20kHz) 0dBW			-81.7dB
(A wtd, 20Hz-20kHz) ½ power			-92.7dB
Residual noise (unwtd)			-88.5dB
Input sensitivity (for 0dBW)			94.41mV
(for full output)			1045mV
Input loading			28kohm
DC offset, left/right			-12.8mV/-14.9mV
Typical price inc VAT			pre £220, pwr £210



# SONY TA-F200

SONY UK LTD, SONY HOUSE, SOUTH STREET, STAINES, MIDDX TW18 4PF. TEL: (0784) 67000.



Though not the cheapest amplifier in Sony's current range, the *TA-F200* must surely be one of the few sub-£150 amplifiers to be equipped with a dedicated MC cartridge input. The amp's styling is not exactly revolutionary but it's solidly built, featuring a brushed alloy fascia, punctuated with a row of clunky mechanical selection keys near its base. In addition to the MM and MC phono inputs the *TA-F200* also makes provision for tuner, CD, video, tape and DAT (ho ho!) sources. Bass, treble and balance controls are dotted across the centre of the fascia, an A/B speaker selector lies to the left while a large rotary volume control dominates the right hand side of the amp.

A loudness contour is provided to enhance the sonic balance at low listening levels while a dedicated CD-direct facility enables the user to override the ordinary selector keys and connect the high-level CD source direct to the internal power amp via its volume control. Inside Sony has deployed low noise transistors to bump up the MC input followed by a *BA4560* dual op-amp which effects the necessary RIAA equalisation. Corners have been cut in the power amp stage, though. A solitary *STK4182II* stereo output IC is used, protected by an over-ambitious *C1237HA* monitor IC that fires a muting relay if the output power rises much above 70W at any frequency into any load!

## LAB REPORT

Courtesy of Sony's invasive protection circuitry the amp provided a remarkably consistent – though not exactly commendable – power output into 8 and 40hm loads. The +1.4dB dynamic headroom is worth having but the 0.28ohm output impedance is far too high and may well be responsible for the thin sound of this amp. The +2dB rise in the MC RIAA response at 40Hz hardly improves matters, while near DC-coupled response and +4.5dB rise at 5Hz on the MM input surely cannot fail to be aggravated by turntable bearing rumble, subsonic arm/cartridge resonances and footfall! Also note the 70° difference in phase shift between MM and MC at 20Hz.

Channel balance was good but separation degraded to 44dB at 20kHz on all inputs. The

*TA-F200* proved to be fairly sensitive, requiring just 1.94mV (MM) and 137µV (MC) for full output with some +27.1dB/+26.6dB of headroom available on these inputs at 1kHz. This headroom fell above 20kHz via MM whereupon the input became progressively less stable. The -75dB to -79dB noise range between inputs (0dBW) marks the MC stage ahead of the line input in relative terms in much the same way as THD proved very consistent, rarely increasing beyond 0.0056 per cent up to 5kHz. This is reflected in the principal 2nd harmonic product detected on the ultrasonic 3D plot.

## SOUND QUALITY

The overall character of this amplifier was one of leanness but was also slightly muted or 'dead', almost as if it were a contrived effort not to sound obviously bright or forward – a charge traditionally levelled at mass market budget amplifiers. The listeners considered sound via CD to be clear and informative but somehow lacking in 'soul'; it was controlled and articulate but not convincing in the musical sense. Piano notes were infested with a faintly clanking quality while vocals tended to harden near the top of its range; sibilance was held at bay I might add.

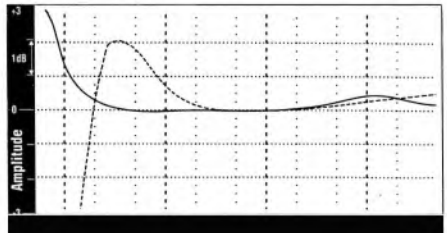
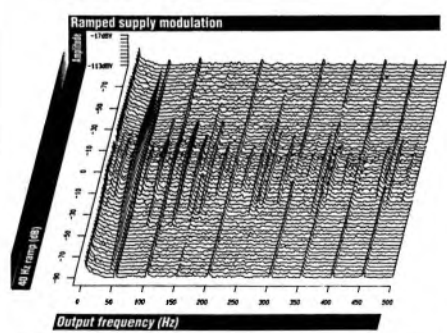
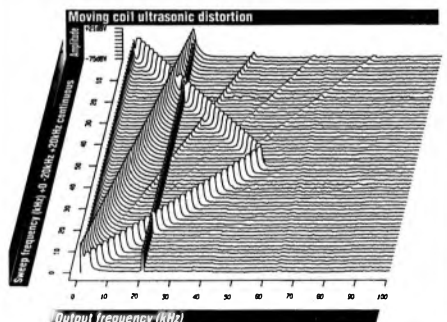
There appeared to be some mild disagreement on the relative merits of both the MM and MC disc stages, though on the whole the MC input was judged to be warmer, thicker and generally less transparent than the MM input. Stereo depth effects were slightly muted but the extra 'bloom' of the MC imparted further weight and scale to large orchestral works.

## CONCLUSIONS

Considering the *TA-F200*'s very affordable price its MC input would appear to be remarkably successful. However, whether an MC input is particularly relevant in the context of a budget hi-fi system is another matter altogether, so perhaps the extra manufacturing costs might have been better spent addressing the limitations of the integrated power amp.

## TEST RESULTS

Maximum Continuous Power Output – 8ohms	20Hz	1kHz	20kHz
	68.6W	73.9W	70.4W
– 4ohms	70.4W*	71.5W*	70.1W*
Dynamic headroom (IHF)		+1.36dB	(101.1W)
Output impedance	0.284ohm	0.283ohm	0.323ohm
Damping factor	28.2	28.7	24.8
Stereo separation (20Hz)	CD/Aux	MM	MC
(1kHz)	83.4dB	75.7dB	72.6dB
(20kHz)	68.4dB	67.5dB	66.3dB
(20kHz)	44.0dB	44.2dB	44.4dB
Channel balance (1kHz, -20dBV)	0.09dB	0.12dB	0.28dB
(-60dBV)	0.69dB	0.71dB	0.73dB
Total harmonic dist. (0dBW) (% power)	-85.8dB	-85.8dB	-85.7dB
CCIR intermod. dist. (0dBW)	-87.9dB	-86.0dB	-85.8dB
CCIR IM dist. (% power)	-87.9dB	-81.8dB	-75.2dB
Rise time			3.2µsec
Power bandwidth (<0.1% THD)			36Hz – 10kHz
Squarewave linearity			-102.8dB
Phase shift (20Hz)	10°48'	3°30'	72°30'
(1kHz)	356°30'	309°36'	309°36'
(20kHz)	354°57'	271°48'	266°24'
Noise (A wtd, 0dBW) (% power)	-79.2dB	-76.4dB	-75.5dB
	-69.8dB	-83.7dB	-76.6dB
Residual noise (unwtd)	-69.5dB	-69.6dB	-69.8dB
Input sensitivity (for 0dBW) (for full output)	17.54mV	220.4µV	15.02µV
	150.9mV	1.942mV	136.5µV
Disc overload (20Hz) (1kHz)		10.83mV	1.151mV
(20kHz)		113.9mV	10.73mV
(50kHz)		1019mV	99.31mV
		1060mV	201.7mV
Tape output/impedance			8.114V/694ohm
Input loading		50kohm	50kohm/100pf
DC offset, left/right			-3.3mV – 5.6mV
Typical price inc VAT			£130





# SONY TA-F400

SONY UK LTD, SONY HOUSE, SOUTH STREET, STAINES, MIDDX TW18 4PF. TEL: (0784) 67000.



Yet another new amplifier from Sony, the *TA-F400* occupies the middle ground in its range somewhere between the prestigious *ES* components and true mass market products. The inclusion of a moving coil facility is rather more practical at £200 than it is with a cheaper amplifier such as the *TA-F200* but otherwise it shares a common styling.

A decent rotary selector replaces the pushbuttons required for input selection but perhaps the most useful addition to the *400* is its independent record-out facility, so, one control furnishes phono, tuner, CD, aux and two tape inputs while the other works in 'background mode' routing any of these inputs back out again for recording purposes.

Other features include a subsonic and loudness contour, MM/MC cartridge selection, CD-direct, balance and a couple of defeatable tone controls. Two pairs of speakers are catered for though the screw-tight terminals on the rear of the amp are quite unorthodox and a little fiddly to use.

Inside, the amp is constructed on two main PCBs separated by an alloy heatsink that accommodates the large Sanken *2SA1215/2SC2921* bipolar power transistors. Sony's MC disc input follows the tried and tested formula of a low noise differential amp followed by series-feedback RIAA equalisation around a dual-channel *EA4560* op-amp. Also included is a solid state protection device (plus relay) that prevents overload or accidental 'thumps' if phono plugs are inadvertently removed from the disc input.

## LAB REPORT

This is a competent rather than outstanding amplifier, the +1dB headroom is simply adequate and THD typically below 0.0045 per cent on all inputs though distortion does increase at low power levels as a result of high frequency crossover effects. Hence the 2nd harmonic of the full  $F_{0-50k-0}$  sweep is seen on the 3-D ultrasonic distortion plot together with the 2nd, 3rd and 4th harmonics of the main  $F_{0-20k}$  sweep. Separation falls to just 37dB on all inputs at 20kHz because of capacitive coupling via the selector switch while the channel balance is some 1dB in error at -60dBV due to the tolerances of the volume control.

A-wtd noise could stand some improvement via the line stage at 0dBW though the equivalent figures for both MM and MC disc inputs are rather better. The MC frequency response shows a +1.55dB lift at 45Hz that is common to other Sony amplifiers reviewed in previous issues. However, in the context of its relatively high 0.14ohm output impedance the bass lift is unlikely to be subjectively desirable. Similarly, though IMD is fairly low on the 40Hz ramp test, the output is contaminated with the nastier odd-order products such as 130Hz and 230Hz (-88.9dBV). This gets worse by some 10dB with the CD-direct facility in operation I might add!

## SOUND QUALITY

A degree of 'looseness' or wooliness was detected at low frequencies even though the amp did not sound thick or warm. The treble was also slightly disjointed, tending to sound out of step or overly strident compared to the more reticent one-note delivery at lower frequencies. In general terms the amp possessed a fair transparency and offered a respectable sense of stereo depth but it had difficulty in tracking the myriad dynamic shadings of the orchestral works in our listening programme.

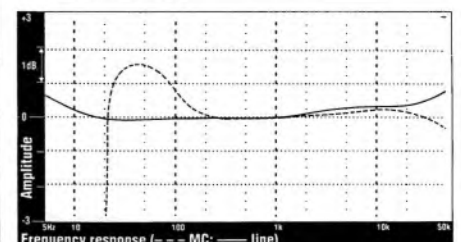
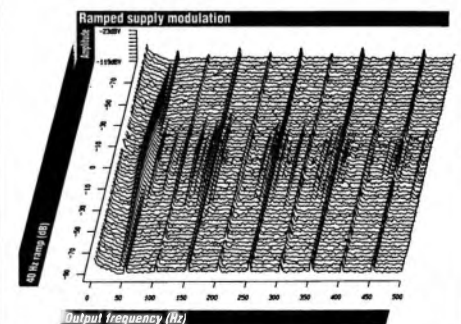
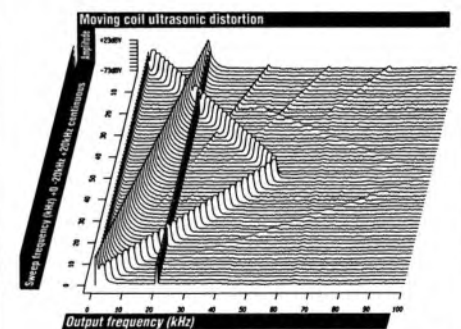
To some extent these criticisms were redressed with vinyl rather than CD sources, vocal images were brought under some semblance of control while the extreme top-end benefitted from extra refinement, poise and control. Our listeners commented on a lack of weight via the MM input though the MC stage simply sounded heavy to the point of being diffuse: the amp seemed to lack the tightness and gusto necessary to maintain the unusual MC frequency response.

## CONCLUSIONS

Bigger, beefier and spared the indignity of the invasive protection circuitry incorporated in Sony's cheaper amps, the *TA-F400* is nonetheless slightly crude sounding compared to some others at this price point. Most surprising is the preference of phono over the CD input, an odd state of affairs considering Sony's commitment to the digital medium.

## TEST RESULTS

Maximum Continuous Power Output - 8ohms	20Hz	1kHz	20kHz	
- 4ohms	69.3W	76.0W	72.9W	
	98.6W	106.1W	101.1W	
Dynamic headroom (IHF)			+1.08dB (97.4W)	
Output impedance	0.142ohm	0.146ohm	0.181ohm	
Damping factor	56.4	54.9	44.2	
Stereo separation	CD/Aux	MM	MC	
(20Hz)	75.4dB	75.3dB	74.8dB	
(1kHz)	63.1dB	62.5dB	61.9dB	
(20kHz)	37.5dB	37.4dB	37.4dB	
Channel balance	(1kHz, -20dBV)	0.03dB	0.04dB	0.05dB
(-60dBV)	1.04dB	1.09dB	1.16dB	
Total harmonic dist. (0dBW)	-88.5dB	-88.0dB	-87.1dB	
(½ power)	-94.2dB	-95.1dB	-95.2dB	
CCIR intermod. dist. (0dBW)	-84.8dB	-78.5dB	-74.3dB	
CCIR IM dist. (½ power)	-80.9dB	-78.9dB	-74.2dB	
Rise time			1.2µsec	
Power bandwidth (<0.1% THO)			15Hz - 12kHz	
Squarewave linearity			-96.8dB	
Phase shift (20Hz)	7°55'	354°36'	12°30'	
(1kHz)	0°	309°36'	300°0'	
(20kHz)	349°12'	280°48'	280°30'	
Noise (A wtd, 0dBW)	-73.5dB	-73.3dB	-69.5dB	
(½ power)	-89.8dB	-86.4dB	-70.5dB	
Residual noise (unwtd)	-70.8dB	-71.1dB	-70.8dB	
Input sensitivity (for 0dBW)	20.46mV	339.6µV	21.60µV	
(for full output)	173.3mV	2.823mV	183.7µV	
Disc overload (20Hz)		15.25mV	1.86mV	
(1kHz)		141.0mV	9.199mV	
(20kHz)		1230mV	84.14mV	
(50kHz)		1379mV	147.3mV	
Tape output/impedance			8.655V/699ohm	
Input loading			50kohm 47kohm/150pF 100ohm	
DC offset, left/right			-2.3mV/-2.5mV	
Typical price inc VAT			£200	





# AMPLIFIERS TECH TALK

*Paul Miller explains the test procedures used in the amplifier reviews. Be warned, this is technical talk with a capital T!*

In keeping with the *Choice* rationale each of the tested amplifiers was auditioned under blind conditions by listeners culled from both the editorial staff and representatives of the Great British consumer. Both CD and vinyl sources were pressed into service with a range of software chosen for its ability to reveal different aspects of the amplifier's performance.

The system equipment included a Pink Triangle *PTT00/SME Series V*/vdH MC *Two* and/or Koetsu *Red Signature* analogue front-end and Marantz *CD-65/ISE* CD player (representative of the kind of player used with budget and mid-range amplifiers despite it being something of a giant killer in its own right). Musical Fidelity *MC-4* loudspeakers were chosen for the group listening sessions because of the panel's familiarity with the design and also because of their strong showing in previous *Choice* loudspeaker issues.

Long lengths of Deltec *Black Sixteen* speaker cable were used for connection of all the integrated amplifiers unless a manufacturer specified the use of a proprietary brand of cable; Linn, Exposure and NVA fell into that latter category. Reference

amplification was provided in the form of a Pink Triangle *PIP II* preamp and Deltec *DPA-100S* power amp, both used for preliminary acclimatisation of the chosen software.

This included excerpts from: Jim Hall Trio, *These Rooms*, (Denon CD); Schubert Winterreise, *Amon Ra* (CD); Mahler Symphony No5/Inbal, (Denon CD); Suzanne Vega, *Suzanne Vega* (A&M vinyl disc); Michael Hedges, *Watching My Life Go By* (A&M vinyl disc); Joni Mitchell, *Chalk Mark In A Rain Storm* (Geffen vinyl disc).

Subsequent to these tests and the measurement program each amplifier was then re-auditioned by myself using the same sources with different material and the Magneplanar *MG2.5R* loudspeakers instead of the redoubtable MFs. The test program includes both standard IHF *A202* measurements together with more advanced techniques made available by the IEEE-controlled digital test equipment currently employed in my laboratory.

## POWER OUTPUT AND DYNAMIC HEADROOM

Quoted in good old fashioned

Watts this refers to the maximum output voltage of the amplifier into 8 and 40hm loads, one channel driven to 0.1 per cent THD. The IHF-A-202 dynamic headroom test employs a gated 1kHz signal, 20-cycles on/480 cycles off, and refers to a maximum of 1 per cent THD into 8ohms relative to the continuous power available into that same load. The power bandwidth refers to the frequency extension of the amp within 0.1 per cent THD and 1dB of its nominal rating. Output impedances are quoted in ohms and should be as low as possible, if not for the effect of damping factor but for the influence this has on non-linearities reflected at the output of the amp from the speaker crossover network.

## SEPARATION, THD, IMD, NOISE AND SENSITIVITY

All input sensitivities were measured with respect to an output of 0dBW (=1W) and full power at 1kHz for the integrated and power amplifiers, or 1V = 0dBV out (3dB higher than IHF) in the case of the preamps. Noise was measured with respect to IHF input levels of 500 $\mu$ V (MC), 5mV (MM) and 0.5V (line), input shorted, A-wtd and assessed as

the true RMS figure of 20 3rd-octave averages.

Disc overload is quoted in mV in the table so as it may easily be related to the peak output of a cartridge, while headroom is discussed in the text as a dB figure relative to these same IHF levels. Separation was measured some +20dB above the nominal sensitivity as was the THD of each amp. For CCIR IMD the respective peak composite (19kHz + 20kHz) levels were 10mV (MC), 100mV (MM) and 2V (line).

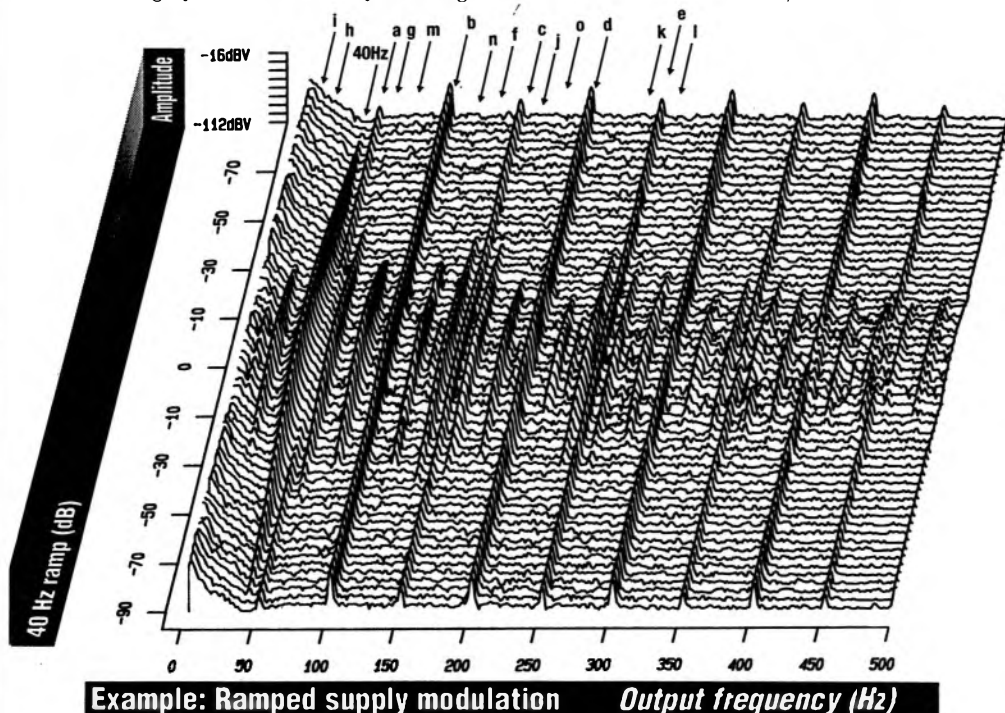
## 40Hz RAMPED SUPPLY MODULATION TEST

This technique effectively supplants the conventional single-power 40Hz supply mod test by examining the relationship between an input signal that changes in level with those artefacts derived from either an electromagnetic or electrostatic coupling. A 40Hz signal is applied either to the power amp or the line input of an integrated amp and ramped over a 90dB range so that the unit is driven to full output into 40hms at the centre line (0dB) of the plot.

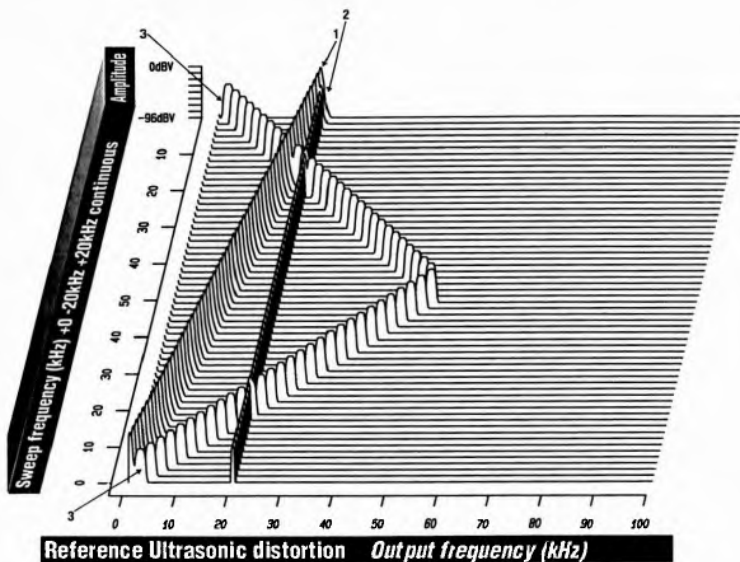
A further advancement on the standard technique refers to the use of a shifting 'dynamic window', allowing us to observe phenomena that are up to 150dB lower in amplitude than the peak driving signal. Please note the calibrated amplitude scaling of each amp which tells you how low the baseline is on each plot. Add this to the peak output of the amp in dBV at 40hms and this is the operating dynamic range of the measurement.

Aside from the constant electrostatic field components present at 50Hz intervals (a,b,c,d,e, etc on the example plot), any supply modulation is more usually associated with the two bursts of current drawn per 50Hz through the bridge rectifier.

Because the supply is subsequently current-modulated at a sampling rate of 100Hz (rather than 50Hz) this then becomes the fundamental frequency about which



**Example: Ramped supply modulation** Output frequency (Hz)



intermodulation is likely to occur. Consequently the figure for supply modulation linearity is usually taken at 140Hz (f) which represents the second-order summation product  $100\text{Hz} + 40\text{Hz}$ . Similarly a difference product at 60Hz ( $g = 100\text{Hz} - 40\text{Hz}$ ) is also usually observed.

Watch out for subsonic artefacts at 20Hz ( $h = 100\text{Hz} - 2[40\text{Hz}]$ ) and 10Hz ( $i = 50\text{Hz} - 40\text{Hz}$ ), the latter being a field modulation attributable to the layout of the amp PCB and mains wiring/transformer.

Higher-order IMD products usually follow a distinct pattern, that is 160Hz ( $j = 2[100\text{Hz}] - 40\text{Hz}$ ), 240Hz ( $k = 2[100\text{Hz}] + 40\text{Hz}$ ), 260Hz ( $l = 3[100\text{Hz}] - 40\text{Hz}$ ) and so on. In tandem with these products are those based around the 40Hz tone such as the 20Hz subsonic product already mentioned together with the summation-series 180Hz ( $o = 100\text{Hz} + 2[40\text{Hz}]$ ) and so on.

Of course, in addition to the supply IMD there are also harmonics of the 40Hz signal (m,n,j,d) to be considered, some of which will inevitably be superimposed on alternate IMD or 50Hz field routes. Remember, in terms of any possible objective/subjective correlation, the signal-dependency of any subsequent supply IMD is more important than its absolute level. In the text, values for the artefacts are either quoted in -dBV (0dBV = 1V) or in dB relative to the full output of the amplifier at 40Hz into a 40hm load.

## ULTRASONIC DISTORTION TEST

This is a particularly revealing test highlighting the interaction of high and moderate-level signals in the context of

harmonic and intermodulation distortions (called 'routes' in the text) caused by such mechanisms as slew-limiting or the progressive reduction of feedback, the latter revealing an increase in open-loop non-linearities. It is not a knitting pattern, as one irreverent member of the editorial staff would have you believe!

Three driving signals are employed, the 0-20kHz sweep (1 =  $F_{0-20k}$ ) raising the amplifier to two thirds output into a 40hm load while the continuous 20kHz tone (2 =  $F_{20k}$ ) and 0-50kHz-0Hz reversed sweep (3 =  $F_{0-50k-0}$ ) track at a level some -24dB below this. For integrated amps a pre-equalised composite signal was used for either the MC or MM inputs (ref. 20mV and 2mV at

1kHz respectively). Each plot is individually calibrated in dBV (0dBV = 1V at 40hms) as an indication of the different power outputs of each amp.

These sweeps were chosen to represent the kind of HF and ultrasonic signals likely to be handled by an amplifier in normal use. We're all aware of the ultrasonic spurious generated by CD players for instance but few people seem to appreciate that the 20-50kHz band noise from a vinyl disc or FM tuner can persist at levels only 10-20dB lower than peak signals in the audio band.

This is another reason why I place such store in disc overload margins (which generally fall relative to the excess gain required with increasing frequency) and why such measurements are now taken as high as 50kHz. Anyway, certain of these ultrasonic distortions will introduce IM products within the audio band of the amplifier, a point of particular interest with disc stages whereupon the IM routes will actually increase in level with decreasing frequency as a function of the RIAA characteristic.

In addition to the obvious harmonic products (4-9) related to the  $F_{0-20k}$  sweep (1) these in-band IM artefacts are determined by the 2nd-order  $F_{0-50k-0} - F_{0-20k}$  (12) and the 3rd-order  $F_{0-50k-0} - 2F_{0-20k}$  (13) routes. The equivalent summation routes are given by  $F_{0-50k-0} + F_{0-20k}$  (10) and  $F_{0-50k-0} + 2F_{0-20k}$  (11) respectively. Similarly there are the 2nd and 3rd-order sum and

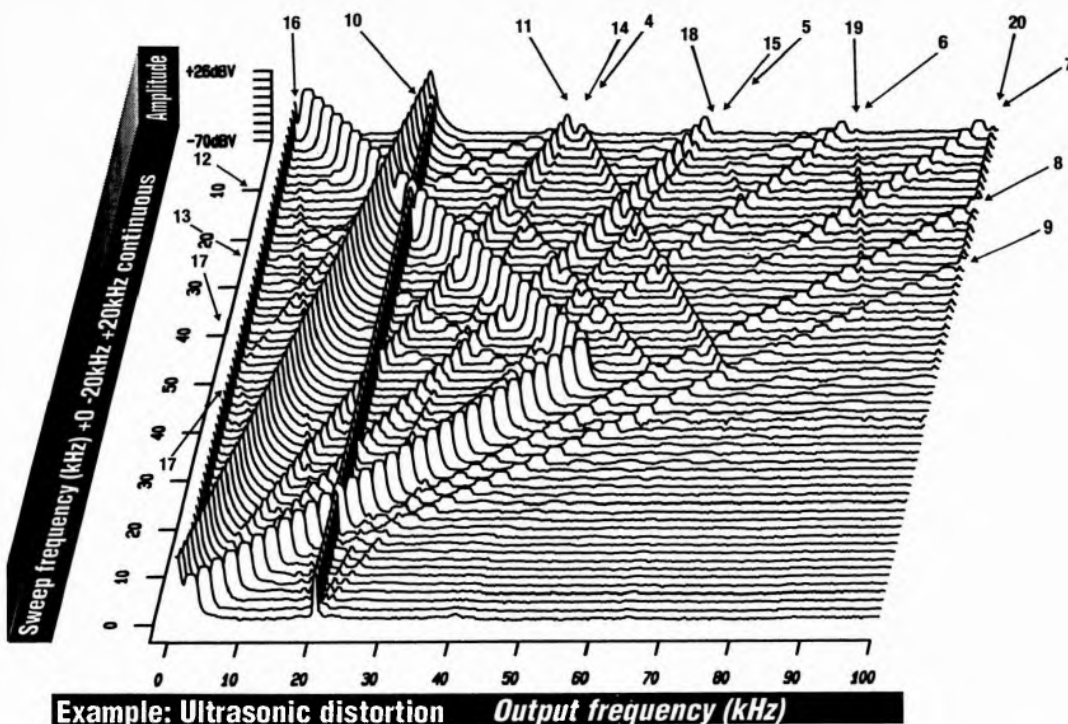
difference routes associated with the continuous 20kHz tone (2) to consider.

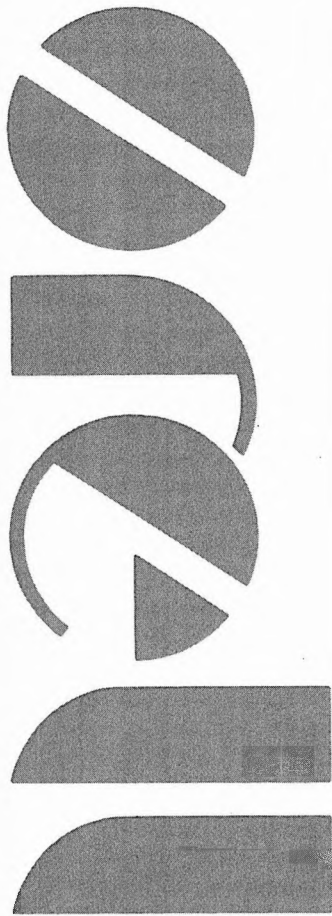
These are defined by  $F_{20k} + F_{0-20k}$  (14),  $F_{20k} + 2F_{0-20k}$  (15) and  $F_{20k} - F_{0-20k}$  (16),  $F_{20k} - 2F_{0-20k}$  (17) respectively. In general the presence of second-order in-band IMD products seems to encourage a warmer though softer and richer sound quality, particularly if these distortions arise in the disc stage. The equivalent third order IMD mechanisms introduce a harder and less beguiling quality.

Of course, higher-order routes are also produced and are shown on the demonstration plot by  $F_{0-50k-0} + 3F_{0-20k}$  (18),  $F_{0-50k-0} + 4F_{0-20k}$  (19) and  $F_{0-50k-0} + 5F_{0-20k}$  (20) etc.

A word of warning. Do not use these plots as some sort of guide to the absolute quality of the amplifiers because this is simply not the case. Any distortion mechanism represented on the plot will have some subjective consequence but, conversely, just because a peculiar coloration or distortion was heard this doesn't mean it will be manifest on the 3-D plot. This test is but one piece in a very complex jigsaw.

Moreover, there's a wealth of evidence to suggest that high but relatively constant levels of THD and IMD may actually mask other - subjectively damning - colorations that lie beneath. These very non-linear but low level mechanisms are difficult to measure (cf. broad-band RF noise IM) but may be subjectively exposed by an absence of higher 'conventional' distortions!





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# AMPLIFIERS: CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS

*Paul Miller sums up this month's reviews and sorts the wheat from the chaff.*

Fortunately for the consumer it would appear that the quality of today's integrated amplifiers is gradually improving. What's more this momentum has been achieved without placing too great a burden on the price of such products. Consequently, though the cost of the best budget amplifiers has risen in recent years from £100 to around £140-£150, their calibre has increased two or three-fold.

Having waded through the mass of data accumulated during this test, it's also clear that some

competition between similarly priced models in this test our judging was required to be both hard and fair.

Consequently only one Best Buy ticket was awarded and the recipient was an old favourite of *Choice* issues gone by, the A&R *Arcam Alpha*. Now elevated from *Plus* to *MkII* status and featuring a beefier power supply together with a new set of clothes, the *Alpha* represents a potent first-time buy for anyone with £160 to blow on an amp. In the years to come *Arcam's Alpha II*, like the

concentric volume control in place of a separate balance potentiometer.

NVA's *AP30MC* is a trifle limited in its flexibility even for a minimalist design but its smooth and moderately laid-back presentation is likely to make it a popular choice on audition. The QED *A270* sounded characteristically rich and punchy without lapsing into the boom 'n' tizz syndrome of lesser amplifiers. They should also be sorting out the slewing anomalies on the MC input fairly soon which is good news. The *Delta 60* lay somewhere in between the sound of these two amps; dynamic but controlled it should prove widely compatible with the majority of ancillary equipment.

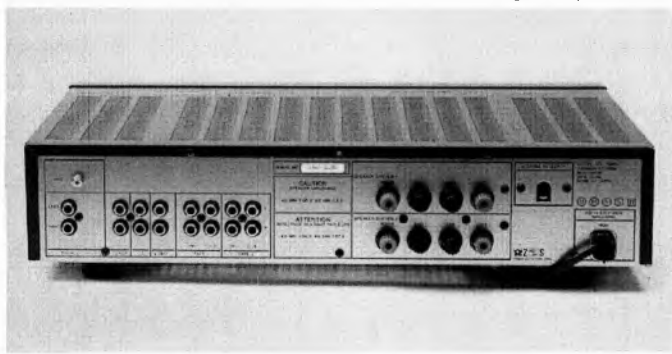
Now that Rotel's *RA-840BX3* has settled into production it too warranted a hearty Recommendation. For some the dry and slightly over-damped quality of this amp might seem to suggest it lacks excitement or 'drama', but listen again and a surfeit of subtle details will be revealed. Harman's cheaper integrated *PM635i* also handled itself well in the tests despite its not living up to the powerhouse reputation earned by previous generations of HK amps.

Personally, I was in two minds

Three of the six pre/power combinations achieved Recommended status though all six of the units seemed to offer a grander sense of scale and dynamics than most of the integrated amplifiers in this test. Rotel's *RC/RB-870BX* combination represents a very solid performance at a very reasonable price, though let's not forget it's the power amp that really pulls the duo through.

Most notable were the Exposure *VII/VII dual/VIII Super* and Deltec *DSP-50S/DPA-50S* combinations which both prompted a very favourable reaction during the listening tests. Of the two, the Deltec amplifiers really stand out as offering superb value for money and a sound quality that was unequalled for transparency, stability and detail resolution. Unfortunately its dealer network is larger abroad than it is in this country so a little detective work to track them down might be necessary. However, the effort should prove rewarding in the long-term.

I'm also happy to endorse the Briston *4B* and Denon *POA-4400A* power amps, particularly the latter which offers exceptional material value for money in addition to a light and



designers are consciously (or otherwise) manipulating certain specific distortion mechanisms to achieve a tailoring of the overall sound quality. This is above and beyond what might be expected from 'tweaking' the frequency response, for instance. Other amps have been conceived without recourse to surreptitious circuit techniques, but through a process of trial-and-error and protracted listening.

However, we're still faced with a community of amplifiers designed to *measure* well despite the fact that the chosen parameters have little or no bearing on the ultimate *sound* of the product. Clearly this approach cannot be endorsed even if it does serve to reinforce the contention that subjective listening tests are the most important arbiter of quality.

Those amplifiers that achieved a very high level of performance in the listening tests have automatically been awarded a Recommended flash, but it required more than a spark of excellence for an amp to be promoted to the Best Buy category. With such obvious

*Plus*, will surely form the heart of many a fine budget system.

By contrast, eight of our 20 integrated amplifiers were able to generate sufficient enthusiasm to warrant Recommendation. One of the most convincingly *musical* amplifiers was the Inca Tech *Claymore S*, not to be confused with the higher output *Z* which elicited a less favourable reaction from the listening panel. Although convincing, the *S* is too expensive for a Best Buy rating and currently suffers from an unfortunate mix of high sensitivity/low overload on both disc inputs. Once these points are redressed the amp can only go on getting better.

The listening panel was similarly impressed with the capabilities of the A&R *Arcam Delta 60*, the new QED *A270* and the not-so-new NVA *AP30MC*. All these amplifiers hail from specialist UK manufacturers who have a vested interest in sound quality rather than twiddly bits and flashing lights. None of the amplifiers is equipped with tone controls, while both the QED and A&R units utilise a dual-



about the Ariston *Amplifier* and also, to some extent, the NAD *3225PE*. Nevertheless, they both acquitted themselves favourably in the blind listening tests, warranting Recommendation despite each suffering certain technical discrepancies. Of the remaining amplifiers some eight units were certainly ripe for 'worth considering', particularly the ADC *A-2080E* and the rugged *B150* from Revox.

fresh sonic perspective when partnered with a more neutral preamplifier.

To conclude I would like to thank those companies who provided amplifiers for inclusion in this gruelling test, to Martin Jeffries, John Bamford and Jason Kennedy for the loan of their ears over the Christmas period and also to my wife who has tolerated a considerable amount of domestic grief.



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

The HB100 speakers above are an example of painstaking development, design and construction.

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

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



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# CHOOSING AND USING . . . LOUDSPEAKERS

*A pair of loudspeakers is as personal as a pair of shoes. A little care spent in choosing and correctly using will pay long term dividends.*

If you're planning to spend one or even several hundred pounds on a new pair of loudspeakers, it does make sense to take at least as much care over the decision as one would in buying a pair of shoes. If you get the shoes wrong your feet will protest, so if you get the loudspeakers wrong your ears will rebel, and you will find yourself not using the system as much.

The first step on the road is to try and specify one's own personal and particular requirements, he writes glibly, opening several cans of worms. It is possible to do this on a basic, simplistic level, checking the price, size and intended location. But there are real benefits for those prepared to take a little more trouble. With a little care, the assistance of the data in this book, and (hopefully) the co-operation of a skilled retailer the end result can be that much more worthwhile.

## SETTING THE BUDGET

Those buying just loudspeakers will have a pretty good idea of the money they have available, which as ever is the fundamental bottom line of any purchasing decision. But there is – and always has been – controversy over the proportion of a budget that should be devoted to loudspeakers, vis à vis that spent on the other components.

Ten years ago conventional wisdom recommended devoting as much as possible to the loudspeaker, as it was regarded as the weakest link in the chain. An alternative philosophy, pointing out that the loudspeaker could do nothing to compensate for an inadequate source, switched attention towards turntables and amplifiers.

When setting the loudspeaker budget, it is vital to allow sufficient funds for a decent stand or support, and good quality connecting wire. From £200, for example, one should probably allocate £140 for the speaker itself, £50 or so for stands, and maybe a tenner for the cables.

## PERSONAL PREFERENCES

Where one listener may be barely conscious of the subtleties of stereo imagery, another will take particular pleasure in pinpointing musicians within a recorded acoustic. Likewise those who listen predominantly to electronic rather than acoustic instruments are liable to sacrifice coloration in favour of dynamic impact.

While a magazine can assist in presenting these alternatives, it is only through skilled demonstration that an individual can be confronted with the different but equally valid options to make an educated choice for himself.

## SITING IS IMPORTANT

The site chosen for loudspeakers is often as influential as the choice of loudspeakers themselves. Over the years I have used open stand locations, both with conventional box speakers and panel types, and also stand-mounted wall-backed designs. Each has its own strengths and weaknesses and imposes its own characteristics on the sound, so again personal preference enters into the equation.

Having chosen the siting, one may then choose the loudspeakers and stands to suit. Alternatively, choose the speakers you like in the shop, and then move them around at home until they sound to your taste.

The end result comes from a complex interaction between the loudspeaker, its support, its site, the acoustics of the room, and the general characteristics of the driving system. That is rarely entirely predictable. For those intending to spend a fair amount of money, it is not unreasonable to expect the luxury of a home demonstration, and/or the option to return and change a pair which do not suit after a day or two.

## BIG ONES OR LITTLE ONES

For any given budget there is an obvious choice between large or small loudspeakers. One instinctive reaction is to favour

the big one, particularly if it has lots of drive units, but others will plump for a miniature or compact on aesthetic grounds. In fact the differences and trade-offs are much more subtle and far-reaching.

Fundamentally, the larger the box the more extended the bass is for the same specific loudness. Ultimately a good big 'un is going to beat a good littl'un on loudness and bass extension, hands down. But it is also going to cost a great deal more. The large enclosed volume remains the route to extended bass, and this in turn adds 'weight' and 'scale' to the sound. But it can also reveal the

fragile if used for the occasional party, and are certainly not at their best when trying to recreate the power and drama of rock or a full concert hall acoustic.

## MODUS OPERANDI

Given the excessive number of different models competing for attention, manufacturers are inclined to make much of the uniqueness of their particular brew. As a result the industry has become riddled with buzz words to describe any single type of engineering solution, and this leads to the sort of stereotyping which entirely misses the point of loudspeaker engineering.

Examples are legion, from the extreme bass/midrange cones of the early 'seventies through to the latest metal dome tweeters which are currently springing up everywhere. The result is that people talk of a 'metal dome sound' as something desirable (or not) per se, whereas in fact there will be a whole range of different metal dome sounds, in all probability some distinctly more 'equal' than others.

The underlying axiom is that great loudspeakers are not created by adopting a quick technological 'fix'. Indeed, history has often shown that the 'radical innovation' is a mere flash in the pan, with benefits in one area more than offset by unforeseen penalties elsewhere.

## BEHIND THE TESTS

When we launched into the loudspeaker review project for our January issue, we actually tested 40 pairs in the anechoic chamber – although subsequently we listened to only 30 of them. The ten models here, then, are the 'left-overs' if you like.

Background details of how the tests were done and explanations of the technical measurements are given on page 111.

The listening panel for this month's reviews comprised the author, Paul Messenger, along with John Bamford, Jason Kennedy, Geoff Hill (Goodmans) and Branko Bozic (of Audiofreaks).



*SL600Si: an example of a speaker which polarises opinions. See 'Personal Preferences'.*

low frequency inadequacies of the sources, be they the equipment or the recordings themselves.

Big speakers suffer from several innate disadvantages. Large box enclosures are expensive to build and ship, and represent an undesirably large surface area of unwanted radiation, which can colour the sound and blur stereo precision. Extra drive units do increase power handling, but bring problems of crossover complexity and unit integration.

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# ACOUSTIC RESEARCH AR 122

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Autumn '88 saw the introduction of a new six-strong series of UK designed AR loudspeakers dubbed the *Spirit* range, costing from £110 to £460 per pair. We received the cheaper three *Spirits* in good time for the latest loudspeaker test programme, and covered the *112* and *132* models in the January issue. The former seemed a trifle too 'small' even with wall mount assistance, while the latter failed to convince either against a rear wall or sited in free space. These experiences gave grounds for optimism that the middle model of the threesome might prove the most effective, satisfying the criticisms levelled at its brothers and making better use of an undoubtedly promising set of basic ingredients.

The *122* is designed to be used close against a rear wall, and optional matching stands are available from Monotrak Engineering. The compact sealed-box cabinet is very solidly built, the baffle in particular being an elaborate MDF/particle board sandwich 36mm thick. The grille uses the same elegant 'peripheral band' arrangement adopted throughout the *Spirits*, an elastic band sitting in a slot around the outside edge of the baffle and retaining a simple cloth stretched across the front. This necessitates some recessing of the bass/mid driver to accommodate cone movement, and again this is neatly handled visually for those who prefer their speakers unclothed.

Perhaps surprisingly, both drivers are sourced from Japanese manufacturer Tonegen, rather than originating from AR itself. The main bass/mid driver has a fairly small (125mm) propylene cone on 160mm frame, while the treble is handled by a complex annulus/dome 25mm unit with phase correction plug and some cavity loading. The crossover is ultra-simple, the bass/mid driver relies entirely on inherent mechanical

decoupling, while a hardwired second order network feeds the tweeter.

## LAB REPORT

Like the two ARs tested in January, the *122* has a significantly stepped response in order to balance well when sited near a rear wall. With the area from 900Hz and upwards hovering around 89-90dB, and that below 400Hz at around 85-86dB, our sensitivity estimate of 87dB is something of an approximation. In fact the *122* will go pretty loud, though it also prefers an amplifier with plenty of current available.

To some extent this is achieved at the expense of bass extension, the -6dB point being at a highish 68Hz. The step is a little too large for full wall 'fill in', while prominence in the midrange and again in a rather uneven treble are also notable, not only in the 1m response but also out at 2m and in the room averaged trace. Distortion is a little on the high side throughout the band and particularly at high frequencies, closely paralleling the *112* findings. On a more positive note, the grille has no negative influence, and the forward response set shows good off-axis integrity provided above-axis listening is avoided, and the pair match is pretty close.

## SOUND QUALITY

While it is true to say that the *122* was better liked than its stablemates, the panel findings were a little lukewarm nonetheless. The 'bright', 'thin' balance was one source of complaint, as was the rather 'lightweight', 'small' overall sound somewhat lacking in 'body', though to be fair none of these criticisms was particularly forceful.

There is some mild 'boxy' and 'cuppy' coloration, dynamics are not entirely convincing and stereo depth is limited, but stereo imaging is actually pretty good by wallmount stan-

dards, and the detailing is quite explicit with some ambience. Ultimately, the *122* failed to attract the listener's attention, and the adjective 'bland' appeared on more than one set of notes. My own subsequent sighted listening left me wondering whether the treble unit is really up to its task.

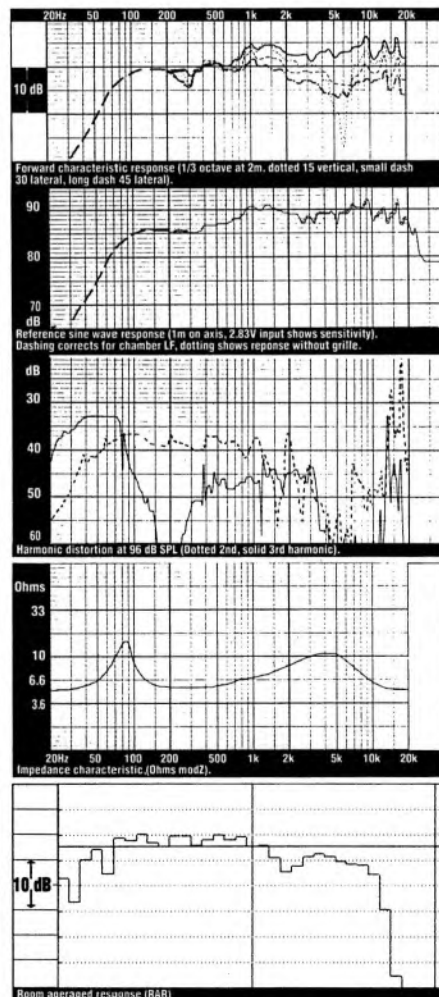
## CONCLUSIONS

Despite a promising enough list of ingredients, the *122* failed to excite sufficient real enthusiasm amongst the listening panel to justify Recommendation.

## TEST RESULTS

Size (height x width x depth)	38.5 x 19 x 22cm
Recommended amplifier power	15 - 80 watts
Recommended placement	on stands near rear wall
Frequency response ( $\pm 3$ dB, 2m)	90Hz - 20kHz*
Low frequency rolloff (-6dB/1m)	68Hz
Sensitivity (ref 2.83V-1W/8ohms; 1m)	87dB
Impedance characteristic (ease of drive)	fair
Forward response uniformity	good
Typical price per pair (inc VAT)	£140

\*  $\pm 4$ dB necessary to accommodate 'step'

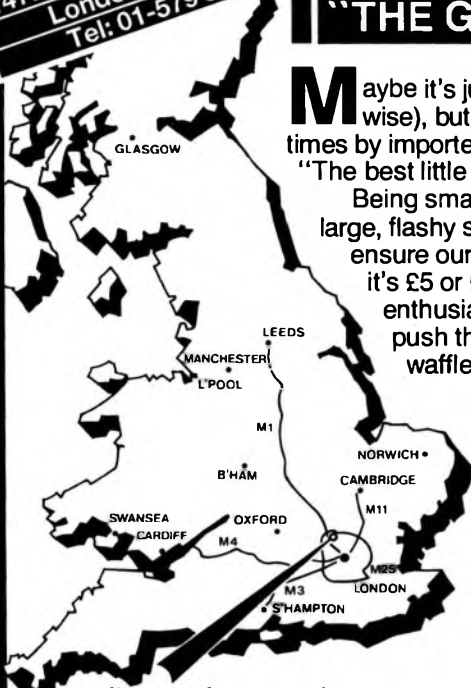


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# AUDIO ELECTRONICS TC10 Mk 2

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RECOMMENDED



The *TC10 Mk2* – itself a metal dome tweeter upgrade on the original *TC10* – is this company's first attempt to create a model for the hi-fi market. It is an attempt worthy of some attention, but first and second impressions – the packaging and the presentation respectively – plus some indecisiveness over the £599 price and method of distribution ("we may cut the price and go direct") all leave me wondering whether it will ever achieve the success it certainly deserves.

Frankly, and in my view regrettably, the odd squat shape with double-angled baffle and overlapping sides looks much too much like a PA speaker or home-built special to survive comparison in today's style-conscious marketplace. . . . Still aesthetics are supposed to be personal, and the Pro look is supposed to be fashionable, so perhaps I'm being unfair.

Certainly there is nothing much to fault in the engineering, which is not only thoroughly sensibly conceived and carried out but is also unusual and original. One visual idiosyncrasy is a frisbee style grille, specifically cloth fabric stretched over a metal frame that neatly flush-fits around a solitary, largish driver. Whip it off and the *TC10*'s main secret is revealed – a twin concentric driver, with 25mm metal dome tweeter mounted snugly in the middle of the main bass/mid cone.

Concentricity is not a new idea of course (ask Tannoy!), and has always been a popular approach in the studio world. However, the recently announced KEF *Uni-Q* driver and range has created lots of interest in the hi-fi world, and the *TC10* just goes to show that KEF isn't the only one who can turn this particular trick. One advantage is that integration through the crossover region should avoid the specific off-axis cancellation 'lobes' introduced by lateral spacing. That still leaves the directivity discontinuity between

the drivers as a potential problem area, particularly here where the bass/mid uses a large 200+mm cone. And Martin Colloms recently measured some IM artefacts (on a KEF *Uni-Q*), due to the reflection of tweeter output from the moving bass/mid cone surface. But on balance a concentric driver is probably a Good Thing.

The sealed box cabinet is well conceived too. The 5° baffle angle minimises first internal reflections passing through the cone. Shelf bracing stiffens 17mm chipboard stock which is further damped by bituminous pads. Low (1ft.) stone stands are available but were not supplied; normal commercial types were used to good sonic effect, though aesthetic integration is another question.

## LAB REPORT

The sensitivity is around average, while bass shows useful extra extension over the market norm. The 1m axial response is impressively flat up to 2kHz and less impressively uneven thereafter, while the 2m set shows reasonable off-axis integrity, albeit obviously influenced by the directivity discontinuity referred to above. The room averaged response looks promising. Distortion components could be lower, but are fairly evenly distributed. And the impedance characteristic looks reasonably benign.

## SOUND QUALITY

Auditioned over a period as part of a normal system, I found the *TC10* consistently informative and enjoyable. The panel was equally enthusiastic under blind presentation giving it the highest rating amongst the current group of ten.

It has an interesting sound with fine focus, dynamics and life plus a nice overall balance, the decent bass extension giving a good sense of scale. Essentially ingratiating and

informative, the treble is a bit uneven and 'papery', while the bass could sound a little too heavy and warm, both factors which reduce the ultimate transparency somewhat.

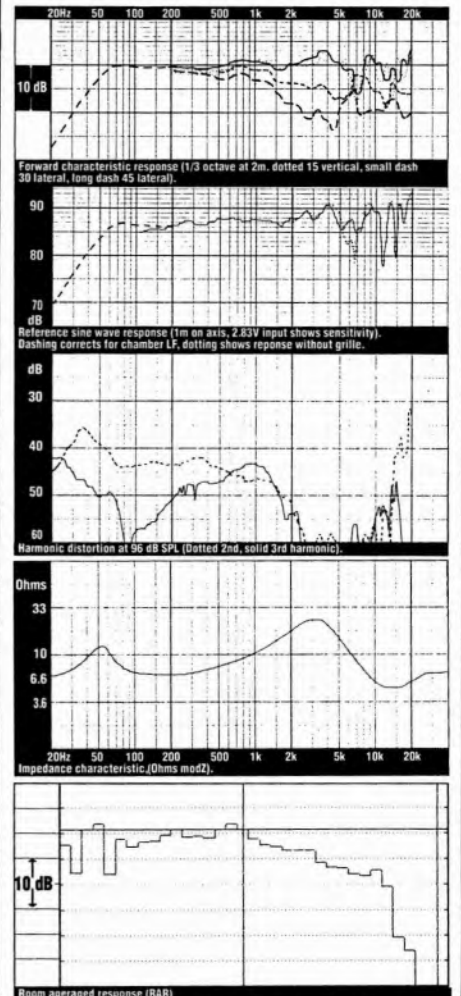
## CONCLUSIONS

The *TC10 Mk2* offers a respectable technical performance, interesting and impressive engineering and fine sound quality at a realistic price. It certainly merits Recommendation and deserves to succeed commercially, though the services of an industrial design consultancy rooted in the late twentieth century might not go amiss.

## TEST RESULTS

Size (height x width x depth)	70 x 33.5 x 33.5cm
Recommended amplifier power	15–100 watts
Recommended placement	on low stands in free space
Frequency response ( $\pm 3\text{dB}$ , 2m)	40Hz–20kHz*
Low frequency rolloff (–6dB/1m)	40Hz
Sensitivity (ref 2.83V–1W/8ohms; 1m)	87.5dB
Impedance characteristic (ease of drive)	good
Forward response uniformity	fairly good
Typical price per pair (inc VAT)	£599

\*  $\pm 5\text{dB}$  limits needed to contain treble unevenness





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# CELESTION SL600Si

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The Celestion *SL* range has probably been the single most influential factor in the evolution of the loudspeaker during the 1980s, though in consequence the story has become a little complicated. In short, the original *SL6* introduced the modern metal dome tweeter, while the original *SL600* added the innovatory Aerolam cabinet, combining high stiffness with low energy storage.

Summer '88 saw some range rationalisation and the adoption of *Si* suffixes. For the '600 this involves a £100 price hike to £779, justified by a new hardwired crossover with redesigned tweeter notch filter, improved components and the socketry for bi-wiring/amping. There is a partnering £109 pillar stand, and the *600Si* remains the *SL* model which allows later upgrading to the £1,570 *System 6000* with its radical dipole subwoofers and electronic pre-equalisation.

Terminals and stand apart, the *SL600Si* looks very similar to its predecessor. There's no overall grille as such, though the copper coloured metal dome tweeter has a carefully shaped set of protective slats. The whole box is very smartly finished in matt grey, and is fitted with classy Michell twin gold-plated terminals. The design is intended to be Bluetacked onto its matching pillar stand and then spiked to the floor, well away from reflecting walls.

The drivers are almost selfconsciously 'high tech'; built into square diecast frames. The copper dome tweeter is a largish 32mm unit, while the bass/mid driver, complete with Cobex cone and special two part surround. The Aerolam enclosure panels are inherently stiff as well as light, and have no need for bracing.

## LAB REPORT

One characteristic of all *SL* models is a determinedly low sensitivity, compensated at least

in part by comparatively respectable bass extension for the box size (-6dB at 53Hz). Our sensitivity rating is a mere 82dB/W - about 6dB below average and 3dB less than the new *12Si* reviewed in January - so quite powerful amplification is desirable to achieve good levels. It would of course be foolishness to partner £600 worth of loudspeaker with a pipsqueak budget amplifier, so most matching solid state models will have ample muscle, but valve and other class A enthusiasts with large rooms should take the precaution of checking loudness compatibility. The load is reasonably easy over most of the range, though the impedance drops and shifts rather rapidly at high frequencies.

The response shows a resolutely downtilted characteristic that is also a little depressed around the crossover region and somewhat less even than might have been expected. But it is notably smoother than the *12Si*, and shows very fine on- and off-axis consistency. Distortion is pretty respectable.

## SOUND QUALITY

The sound quality of Celestion's *SL* series has always been a matter of some controversy - adored by some, reviled by others - and the *600Si* maintained this tradition in the listening tests, highly rated by three out of five listeners, less well received by the other two. Given also that experience has shown that 'falling response' speakers tend to be slightly disadvantaged by our listening conditions, the *600Si* performed pretty respectably overall - and substantially better than the *12Si* did a couple of months before.

Positive reactions praised fine 3-D stereo, minimal box coloration and impressive detail in a soundstage which showed good scale. However, the 'rich' balance and 'polite' presentation was not to all tastes; dynamics and 'speed' both attracted criticism. My own

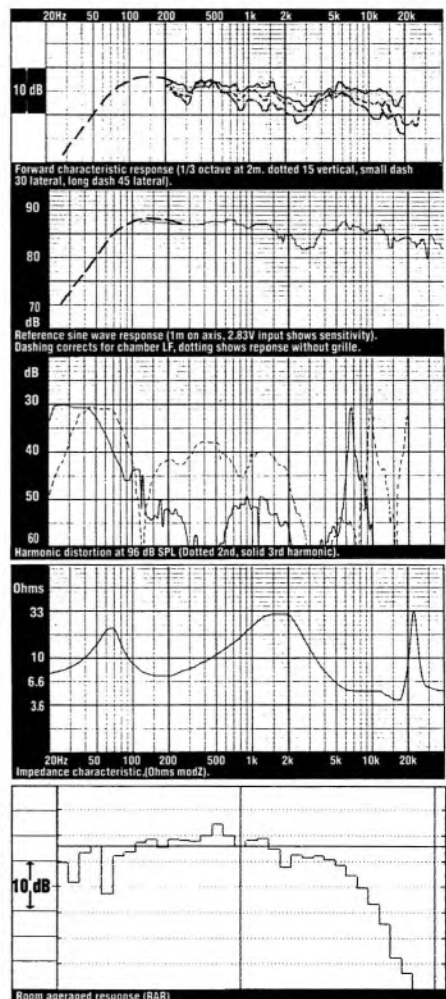
notes refer to a 'softspeaker' which plays "reggae with an Oxford accent".

## CONCLUSIONS

The Celestion *SL600Si* has some remarkable qualities that some will find irresistible, and which go a long way towards justifying the highish price. Although it is by no means a unanimous favourite, it is certainly well worth trying in specific system and room contexts.

## TEST RESULTS

Size (height x width x depth)	27 x 20 x 23cm
Recommended amplifier power	30 - 120 watts
Recommended placement	on matching stands in free space
Frequency response ( $\pm 3$ dB, 2m)	60Hz - 20kHz
Low frequency rolloff (-6dB/1m)	52Hz
Sensitivity (ref 2.83V-1W/8ohms; 1m)	82dB
Impedance characteristic (ease of drive)	fair
Forward response uniformity	very good
Typical price per pair (inc VAT)	£780



# HEYBROOK POINT 7

HEYBROOK HI-FI LTD., ESTOVER CLOSE, ESTOVER IND. EST., PLYMOUTH, DEVON PL6 7PL. TEL: (0752) 780311.



In the increasingly wide range of models available from this West Country loudspeaker specialist, the £170 *Point 7* bridges the price and size gap between the well established and highly regarded *HB1* and the cleverly constructed *Point 5* (reviewed by AG in July '87).

In outline terms the *Point 7* is an extension of the techniques used in the *Point 5*. Whereas most loudspeakers are constructed by V-grooving and folding top, bottom and sides from a single sheet, then fixing on the baffle and back later, the *Point 7* is 'wrapped' around the vertical axis, constructing baffle, back and sides from the single 15mm chip-board sheet. Then the attractively radiused top and bottom sections made in substantial 25mm MDF are added afterwards, to provide bracing.

The contemporary appearance achieved by this construction technique is enhanced by a dark textured finish described as 'black stipple vinyl', in place of the increasing monotony of black ash vinyl. This gives a similar effect to certain trendy upmarket speakers such as the Celestion *SL600Si* and *SL700* and the Acoustic Energy range, which by association makes the *Point 7* appear both trendy and upmarket, which is smart marketing. A grille with neatly chamfered frame is an optional part of the package.

It's a medium size, sealed-box 'bookshelf' loudspeaker that is designed to be used close against a rear wall, on good quality stands such as Heybrook's *P5S* – the *HBS1*s we used seem equally suitable. A smallish paper cone Elac driver handles the bass and midrange duties, and is designed to roll off mechanically at the top end (so no network components are necessary), while just a single component provides first-order feed to the 19mm SEAS metal dome tweeter. Two pairs of terminals on the rear provide optional bi-wire

(or bi-amp) connection.

## LAB REPORT

Our sensitivity rating of 85dB is a little below average, as is the level of distortion measured at 96dB, but sensible loudness levels can still be achieved and the impedance represents a simple load for the driving amplifier.

The basic 1m reference response looks promising enough, and the bass should be appropriately reinforced by wall siting. There is some unevenness around 1-1.5kHz and a mild crossover suckout at 4.5kHz; that at 10-11kHz is largely down to the grille, which is otherwise pretty innocuous. The room averaged response also looks reasonably smooth, though the on-/off-axis 2m traces are somewhat uneven, particularly around the crossover region – as is often the case in designs that use gentle crossover slopes with consequent wide driver overlap.

## SOUND QUALITY

The *Point 7* prompted a rather mixed response from the listening panel, and this may well be related to the relative balance from each speaker received at the different listening positions. Although there was some praise for the overall balance, a fundamentally musical presentation and reasonable bass control and detail, there was also criticism of diffused and 'phasy' images, of some lack of integration and some 'boxy' and 'cuppy' midband coloration.

My subsequent (sighted) listening was rather more positive than the panel's findings, though I am nevertheless unwilling to override what is surely the only truly fair way to assess loudspeakers; I merely add a note of qualification that panels don't always get it right. The *Point 7* does have its cosmetic rough spots, but it also offers a particular

virtue in the fine projection and focus of vocal information. And, perhaps paradoxically, it seems to start to come really alive when driven fairly hard.

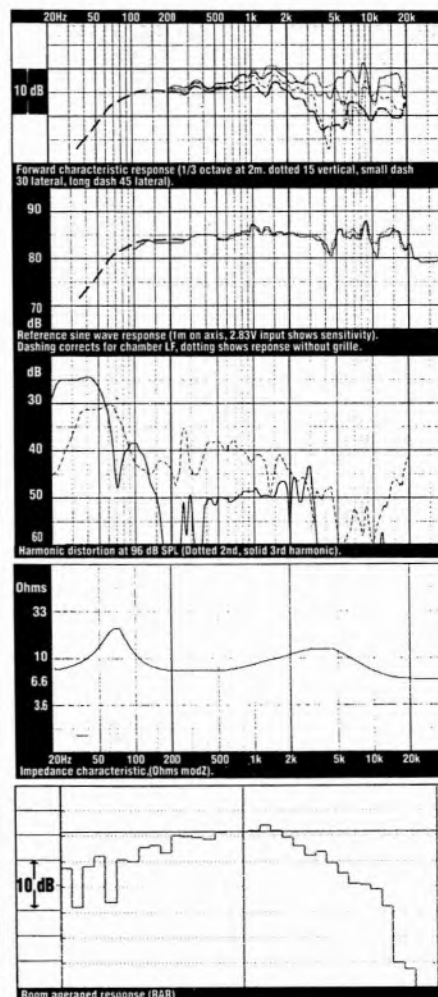
## CONCLUSIONS

Cosmetically one of the most attractive packages around, with a distinctly contemporary appearance, the *Point 7* left the listening panel somewhat underwhelmed and also shows certain technical weak spots, so formal Recommendation is not appropriate. But I confess I rather like it all the same...

## TEST RESULTS

Size (height x width x depth)	40.5 x 23 x 23cm
Recommended amplifier power	15 – 75 watts
Recommended placement	on rigid stands near rear wall
Frequency response ( $\pm 3$ dB, 2m)	75Hz – 20kHz*
Low frequency rolloff ( $-6$ dB/1m)	60Hz
Sensitivity (ref 2.83V-1W/8ohms; 1m)	85dB
Impedance characteristic (ease of drive)	very good
Forward response uniformity	fair
Typical price per pair (inc VAT)	£170

\* $\pm 4$ dB limits needed to contain unevenness



# MONITOR AUDIO R1200/GOLD MD

MONITOR AUDIO LTD., 34 CLIFTON ROAD, CAMBRIDGE CB1 4ZW. TEL: (0223) 246344.



Monitor Audio has specialised (very successfully) in medium and small size, mid-priced loudspeakers for several years, introducing a succession of incremental 'high tech' upgrades particularly to the tweeter drive units. New for 1988/89, the £800 *1200/GOLD MD* is a larger, floorstanding model that extends this tradition further upmarket.

That doesn't mean that this is a bulky loudspeaker by any means. In fact it is very slim indeed, if rather deeper, and in terms of 'footprint' and height takes up no more room space than most stand mounted bookshelf models.

The floormounting approach not only effectively incorporates the stand space within the enclosure volume, but also avoids any need to spend a further £50-100 on appropriate quality stands. The base of the *1200's* enclosure has the necessary threads to accommodate supplied floor-keying spikes, an approach that provides the coupling but not the decoupling characteristics of a conventional up-an-down spiked stand arrangement.

Cabinetwork has long been a major MA strength, so the standard of finish of this prestige model is naturally superb – real wood aplenty (though not on the painted particle board back), in virtually any veneer you'd care to dream up (not to mention a few you'd rather not remember when you wake up in the morning). Our samples combined an attractive deep red baffle with black sides.

Visually the front is not for the faint-hearted: the gilt drive unit trim enhances or detracts from the fully veneered baffle according to preference – and is only theoretically optional, given the somewhat negative sonic influence of the half-grille. Top quality twin terminals allow bi-wiring or bi-amping for those so inclined.

The generously dimensioned and (rear)

ported enclosure is designed for siting well clear of walls. Fairly thin 18mm panels are assisted by some damping, shelf bracing and battens, though the baffle seems quite resonant when subjected to the knuckle test. The main bass/mid driver is surprisingly small, with a cone diameter of 125mm, while the tweeter is the well publicised anodised MA/SEAS 'gold' metal dome unit.

## LAB REPORT

Sensitivity rates a little below average, though not sufficiently so as to cause any real concern, given the easy to drive impedance characteristic. However, bass extension is surprisingly limited in view of the overall volume and sensitivity. Distortion is pretty low through most of the range, but deteriorates somewhat at low frequencies.

The frequency responses confirm the grille is best avoided, and show a reasonably well balanced result, marred by some loss of energy around the crossover region (2-4kHz); ironically this is avoided by above axis listening, which is unlikely in such a tall floorstanding model – maybe MA should invert the drivers Mission-style! And although they're respectable enough, the traces are not really a significant improvement over those obtained from the £450 *R852/GOLD MD* (reviewed January).

## SOUND QUALITY

The *1200* did pretty well on the listening tests overall, but no more than should be expected for the price. The well balanced neutrality was praised, allowing good analysis of detail and soundstage, but there was also good consistency in observations that the sound was a little too civilised and polite, and somewhat lacking in excitement.

In longer term, sighted listening I found the *1200s* perversely uningratiating –

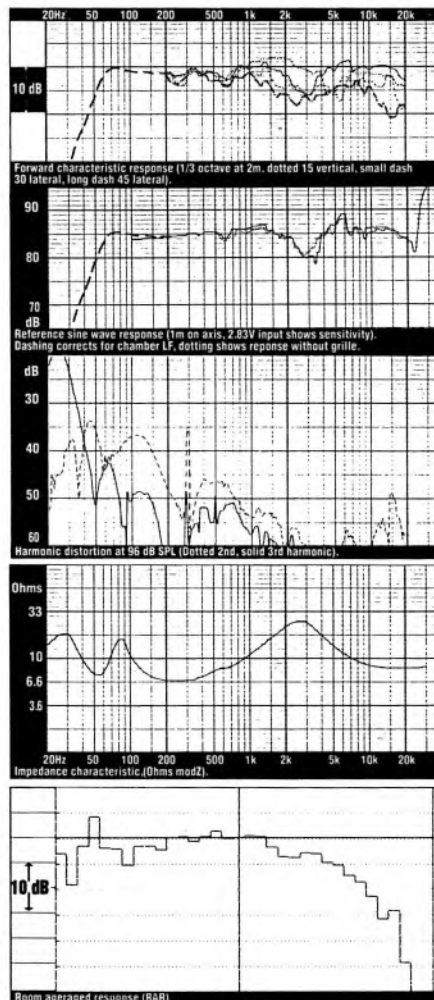
inoffensive to be sure, but also bland, to the point where I stopped wanting to bother playing the hi-fi at all, even though the basic perceived bandwidth is quite good.

## CONCLUSIONS

This is a smooth and civilised loudspeaker that is well built and nicely presented. But it is also expensive, and seems to offer little real advantage over smaller, cheaper models in Monitor Audio's range, larger enclosure notwithstanding. It's not bad, to be sure, but it's not really exceptional enough to justify the premium price.

## TEST RESULTS

Size (height x width x depth)	94 x 20 x 26cm
Recommended amplifier power	25 – 100 watts
Recommended placement	in free space
Frequency response ( $\pm 3$ dB, 2m)	50Hz – 20kHz*
Low frequency rolloff ( $-6$ dB/1m)	48Hz
Sensitivity (ref 2.83V-1W/8ohms; 1m)	85dB
Impedance characteristic (ease of drive)	very good
Forward response uniformity	good
Typical price per pair (inc VAT)	£800
<i>* <math>\pm 4</math>dB limits needed</i>	



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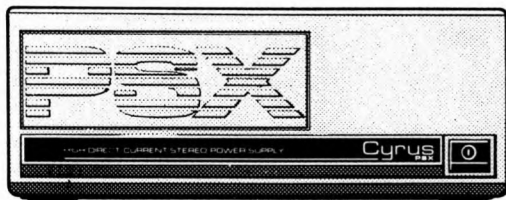
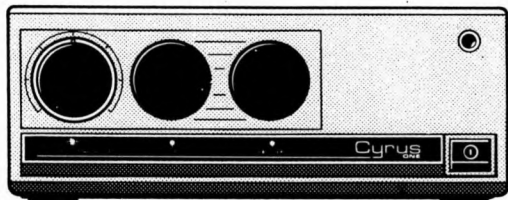
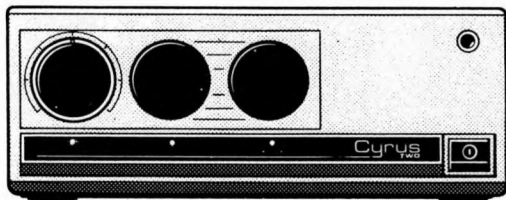
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# MISSION 763

MISSION ELECTRONICS LTD., STONEHILL, HUNTINGDON PE18 6ED. TEL: (0480) 52777.

BEST BUY



The 763 sits third up in the new Mission model range that was introduced in the UK at the end of 1988. Both the 761 and 762 assessed in the January edition of *Choice* are 'bookshelf' size models, but the 763 is a significantly larger floorstanding model. It has a largish box for the £280 asking price, and appears even better value when you take into account that there is no need to lay out another £70 for a partnering stand. The speaker comes with locknut levelling spikes that screw into the corners of the base to give good floor coupling – though whether that is a satisfactory as well as a cheap alternative to the decoupling action of a twin-spike stand is a matter for debate.

Cost constraints are evident though not obtrusive. Finish is vinyl, but our samples sported a rather nice rosewood imitation that extends to the baffle and back.

Another neat cost saver is that the 763's 'half grille' uses the same plastic moulding as that used to cover the 762's front completely.

Elsewhere there are fewer signs of economies. Twin terminals on the back will please those who favour bi-wiring or bi-amping, the crossover itself being a simple 6/12dB per octave affair. The drivers are neatly mounted with squared styling trims. The 210/160mm bass/mid unit has a transparent polypropylene cone and large 38mm voice coil, while the 19mm doped fabric dome tweeter has a short horn-type equalising flare.

The big box uses damped 19mm particle board and horizontal shelf bracing, plus 25mm high density stock for the baffle. A generous, moulded, front mounted port provides damped reflex loading, and the low frequencies are (purportedly) aligned to give best performance mounted close to a rear wall. Big box notwithstanding, the 763 will take up less room space than many much smaller designs.

## LAB REPORT

One might properly have expected the 763 to build on the basis of the 762, and the tweeter certainly looks the same, but in fact the 763 is quite differently aligned. Sensitivity is some 5dB lower, though still adequate enough for decent loudness levels, while the bass –6dB rolloff point has been extended to a respectably – indeed unusually – low 40Hz.

More bass and less midrange prominence creates a frequency response set which is significantly better balanced overall than the 762. The mild treble hump in the room response remains, but the off-axis set is very impressive, assuming you don't want to listen standing up. Distortion stays under reasonably good control, and the impedance represents an easy load to drive.

## SOUND QUALITY

I grew quite attached to the 763, allowing it to remain in occupation of my room and system for a number of days – an accolade reserved for very few. And the blind panel test merely served to confirm this favourable personal judgement, with an overall rating typical of speakers costing twice the price.

This loudspeaker has good subjective bandwidth (ie LF extension), a nicely neutral overall balance, and imaging capabilities comfortably better than most wall mount designs. There is slight bass 'detachment' and 'heaviness', while good control at lower powers led to some distortion when driven hard. The sound is basically lively but lacks true dynamic drama through the mid-band and treble – and is just a little too slow and a little lacking in upper bass energy and drive and warmth.

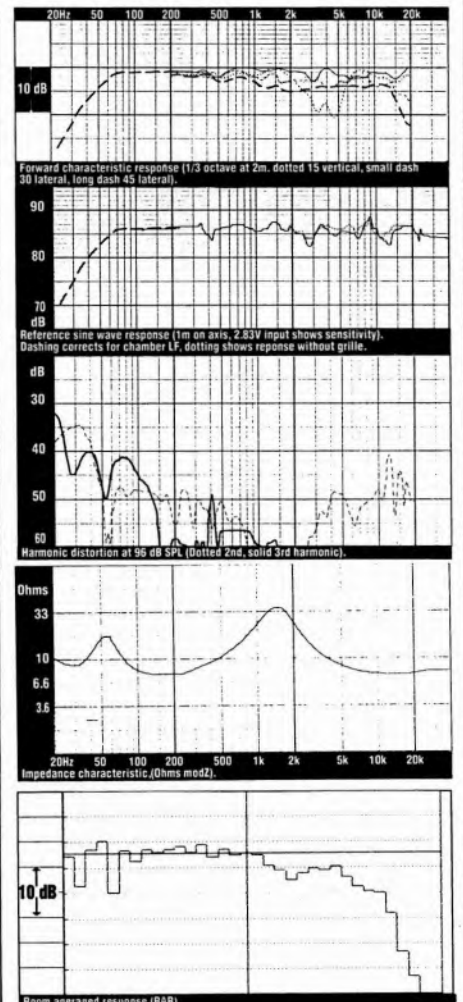
## CONCLUSIONS

The 763 is maybe not a great loudspeaker, as it has its weaknesses and limitations. But it's

certainly a very artful one that combines its compromises exceedingly well, working very well in the listening room and combining generous volume and good bass extension at a surprisingly modest price. An obvious Best Buy as an impressive allrounder, it should still be auditioned prior to purchase.

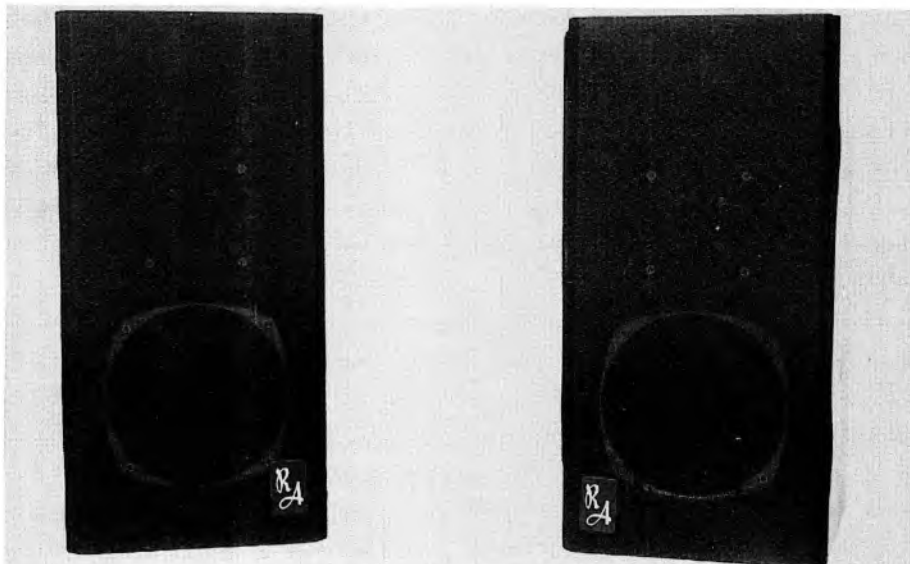
## TEST RESULTS

Size (height x width x depth)	77 x 25 x 32cm
Recommended amplifier power	20 – 60 watts
Recommended placement	near rear wall
Frequency response ( $\pm 3$ dB, 2m)	45Hz – 20kHz
Low frequency rolloff ( $-6$ dB/1m)	40Hz
Sensitivity (ref 2.83V-1W/8ohms; 1m)	86dB
Impedance characteristic (ease of drive)	very good
Forward response uniformity	very good
Typical price per pair (inc VAT)	£280



# RICHARD ALLAN CD5

RICHARD ALLAN RADIO LTD., BRADFORD RD., GOMERSAL, CLECKHEATON, WEST YORKS BD19 4AZ. TEL: (0274) 872442.



Richard Allan is a name that goes way back to the early days of British hi-fi, with a manufacturing history that includes speaker system, drive unit, speaker kit and even an ahead-of-its-time class A transistor amplifier. Although still busy in hi-fi export markets, much of the company's recent activities have been concentrated on the alternative, related area of driver manufacture for the music/PA marketplace.

But the recent revival of hi-fi's fortunes with the success of compact disc has also served to reawaken Richard Allan's interest in its old stamping ground. Autumn 1988's Penta Show saw a welcome reappearance with a neat, compact loudspeaker system whose inspiration is clear from the type number *CD5*. It's smartly finished, though the pricetag of £240-odd looks a shade on the high side for the enclosure volume.

The *CD5* has a slim enclosure for its height and uses real wood veneer on the sides, in either black or walnut. A small, short reflex port is set above the tweeter. The sides are 15mm chipboard, while the baffle is 19mm MDF, shaped and fixed to permit the use of a 'stocking mask' grille – a stretched cloth held by an elastic band that sits in a groove between the baffle and the carcass.

In the interests of efficiency, the bass/mid unit has an undamped paper cone – and a rather diddy little 90mm one at that, held in by rather diddy little screws. But these were at least properly tightened, the generous magnet needed for reflex operation is certainly present, and the cast frame is another luxury touch. The tweeter is a modified version of Richard Allan's own *DT30* fabric dome unit. All internal connections use soldered heavy gauge wire, and the crossover network is a very simple affair, with air-cored chokes glued to the backs of each driver magnet (a strange place indeed), plus an extra capaci-

tor for the treble feed.

## LAB REPORT

RA's brochure optimistically claims a sensitivity rating of 91.5dB. Our samples just about met this output – at 950Hz precisely; elsewhere the output fluctuated quite severely, falling to 74dB at a crossover notch. Our 88dB rating is more realistic.

It is even harder to see any correlation between the brochure's response curve (with no vertical axis stated) and our findings, which by any standards are second rate – and which are presumably typical as the pair match was not too bad. Distinctly uneven above 800Hz, the only positive attribute seems to be the pretty smooth behaviour below 500Hz – which looks little enough on the graphs but of course represents a fundamental frequency an octave above middle C. That said, bass extension is strictly limited too, and the unevenness seen in the 1m trace is also found out at 2m and in the integrated room response. Harmonic distortion levels are unexceptional.

## SOUND QUALITY

In the light of the measured frequency responses, it is hardly surprising that the *CD5* was rated below average by the listening panel. What is possibly more surprising is that it did not receive stronger censure.

A lack of basic transparency was particularly noted, as was the inevitable coloration that the uneven response is bound to cause, and which is particularly noticeable on natural, acoustic instruments. But the overall perceived tonal balance seemed reasonably acceptable, marred by a slightly 'exposed' treble, and vocal resolution is quite good. On simpler rock/pop material it was able to maintain an attractively lively and quite informative pace – paradoxically preferred

with vinyl rather than CD source material.

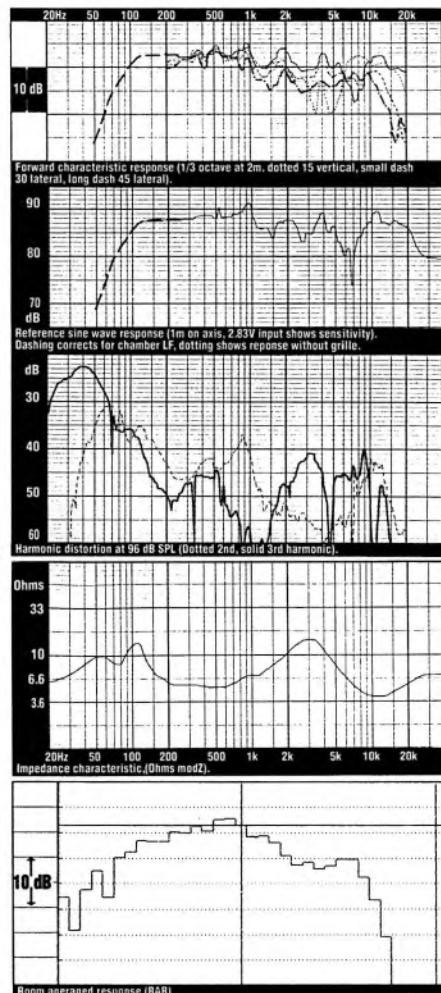
## CONCLUSIONS

The measurements, and specifically the frequency responses, let down this loudspeaker. It doesn't sound as bad as the pen charts suggest, as I found during casual sighted listening whilst preparing this report – in fact it sounds engagingly communicative on much material, if somewhat coloured too. But the bottom line is that any loudspeaker costing £240 per pair should be capable of much more accurate reproduction.

## TEST RESULTS

Size (height x width x depth)	38 x 19 x 23cm
Recommended amplifier power	10 – 60 watts
Recommended placement	on stands in free space
Frequency response ( $\pm 3dB$ , 2m)	65Hz – 20kHz*
Low frequency rolloff ( $-6dB/1m$ )	80Hz
Sensitivity (ref 2.83V-1W/8ohms; 1m)	88dB
Impedance characteristic (ease of drive)	fair
Forward response uniformity	fair
Typical price per pair (inc VAT)	£242

\* $\pm 7dB$  limits needed to contain unevenness



# TANNOY M20 GOLD Mk2

TANNOY PRODUCTS LTD., THE BILTON CENTRE, CORONATION RD., CRESSEX IND. EST., HIGH WYCOMBE, BUCKS. TEL: (0494) 450606.

RECOMMENDED



It's only a couple of months since we assessed Tannoy's latest £160 *Mercury S* contender as a clear Best Buy in its price class, after it proved more successful than most at being (nearly) all things to all men. The *M20 Gold Mk2* is the next model up the price scale, tipping the till at the psychologically significant £200 price point, though physically no larger than its cheaper brother.

If the price premium hasn't been devoted to expanding box volume or increasing shipping costs, it's been spent instead on a number of luxury touches in the build. The two models in fact look almost identical with grilles in place, the only obvious distinction being the presence of two pairs of Michell-style gold plated socket binders in the *M20*'s rear, permitting optional bi-wiring/amping. In fact this is just one of several 'tweaks' that should place the *M20 GOLD Mk2* on a higher level of sonic subtlety and refinement than the *Mercury S*, not to mention a real wood veneer in place of vinyl.

The *Gold* of the title presumably refers to the rather over-the-top styling and presentation that's also shared with the *Mercury* – a crackle-finish gilt on the driver chassis, supplemented by gold legends and graphics just to ram the message home. Happily the plastic frame grille is better than most acoustically (if still better avoided), for those who prefer not to have go faster stripes plastered all over their hi-fi equipment.

The main ingredients are the same as those of the *Mercury*: 15mm cabinet carcass with 18mm baffle, 200/160mm polypropylene cone bass/mid unit, and 25mm polyamide dome tweeter. The crossover is a simple separate-arm second order device, using heavy duty wiring and soldered joints. The speaker is designed to be sited on good quality stands in free space well clear of side or rear walls.

## LAB REPORT

The 87dB sensitivity and 50Hz –6dB bass extension are both the same as for the *Mercury S*, and the rest of the lab performance continues to reflect the considerable common content, confirmed in identical impedance characteristics and remarkably similar distortion traces.

The response trend is basically pretty flat on all measures, if a shade short of energy in the 200Hz-1kHz midband. The 2m on- and off-axis response set is pretty well controlled too, provided one doesn't attempt to sit above the line of the tweeters, where a deep crossover notch may be seen. The room averaged response suggests that the basic balance should be about right. Pair matching is respectable enough.

## SOUND QUALITY

Although the listening conditions were much the same, the group of loudspeakers and the panel members were not, so it is difficult to make direct comparison between the findings for the *M20 GOLD Mk2* and those for the *Mercury S*. In point of fact the outcome was satisfyingly similar, though if anything the cheaper model was marginally preferred (bearing in mind that the *M20*'s bi-wire facility was not exploited for reasons of consistency). This need not be the paradox it appears on the surface; such is the perversity of loudspeaker design that an improvement in some ingredient does not necessarily create a more satisfying overall mix, as limitations elsewhere can become more obvious and less comfortably tolerated.

Several listeners criticised a 'plummy', slightly 'heavy' and 'thickened' character in the bass, lacking the solidity and authority of more extended designs though still creating a fair sense of scale. The treble sounds a shade 'exposed' on some material, and stereo

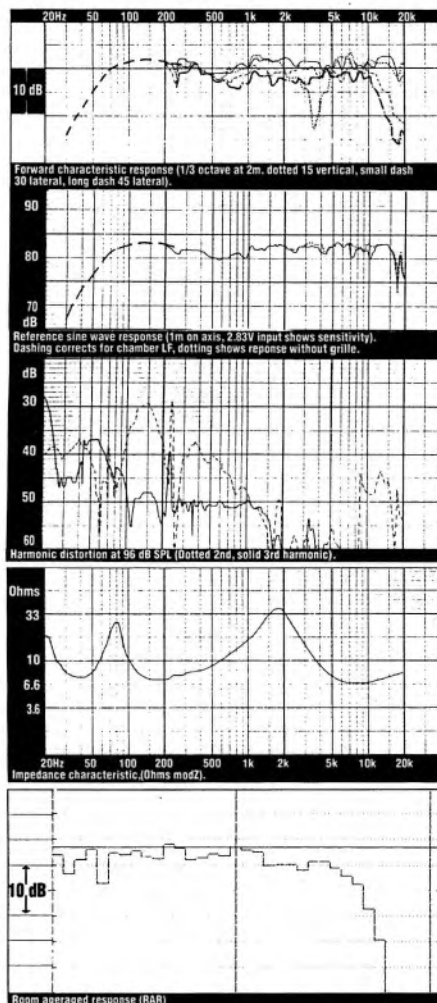
depth is mildly constrained, though transparency and detailing are nonetheless fairly good. As with the *Mercury*, the criticisms were mild and the design was considered a good all rounder.

## CONCLUSIONS

The *M20 GOLD Mk2* is almost inevitably similar to the *Mercury S*, though whether it justifies the 25 per cent price premium is debatable, depending largely on the value placed on the bi-wiring capability. It still deserves Recommendation, but falls a little short of the *Mercury* on sheer value for money grounds.

## TEST RESULTS

Size (height x width x depth)	49.5 x 25 x 21.5cm
Recommended amplifier power	10 – 80 watts
Recommended placement	on stands in free space
Frequency response ( $\pm 3\text{dB}$ , 2m)	55Hz – 20kHz
Low frequency rolloff ( $-6\text{dB}/1\text{m}$ )	50Hz
Sensitivity (ref 2.83V-1W/8ohms; 1m)	87dB
Impedance characteristic (ease of drive)	fairly good
Forward response uniformity	good
Typical price per pair (inc VAT)	£200





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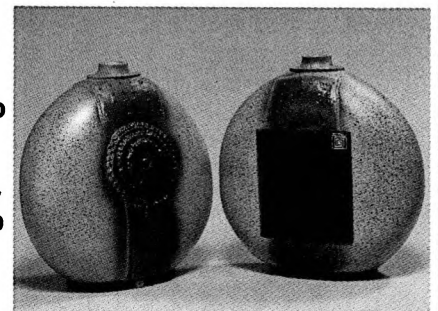
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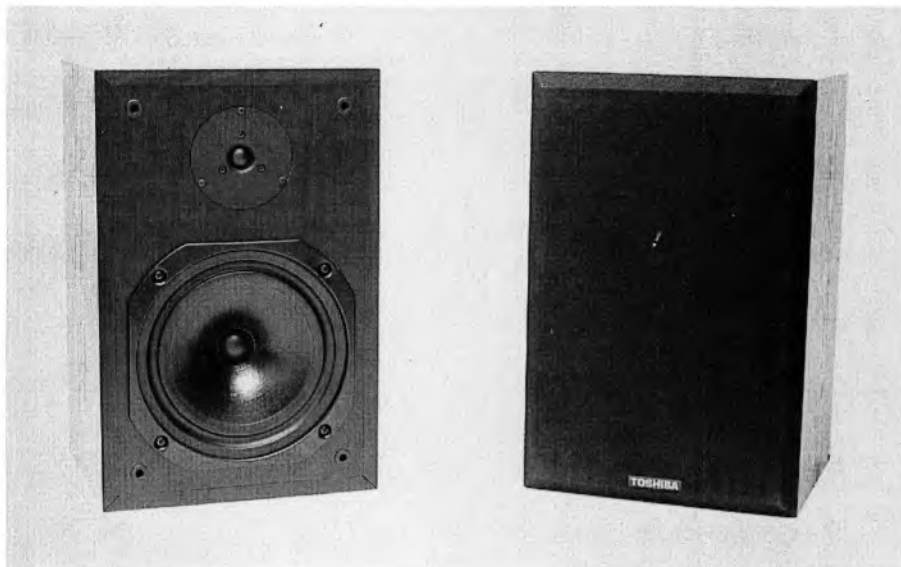
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# TOSHIBA SS-33M

TOSHIBA UK LTD., TOSHIBA HOUSE, FRIMLEY ROAD, FRIMLEY, CAMBERLEY, SURREY GU16 5JJ. TEL: (0276) 62222.

BEST BUY



This latest version of the *SS-33M* differs little from its predecessors, either in concept or execution. Why change such an obviously successful formula? Though labelled, marketed and inspired by Toshiba UK, in fact the £90 *33* is a fine example of what the indigenous UK OEM (original equipment manufacturer) loudspeaker makers can come up with. Unknown names to the consumer, several such companies compete fiercely to supply low cost speakers to go with innumerable stacker and midi systems, and are consequently past masters at the subtle art of cost effective loudspeaker design compromise.

What we have therefore is a surprisingly large enclosure for the price, in an overall package where all traces of luxury are eschewed. The spring-loaded bare-wire ('crappy' in operator JK's pithy dismissal) terminals are scarcely able to accommodate 4mm banana plugs, which is one indicator, as is a very thick and unchamfered grille frame. But then you don't expect to find mortice and tenon joints down at MFI.

Deliberate economies aside, the basics are all there. The sealed box with undamped 15mm panels is nicely enough finished in black vinyl. A generous 200mm frame main driver with less than generous magnet has a 150mm doped paper cone with quite broad surround termination, while the tweeter is a small fabric dome with slight horn/cavity reinforcement. The crossover is minimalist and hardwired, which is all to the good of course.

## LAB REPORT

Sensitivity is a shade below average at 86dB, while bass extends only to a modest 55Hz (-6dB) despite a little 120Hz 'kick up'. The grille is not entirely unusable but might be better discarded nonetheless. The main reference 1m frequency response also shows

a wide c5dB trough around 2-5kHz and a somewhat exposed mid and upper treble in consequence.

Though still visible as the major characteristic, this trough is definitely less severe when measured out at 2m, and the consistency of output across the measurement 'window' is very impressive indeed. The room averaged response is equally encouraging, if lacking in overall smoothness compared with more sophisticated and expensive designs. Distortion stays under good control across the band, and the impedance should pose no problems whatsoever for the partnering amplifier.

## SOUND QUALITY

Auditioned in free space, and on good quality stands costing nearly as much as the speakers themselves, the panel was well impressed by this budget Toshiba, with the solitary exception of Yrs trly. The major strength is that the *SS-33* turns in an inherently honest performance, notwithstanding a few rough edges, and so places few obstacles in the way of the music.

Despite the audibly depressed presence and boosted upper treble, plus a degree of bass 'warmth' and 'plumminess', the overall balance is still pretty convincing, and the speaker is capable of generating a quite convincing soundstage. There was some disagreement over the quality of life and dynamics, which some found impressive, others less so.

Auditioned over several days without concealment, I have to concede that the *SS-33M* does do a remarkable job for the price, aided by the abovementioned intrinsic honesty, but nevertheless limited by a fundamental lack of subtlety and refinement which made me glad for the excuse to move back a little further upmarket.

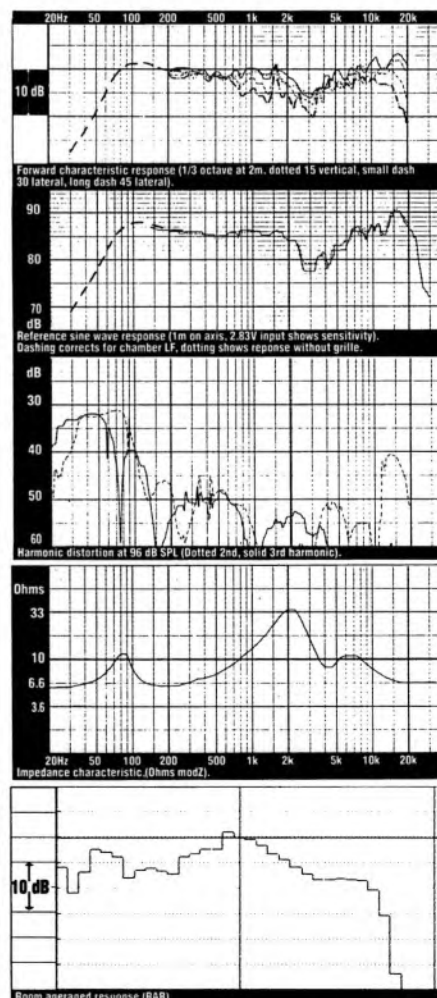
## CONCLUSIONS

For those for whom minimising expenditure is the most important criterion, this Toshiba is an obvious Best Buy that merely confirms the continuing success of a simple but effective formula. But it is also only just about a hi-fi speaker in terms of refinement, which emphasises that a little greater expenditure is well worthwhile.

## TEST RESULTS

Size (height x width x depth)	40 x 26 x 21.5cm
Recommended amplifier power	20 - 70 watts
Recommended placement	on stands in free space
Frequency response ( $\pm 3$ dB, 2m)	52Hz - 20kHz*
Low frequency rolloff (-6dB/1m)	55Hz
Sensitivity (ref 2.83V-1W/8ohms; 1m)	86dB
Impedance characteristic (ease of drive)	fairly good
Forward response uniformity	very good
Typical price per pair (inc VAT)	£90

\*  $\pm 5$ dB limits necessary to accommodate unevenness



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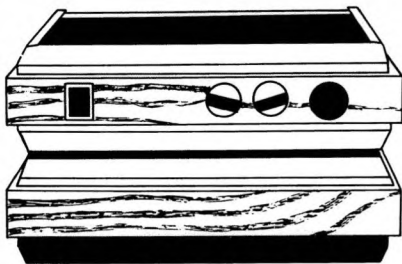
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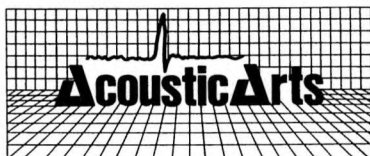
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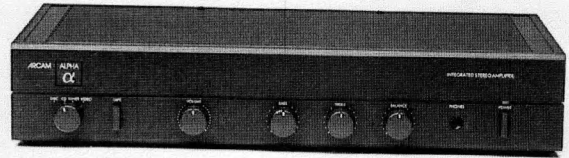
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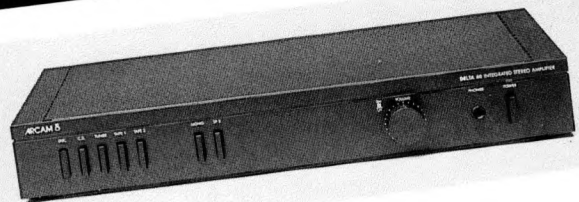
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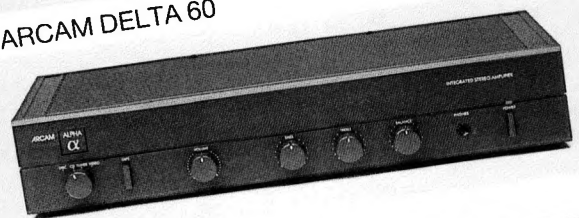
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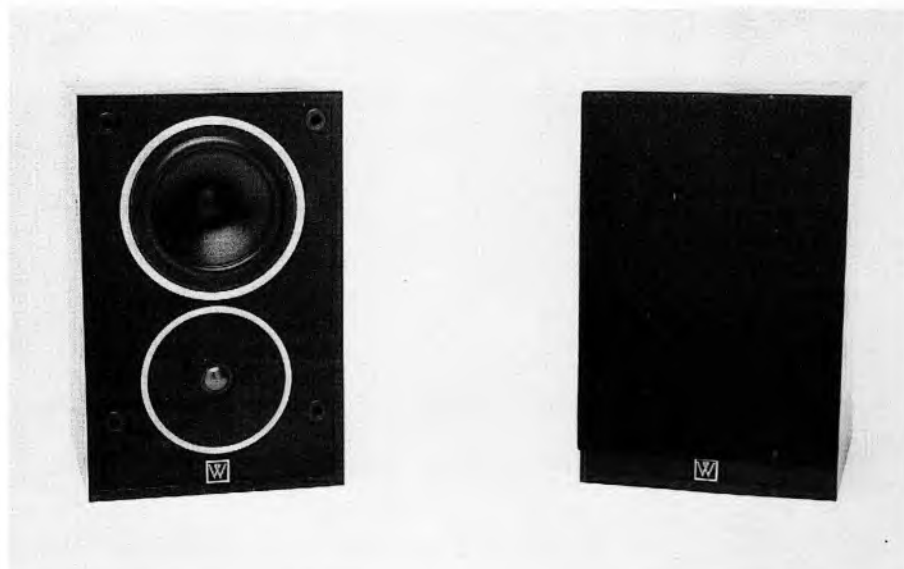
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The £140 *504.2* is the latest version of a long running 'miniature' model that has filled a 'luxury' niche upmarket of the more excitable *Diamonds* for several years.

It doesn't look such obvious good value as the much larger *505* – you don't even get real wood on the standard version, though a pretty red mahogany veneer is a rather attractive option. But the *504* is an established favourite that has benefitted from many years of refinement and development. The tiny reflex-loaded enclosure with inset and ported rear panel is already inherently rigid, but is further strengthened by a 16mm MDF baffle and plywood internal bracing. Presentation is both neat and smart under a grille with an unpromisingly thick frame.

Bass (up to a point!) and midrange are handled by a very small polypropylene driver with 85mm cone on 110mm chassis, while the tweeter is an advanced ferrofluid-damped aluminium 20mm dome unit. The crossover uses first and second order slopes and also reinforces the reflex loading to improve bass output and power handling. Although suitable for genuine bookshelf location providing the support is rigid enough, the *504.2* probably works best on rigid 18inch spiked stands, sited close to a rear wall.

## LAB REPORT

Our below average sensitivity rating of 84dB is broadly representative of the relative output of this miniature, and is typical of a degree of tradeoff made in the interests of bass extension. The size of enclosure and main driver must both place inevitable maximum loudness limitations, though the distortion performance is very creditable under the circumstances. The impedance should prove easy enough to drive in practice, though the high frequency minimum is a shade severe.

The 1m response is pretty uneven across the band, while the treble is sensibly curtailed in order to balance the subjective lack of bass extension. The bass is cleverly tailored with a 'fool you' 80-90Hz 'bump' – an effective technique pioneered in the *LS3/5A*. The grille on/off comparison suggests that this accessory might more usefully be employed as an environmentally sensitive fly swat, via a dextrous DIY conversion.

Both the 2m and room averaged response traces confirm a significant mid-range prominence, but the former shows how effective a physically small loudspeaker is in maintaining response across a wide window, and also how well the crossover integration has been engineered here, upside-down drivers notwithstanding. Naturally wall siting will assist the bass, but not sufficiently to more than partly compensate for the inherent shortfall.

## SOUND QUALITY

Presented both at the start and again towards the end of the presentations, the *504.2* did rather well overall, though not without significant inconsistency from some panelists (yrs tly happily not guilty on this occasion!). It is certainly a small and somewhat limited loudspeaker sonically, but aspects of its limitations also represent a source of strength. Even though the midband is somewhat projected and far from uncoloured, it is nevertheless exceptionally well integrated in itself making vocal lines particularly informative and attractive.

An inherent spriteliness and good sense of timing distances the *504.2* from the ordinary, notwithstanding certain obvious cosmetic flaws. I carried out extended sighted listening following a spell with the Tannoy *M20s*, and although the small size and boxiness of the *504.2s* was immediately apparent, I nevertheless found their sheer charm more

than compensated in terms of enjoyment and musical communication.

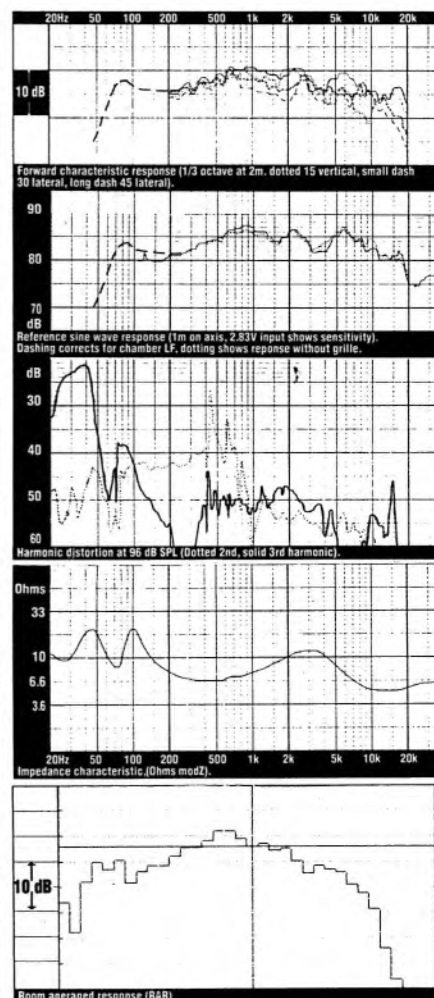
## CONCLUSIONS

Wharfedale's *504* is too heavily constrained by its size and measured performance to qualify for a Best Buy endorsement, but it definitely deserves a Recommended tag. Something of a niche product, it provides all the boogie factor that has made the *Diamond* famous, happily without some of the unwelcome raucousness of its junior stablemate.

## TEST RESULTS

Size (height x width x depth)	29 x 18.5 x 19cm
Recommended amplifier power	20 – 70 watts
Recommended placement	on stands near rear wall
Frequency response ( $\pm 3$ dB, 2m)	65Hz – 20kHz*
Low frequency rolloff ( $-6$ dB/1m)	60Hz
Sensitivity (ref 2.83V-1W/8ohms; 1m)	84dB
Impedance characteristic (ease of drive)	fairly good
Forward response uniformity	very good
Typical price per pair (inc VAT)	£140

\*  $\pm 4$ dB limits needed to contain unevenness



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# LOUDSPEAKERS TECH TALK

*Paul Messenger explains the listening and lab test procedures covering our loudspeaker reviews.*

Although both the reviewer and the listening room have changed, much of the methodology originated over a decade by Martin Colloms remains largely intact. The same technical tests were carried out in the same anechoic chamber, ensuring reasonable continuity between current loudspeaker reviews and those from the past. The room measurements too employed the same apparatus and computer averaging technique.

Comparison between the same loudspeaker measured in the current listening room and those used previously confirms that the differences are slight across the bulk of the audio range, though there are inevitable contrasts at the low frequency end where main room modes come into play.

## THE LISTENING TESTS

The 'blind' listening tests comprised separate presentations of about half an hour each, the programme being split evenly between vinyl and compact disc sources and selected to provide a broad range of music.

Care was taken to 'normalise' the relative volume of each loudspeaker as far as possible to compensate for different sensitivities, given that frequency balance differences are not adjustable and unavoidably get in the way.

Choice of ancillary components inevitably influences the type of sound, possibly by even more than the room itself. For this batch of ten loudspeakers the driving system comprised my tried and trusted Naim pre- and power amplifiers, with their own cable, a Naim modified Linn *Sondek* turntable with *Ittok* and *Troika* sited on an Origin Live *Skyline Ultra* table, and a Meridian *207* compact disc player.

While some were perfectly happy with this arrangement, others found the sound somewhat unfamiliar and a little disconcerting in stereo terms. The Naims do not create the delicate airy transparency of some rivals, though they more than compensate in my view with

their superior grip and dynamic integrity.

Before the listening started it was necessary to make certain decisions. The first one was to leave the grilles on. Not because the speakers sound better that way – usually the reverse in fact – but simply because most people use them that way, outside the worshipful company of audiophiles. For similar reasons, and to avoid introducing another variable, we also decided not to use bi-wiring (where applicable).

Save for the odd floorstanding model, all the speakers were used on Heybrook *HBSI* stands for the blind listening tests, simply because these are as close as anything to an industry standard. These were 'floor-keyed' into crosshead screws at two positions: as close as practical to a rear wall for 'wall mount' models, and 1-1.5m away from room boundaries for 'free space' designs. As far as possible the loudspeakers rested directly on the upturned spikes, but Bluetack was used for models with small footprints that didn't span the spikes.

The main listening programme consisted of the following extracts: *Who knows where the time goes?* (The Best of Sandy Denny, Island *CDS100*); *Fionnghuala* (The Best of the Bothy Band, Mulligan *LUN041*); Vaughan Williams, *Mass in G minor* (Christ Church Cathedral Choir/Stephen Darlington, Nimbus *N15083*); Sibelius, *Symphony No6* (VPO/Maazel, Decca *D7D4*); Vivaldi, *Le Quattro Stagioni* (The English Concert/Pinnock, Archiv *400 045-2*); Black Uhuru, *Youth of Eglington* (Red, *ILPS 9625*).

My particular thanks go to Chris Bryant, who supervised (and carried out) most of the measurements, Martin Colloms, and Jason Kennedy (the listening test operator).

## LAB TEST PROGRAMME

For the sixth successive edition the Cambridge Electroacoustics anechoic chamber was used. Despite the comparatively large size of this facility, a degree of

low frequency correction is still desirable to approximate true anechoic conditions. Such correction has been applied to both the 1m (reference) and 2m (forward characteristic) response traces.

## The Characteristic Forward Response (2m)

This primary measurement presents visually the forward radiating character of the loudspeaker, over a sensible forward solid angle and throughout the audible frequency range.

The uniformity of response traces taken on and around the main axis represent a crucial aspect of performance, which determines whether good stereo imaging is possible, and whether the speaker will sound markedly different on- and off-axis.



*Loudspeakers usually sound better with the grille off.*

## Reference curve

All loudspeakers (both left- and right-hand models) were measured using sine wave excitation at one metre. This provides an accurate representation of the low frequency response. Pair matching can be checked by over-laying the curves of left- and right-handed speakers, and the measurement also sets a reference level against which the distortion can be scaled and the lab sensitivity established.

## Listening room responses

Naturally specific to the room used during the listening test, the computer-averaged in-room response has evolved into one of

the most powerful predictors of subjective performance. The intention is to create a plot of the average forward sound energy arriving at the listening area.

The near ideal speaker may be expected to run more or less flat up to 5kHz; beyond this the response should gradually fall away. Sharper changes in slope will correspond to irregularities in response or directivity, and are therefore suspicious.

## Distortion

Using a swept tracking filter, second and third harmonic distortions were plotted at 96dB.

It is generally accepted that third harmonic distortion is more aurally intrusive than second, so we pay particular attention to the level of third order effects in the midband, where the value should be significantly below 1%. Higher figures are permissible below 100Hz – say 2%, with up to 5% satisfactory levels under 50Hz.

Second harmonic distortion values of perhaps double the level of third may be considered acceptable.

## Impedance

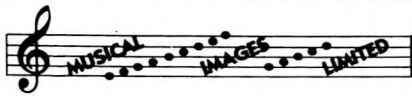
The impedance curves were plotted for all loudspeakers, while the phase angle was monitored.

## Sensitivity and power rating

From the reference curve, a mean midband sensitivity figure was recorded, corresponding to the sound pressure at one metre from the enclosure when energised by 2.83V (sine). A nominal 8ohms draws 1 watt from this voltage, and lower impedance draws more power, on a pro rata basis.

From the distortion, sensitivity and impedance data, a recommendation can thus be made concerning the loudspeaker's minimum and maximum amplifier power rating (per channel, 8ohms). It should be appreciated that this is only a recommendation, and will be modified in practice by individual taste; ie a requirement for low or high listening levels as well as by the size and acoustics of the particular listening room.

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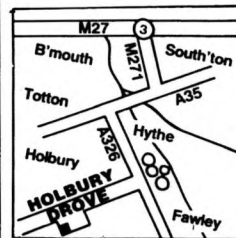
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# CHOOSING AND USING . . . IN-CAR ENTERTAINMENT

*If you're contemplating spending around £1,000 on an in-car system, a head unit and separate amp is likely to be the choice. Jason Kennedy outlines the background to our tests.*

Many of us spend as much time listening to car radios, tape and now CD 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, engine 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 domestic system? Here we've tested a selection of head unit and power amplifier combinations costing around £1,000, including examples from both specialist in-car manufacturers as well as those familiar to the audio world.

The machines under scrutiny consist of either cassette player, CD player or DAT player and FM/AM tuner driving a separate power amplifier. The majority of the power amps will drive two pairs of loudspeakers or can be used in stereo or bridged mono mode. This degree of flexibility means that the power amplifier(s) is usually sited remotely, under a seat or in the boot. This, combined with the

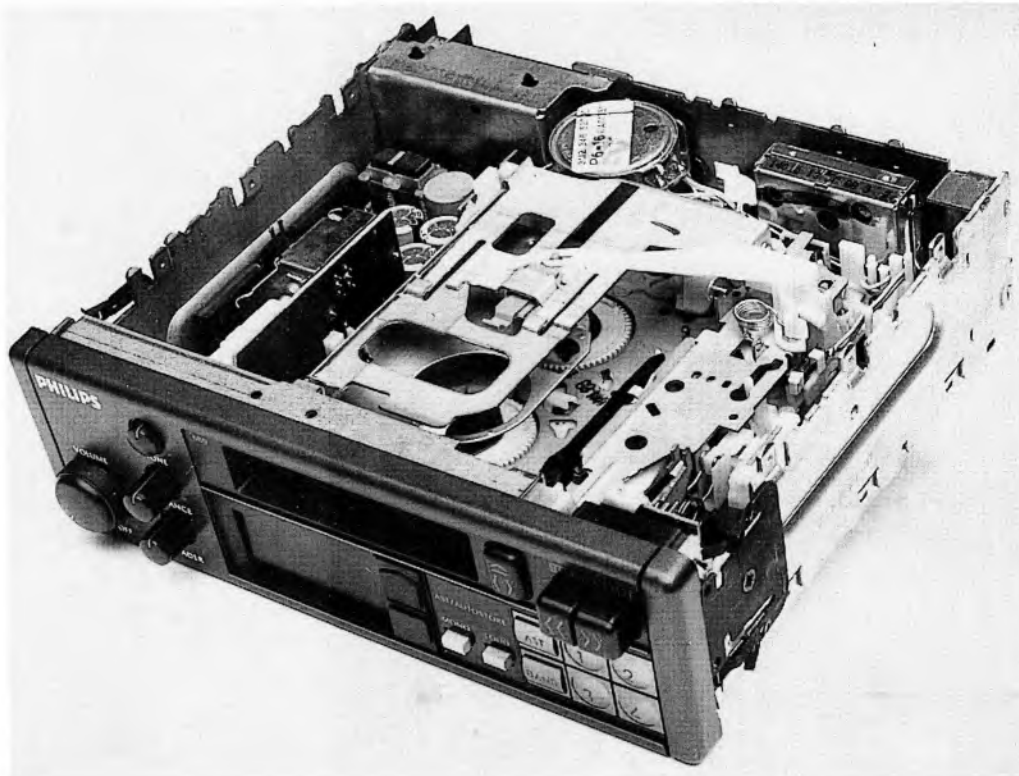
more complex hook-up arrangements makes installation a job for the professional or keen amateur. A note for the latter is to read the instructions carefully and get the system running before you install it.

## 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 Linn *Sara 9* speakers was used. These have twin mid/bass drivers (mounted one behind the other) and have a nominal 4ohm impedance, as is the case with in-car loudspeakers. They are somewhat more revealing than the average in-car transducer, of course, although there appear to have been some improvements made in this area of late. For maximum information transfer we used Audio by Design speaker cable 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 12volt 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. Software used included prerecorded and home made cassettes, prerecorded DAT and CDs. Unfortunately we couldn't double up the same music on different formats but a cross section of music types was used including Yello's *Flag*, Green on Red's *No Free Lunch* and a variety of classical pieces. The DATs included a GRP sampler and *Baroque Brass Music and Italian Trumpet Concertos II* on the Capriccio label.



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# ALPINE 7905M/3539

ALPINE ELECTRONICS UK LTD, 13 TANNERS DRIVE, BLAKELANDS, MILTON KEYNES MK14 5BU. TEL (0908) 611556.

RECOMMENDED



digested the instructions. Fluent programming therefore will take a bit of practise, so keep the manual to hand.

Sound quality is basically quite rich, in a slightly muggy and veiled fashion, but only slightly – the differences between most of the CD players was on the whole very subtle. It does have the ability to reveal differences in software and made a fine job out of the more 'audiophilesque' discs it was offered. Flim and the BB's and Michael Hedges sounding dynamic and solid with only the occasional sense of edginess in the treble. With discs like Yello's *Flag* the low frequencies were perhaps over-emphasised, this undoubtedly to make up for the limited extension of in-car speakers.

One gets a good sense of dynamics with this machine and the beginning and end of notes are slightly more discernible than with others. And if it fails to offer the last word in clarity it's nonetheless musically quite competent for a digital in-car machine.

## LAB REPORT

The 7905M managed to produce the healthiest lab measurements of the three machines we looked at. The frequency response starts at 2dB down and gently slopes up to 500Hz at which point it flattens out and arrives at 20kHz with only a subtle ripple. It is this last anomaly that indicates potential noise at HF and could be contributing to the slight edginess noticed on audition. The crosstalk figures (L-67dB, R-78dB) are the lowest we found but the discrepancy between channels is not welcome, suggesting more noise on one channel than the other.

## CONCLUSIONS

This attractively styled player is relatively easy to use and combined with the 3539 power amp offers a flexible and competent source of in-car entertainment. Admittedly the asking price is quite high and for rock and pop music the advantage over something like the Proton cassette playing combo won't be that obvious in a car. However, for new age and classical music – and anything with a piano in it – this set-up will prove its worth and can thus be Recommended.

Price: 7905M/3539 – £650/£350

The Alpine integrated units we tested last August made a good impression for this in-car only brand in the UK. The company is however, a major consumer electronics force in Europe.

The 7905M (another highly forgettable model number) head unit is finished in the usual Alpine house style – simple and attractively uncluttered compared to many CD player/tuners. The CD mechanism accepts nude discs and swallows them up in a reasonably civilised and fuss-free fashion. Therefore, unlike cartridge systems, one can use any disc direct from its jewel case, (with all the fiddling that that entails whilst on the move!) which does make using the same discs at home and in the car that much easier.

In view of its sexy appearance Alpine has made this £650 head unit a slide-in/out type to allow easy removal and thus avoid theft. Given the price one would have thought this an important feature, but the Alpine is in the minority here. However, if you can afford a grand's worth of ICE then perhaps you can also afford a garage. Ergonomically its simple appearance is a little misleading as many of the buttons have unusual legends such as SDK and MIX, and inevitably a lot of the controls have different functions for CD and radio. But it has a knob for volume/balance and individual sliders for treble and bass which are pretty straightforward, what's more they can be defeated with a switch in the body of the machine. Not surprisingly, this isn't something specifically for the purist but allows complete control with an external graphic equaliser. Phono sockets on flying leads are provided for front and rear outputs alongside a pair for an incoming line level signal, such as would be provided by a separate cassette player.

The Alpine 3539 power amp is a fairly hefty stereo machine rated at 150wpc into four ohms, which can be bridged for mono operation, and drive two pairs of speakers if required. The economical damage is £300, but it's a well finished box with gold plated connections all round.

## TUNER

The radio section of the 7905M uses straightforward seek tuning that runs up or down

through a band in either DX or local mode (high or low sensitivity) and stops at the next station until provoked to go on by the user. The six preset buttons will, once mastered, remember 12 FM stations and six on the long and medium waves. There's also a function called DAP (direct access preset) which allows the presetting of stations from different wavelengths on the same band.

Using DX mode sensitivity on the FM band this set picked up nine stereo and as many mono stations at the test site, all of which were pretty loud and clear, making it about average amongst this bunch.

Sound quality is unspectacular and as such on a par with the other radios in the test. Music sounds push in a slightly synthetic way, but a reasonable amount of information gets through on FM at least. AM is neither detectably any better nor worse than usual, with a few listenable stations on medium wave and the usual highly unnatural Radio 4 on long wave.

## CD PLAYER

Inserting a CD overrides the radio and play commences automatically. All the usual CD operation keys are available even if some legends are quite well hidden. Unfortunately the radio preset keys cannot be used for direct track access as they fulfil other functions in CD mode. These include repeat, scan, random play etc, and there's also buttons for programming track order, but the logic of these eluded me until I had fully



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# CLARION CDC7000/10028HA

CLARION SHOJI (UK) LTD, UNIT 1, MARSHALL RD, HILLMEAD, SWINDON, WILTSHIRE SN5 7DW. TEL: (0793) 870400.

RECOMMENDED



The Clarion is an attractive, if slightly complicated beast, with a well populated liquid crystal display and plenty of buttons and knobs to fiddle with. The *CDC7000* is hardly a conventional machine. Although nominally a CD/tuner the guts of the tuner live in a separate tin box and connect to the head unit via a DIN plugged umbilical, leaving more room for the CD player.

As with the JVC player tested this month it uses cartridges in which the CDs are placed (face down) in order to play them. The advantage here is that there's no fiddling around trying to open and close jewel boxes when on the road, and the disc is well protected. The drawback is that only five cartridges are supplied and they appear to be designed so that only people with three hands can open them! But I guess the Japanese are pretty deft, what with origami and all. A pack of five cartridges costs a not insubstantial £33.45.

On the security front the *CDC7000* is equipped with a security code system that disables the player once it's removed from a constant power source. The system's effectiveness will grow in proportion with people's awareness of it. At the time of writing I notice that Philips is advertising the system on the radio, but the bottom line is how observant is your local car radio thief?

The *CDC7000* is a little too busy to be ergonomically inviting and features such as high sensitivity seek tuning are relatively difficult to access. It also has more than its share of tiny buttons requiring some attention to manipulate, but it's well lit up and has an informative display.

The *10028HA* power amplifier is a particularly nicely made unit, with a substantial alloy case and even handles. The most realistic power rating quoted is 80wpc at 0.1 per cent THD with which it will drive a pair of 4ohm speakers; the power hungry can use it as a monoblok.

## TUNER

In seek mode the radio proved straightforward to use although attempts at counting stations in DX mode were not eased by the two hit system required to up the sensitivity. Presetting is reasonably foolproof – one can hold six stations per band, MW and LW are

separate, and using the SAM (signal auto memory) button six FM signals can be automatically preset, or alternatively SAM can be used as a second FM band.

Sensitivity in DX mode proved to be pretty average, the set managing to tune in 17 stations at the test site, most of which being mono, which isn't necessarily a bad thing – the set may merely have a realistic display. Many ICE units show a stereo beacon when the signal is too weak to give adequate stereo reception and so are rather misleading.

Despite the almost separate nature of the tuner's electronics, its sound quality didn't vary dramatically from that given by the others. The tuner is the one element that really needs to be road tested before its worth can be fully appraised, and unfortunately when you've got seven players this is rather impractical. And, of course, for serious radio users on the road RDS is the most logical approach. If anything the sound quality has a touch more clarity and depth than usual, but it takes serious A/B'ing to notice as much.

## CD PLAYER

Once the disc inside its cartridge has been inserted play starts automatically (overriding the radio if it's on). Different tracks can be found using the music search (skip) buttons and one can scan within a track using fast forward/reverse. It's possible to program up to 20 tracks and the selection will auto repeat ad infinitum unless discour-

aged, it will even carry on if you change the disc assuming the same track numbers are available.

First impressions were quite healthy, the amplifier producing high levels with little effort and the front-end reproducing discs with fluency. The balance again sounded a little bass forward with the Linn Sara speakers, but it's probably quite even when more appropriate transducers are used.

There's definitely an open informativeness in the way this combo reveals what's on the disc, and one gets a stronger impression of life and human endeavour in the music than with other machines, which may well be a result of better dynamic range and less limited bandwidth.

Although CD players theoretically have great bandwidth and dynamics this isn't always the case – especially in a field like this where, because of ancillary equipment and background noise, such things aren't always considered desirable. On most of the discs played there seemed to be more information or better resolution – for instance on a recent Claudio Arrau piece the odd whistling noises turned out to be the old man's breathing.

## LAB REPORT

Ironically, for what's apparently the best sounding CD player in the bunch it turned in the lousiest lab results, but basically it's a matter of interpretation. Perhaps a crosstalk figure of –55dB on each channel isn't such a bad thing; it's half that of domestic CD players but only about 20dB down on the best encountered in this test. Likewise the frequency response is unspectacular with close on 4dB difference in output between 20Hz and 4kHz, so one should expect emphasis on the upper midrange – which has something to do with its apparent transparency in this area – remember the breathing?

## CONCLUSIONS

Despite anomalies in the lab measurements and a slightly offbeat cartridge system, the Clarion duo put in a performance that, to my ears at least, has the edge over the other disc players on test and for that one can hardly fail to Recommend it.

Price: *CDC7000/10028HA* – £650/£250



# JVC XL-C30E/KS-A102

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



Not renowned (as yet) for its in-car equipment in the UK, JVC is in fact quite active on this scene and looks likely to heighten its profile with relatively inexpensive CD players such as the £499 *XL-C30*. This, along with the DAT player also reviewed, should at least ensure some high-end exposure. Like the Clarion the *'C30* only accepts discs contained in a CD jewel case-like cartridge, which keeps discs relatively clean whilst avoiding the bother of continually opening CD cases. The drawback is that only three cartridges are supplied and these are particularly fiddly to open, though no doubt a knack can be developed with practise. However, for the bargain price of £6.90 you can buy another three cartridges (which makes Clarion's five for £33.45 seem even more ludicrous – they are interchangeable), so it's not the end of the world as we know it.

Styling and build quality is slightly utilitarian though not cheap-looking, and despite the 15 key pad it doesn't appear too complicated or busy. One ergonomic drawback is the size of the inscriptions on many keys, which require some attention, especially in low light, before their function becomes clear – but this becomes less of a problem with familiarisation. Aesthetically the *'C30* is quite attractive, enough for some poor misguided soul to consider 'nicking it', and unfortunately aside from garages and alarms there's little that the machine can do to discourage him.

One unusual feature for a CD player is the aux socket (3.5mm jack) on the fascia, something that JVC fits to many of its players. It will accept any line level signal and in this case the output from a *Walkman* would seem appropriate.

Two *KS-A102* power amplifiers were used as a bridged pair for the listening tests. Relatively small and lightweight these £130 units are specified to deliver 30wpc at 0.08 per cent THD into 4-8ohms and cannot power more than one pair of loudspeakers.

## TUNER

Most of the radio controls are tucked away along the bottom row of CD access keys and include the usual seek, which runs upwards only, Lo/DX, mono and band select. The AM band accounts for medium and long wave

which are scanned in that order, each band having a generous ten presets, and logging stations is quite straightforward. A couple of uncommon functions are auto seek and auto recall – the first re-tunes to the next higher station when the tuned-in one gets too weak, and the latter retunes to preset number one when the present signal fades. If preset one is also weak it goes to two, and so on.

Before a stereo signal gets that weak an auto blend system comes into operation, not only blending stereo to mono as the signal weakens but also cutting high frequencies to reduce noise. Whereas the auto seek/recall functions can be switched out, this latter system is automatic.

Sound quality is essentially conservative, lacking the sparkle and scale of superior domestic models. There's also a slight veiling of information relevant to depth and ambience making the sound somewhat dry. Background noise levels are reasonable but there's a loss of low frequency extension, which could be due to the integral preamp. By and large it makes a fair job of that which it's given, it just lacks life.

## CD PLAYER

One area in which this player scores over the others in the group is that tracks can be directly accessed with the keypad provided. This has 15 numbered keys and one marked +10 for higher numbers, not entirely conventional but quite effective. The display shows both time and track as well as pro-

gramming status, but initial attempts at programming more than one track were rather fruitless. However, after concentrated study of the manual it's quite feasible to memorise up to 15 tracks whilst in stop mode. Other features include random playback and skip, but not scan – which may be a nuisance.

On listening to the set-up the initial impression is of impressive power, giving weight and impact to the likes of Yello's *The Race*. Further comparative listening reveals that speed and dynamics tend to be emphasised at the cost of control and presentation which occasionally seems a little thin and muddled. There also appears to be a bass hump and a lack of extension at LF, which, it must be said is a trait of many in-car players – not a particularly relevant criticism in the light of in-car loudspeakers which at best are unlikely to go down as far as 50Hz.

Using a piano piece showed up a certain hardness in the sound suggesting a degree of noise, but that aside this particular track sounded dynamic and involving which can't be bad.

## LAB REPORT

The frequency response proved quite reasonable by ICE standards (unlike flat response domestic players, ICE units have an unavoidable preamp in the signal path, which colours the response), revealing a slight hump at 400Hz which seems higher than the one noticed on audition, and remains within 1.5dB across the audio band. Again by domestic standards the crosstalk figures are quite poor at –69dB left and –65dB right, and these are partly indicative of a highish amount of spurious noise.

## CONCLUSIONS

A reasonably well equipped CD player and radio and some fairly powerful monoblocks when combined as a system make for dramatic in-car entertainment. There are others which are sweeter and others more 'ballys', but if you can handle the cartridge system and appreciate direct track access the JVC combo is well worth a try.

Price: *XL-C30E/KS-A102* – £499/£129.90.





# JVC KS-D1

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

RECOMMENDED



The *KS-D1* is the first in-car DAT (digital audio tape) player to come to our attention and as such is a brave move by JVC, not least because of the scarcity of software. When a new format is created there's often a chicken and egg situation where manufacturers wait for software and record companies wait for hardware. But these days major companies from both sides of the fence are amalgamated so that theoretically, both can be launched simultaneously. However, in the case of DAT the record industry, with its paranoia about piracy, is doing all it can to slow up proceedings.

Thankfully this blanket is beginning to wear thin, and DAT recorders are slowly filtering on to the market either as grey imports or officially with the likes of the Grundig Fine Arts machine which we hope to review next month.

There's also some growth in software production, a must if non-record machines are to sell – perhaps the likes of JVC should be producing its own. The tapes that were scabbled together for this review include a GRP sampler – a slightly rich collection of new age jazz from the likes of Dave Grusin, Chick Corea and Stephane Grappelli. And two tapes from the Capriccio label, Italian Trumpet Concertos and Baroque Brass music, perhaps a little esoteric for my taste but quite informative from a reviewing point of view.

Not unlike the Pioneer *DEX-M300* the JVC *KS-D1* is a knob free device offering a relatively flat fascia to the user. Volume is electronically controlled, in rather large increments with up and down switches; and a sliding scale on the display indicates the level at which it's set – useful when inserting a new tape. The combination of these up/down controls and the display is neatly used to alter tone, balance and front/rear fading by using the appropriate buttons to select function, so cutting down on switches and simplifying appearance. Most buttons are sculpted to give touch identification, which is both attractive and practical for the driver. Connections are included for an external source such as a cassette or CD tuner which will play as long as there's no tape inserted.

The styling and finish is more sumptuous and sophisticated than the *C30* CD player,

but at twice the price one expects improvements. The DAT mechanism itself is quite straightforward and operates much like that on a VCR, but for some reason wouldn't accept one of the test tapes that the reference Grundig domestic DAT recorder put up with. It could have been that the cassette's moving parts weren't working precisely – so make sure you keep them in their cases. The transport is also a lot noisier than cassette or CD, which won't be a problem in the average car but might niggle *Rolls-Royce* owners.

Like the *C30* this machine makes no attempt at theft prevention, so the usual warnings apply. Quite why more of these players aren't of the slide-out variety is baffling; it obviously costs something but this is a £1,000 player – so how painful can another £25 be? For those concerned about the safety of valuable in-car gear it is possible to purchase trays to adapt any ICE unit for easy removal.

The power amps used to audition this machine are the same *KSA102s* used with the *C30*; suffice to say that they are 30wpc stereo amps used in bridged mode which should double continuous output.

## DAT PLAYER

One of the major operational advantages that DAT players have over their analogue cousins is that you get the same track accessing flexibility as a CD player, so there's no more winding back and forth to find the beginning of a track. Because it still has to wind the tape, track access isn't as quick as a CD player but it's a lot faster than compact cassette. For this reason the *KS-D1* is equipped with a ten digit keypad and a +10 button – presumably a domestic style keypad (working like a calculator) is too bulky and/or expensive. It also features many of the controls of an in-car CD player, including skip, repeat and intro scan which gives you the first 12 seconds of each track. However, there's no scan function for moving around within a track which is a limitation of the machine, not the DAT medium.

In true ICE style the *KS-D1* auto plays on tape insertion and auto rewinds and replays at the end of a tape, there's no stop switch, just off or eject. Programming is surprisingly simple and up to 30 tracks can be memorised.

For the assessment of relative sound quality it would have been useful to have compared prerecorded DATs and CDs but unfortunately this wasn't possible due to the infantile nature of DAT software and the far from comprehensive availability of CDs. Using the tapes I had and comparing them with similar CDs revealed an apparent improvement in clarity, imaging and naturalness. This could be put down to software but it's unlikely that the GRP tape is fundamentally any better a recording than a DMP compact disc which on most machines is startling. The difference either indicates that this particular DAT player is superior to a CD player made by the same company and costing half as much, or that the medium itself is slightly better.

Non comparative listening suggested precise presentation of complex pieces, instruments overlapping in a well defined and neutral fashion. The almost clinical way that music is presented is initially unappealing, but the impression is that information isn't being blurred by noise to the extent that it can be with discs. Brass retains its natural, almost painful edge and strings don't sound glassy in the way they can on CD. Saxophone on the GRP sampler sounded remarkably open and breathy and other instruments playing at the same time don't disturb this – in fact dynamics and imaging are the machine's most noticeable strengths. This isn't to say any tape will sound wonderful; the classical pieces which were probably recorded with less resource to studio effects sounded comparatively small and mundane.

Like any medium it's limited by its software, but given something with bandwidth and dynamics this in-car player makes a healthy attempt at reproducing it, and compression (deliberate or otherwise) doesn't seem to be so rife as it is with in-car CD. But then again I've never heard a £1,000 in-car CD player.

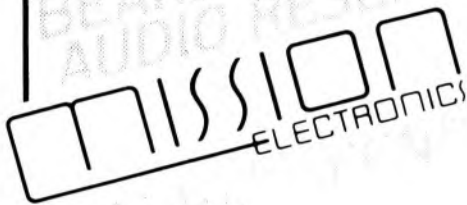
## LAB REPORT

We very nearly didn't have the software to carry out lab tests, but the timely arrival of the aforementioned Grundig allowed us to make a quick test tape with which a frequency response was plotted. This turned out to be the most even in the group but still not ruler flat, remaining within 0.5dB up to 15kHz where a slight rise occurs. This could well have emphasised the open, airy quality of the player and given a slightly false impression of clarity.

## CONCLUSIONS

The make or break factor with the *KS-D1* will be software and the availability of DAT recorders enabling you to make your own tapes. It's still hard to tell whether either will become widely available, and if they do how long will it be before they become affordable? As an in-car music source it's uncannily dynamic and informative, and for that reason a Recommendation is mandatory. In the meantime, what are you going to play on it? Price: *KS-D1* – £1,000.

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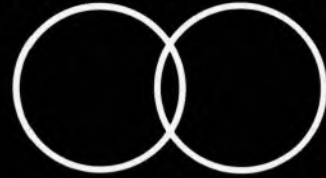


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# NAKAMICHI TD-700E/PA-300II

CAR AUDIO CONSULTANTS, 141 GREYHOUND ROAD, LONDON W6 8NJ. TEL: (01) 381 5174.



The *TD-700* is a straightforward unidirectional cassette player/tuner, which from the point of view of layout is 75 per cent cassette and 25 per cent tuner. Not that the latter is an afterthought, it's just that if you spend £800 on a cassette playing head unit the chances are you'll be using that part of it quite a bit. The transport controls are unusually generous in size, directly relating to the clumsy digits of the driver who shouldn't have to study the player in order to get it to succumb to his or her will.

The standard of finish and build quality is exemplary, as good if not better than the Alpine which is the other very attractive machine in this month's group. Points in its favour include the small green LEDs that light to indicate the transport function in use, and push-in rotary controls for treble, bass and mid. One feature I've not come across before is that the player can be partly disassembled and put into play mode to aid cleaning with the pen provided. The way it aids and abets the user in this task is quite extraordinary and should encourage the ten-hourly cleaning that Nakamichi recommend.

The *PA-300II* is the same power amplifier used with the *TD-400* in last September's test, as it fits nicely into the £1,000-ish price constraint we established for this test. It's a reasonably neat beast which, according to the manual, has a specified output of 75wpc at 0.003 per cent THD, and is designed to drive a single pair of speakers.

## TUNER

First attempts at locating the FM band were somewhat unsuccessful, but the button was eventually located and the upwards-only seek function used to find GLR (Greater London Radio - a BBC station). Seek is accurately labelled 'scan' as the function runs through the band stopping at each signal for eight seconds when it can be stopped if required. One can manually seek in both directions and memorise stations with the six presets; more presets or another band would be useful but isn't essential. The only other radio control is the DX/Lo button for increasing sensitivity. In its most receptive state the *700* dragged in 13 FM stations - which puts it in the 'fairly deaf' category - however the majority were in 3-D stereo and

none suffered from interference - a conservative but realistic wireless.

The sound quality it produces, given a reasonably strong signal, is unusually clean and analytical. Certainly the unit is revealing of limitations in broadcast quality, which in the case of the station above and many others means severe dynamic compression and limited bandwidth. But this isn't enough to crush a good song and if one comes along the *TD-700* gives it a better chance than most to hit the spot.

## CASSETTE DECK

The raison d'être of the *TD-700* is of course the replay of compact cassettes, which it does with considerable professionalism, a situation that first becomes apparent when loading a cassette. If you haven't fully read the multi-lingual manual its reaction is slightly baffling as the transport first rewinds and fast forwards in turn to take up any slack in the tape. Very slick. The transport controls are fully logical electronic types and include a clever track seek system enabling track location that is ten tracks away in forward and nine away in reverse mode - which isn't quite DAT but is obviously helpful.

For the hi-fi oriented the most attractive feature of this deck is the azimuth adjust knob allowing fine tuning of azimuth (that perpendicular angle of the magnetic head) to achieve maximum HF response. One of the major drawbacks of a non-recording cassette

deck is that it has to replay tapes made on a different machine and the angle of the heads in that machine will probably be slightly different resulting in a HF response drop.

But what does all this trickery do for the sound? Using the azimuth adjustment improved the HF response of all the tapes tried, commercial and homemade. The degree of adjustment required is not that great, but if the treble is temporarily boosted the effect becomes obvious and thus optimising isn't difficult. The treble is one of the most obvious strengths, being well extended and remarkably secure and generally the sound quality is uncannily revealing and analytical. Given a good tape such as a Steve Berry real time studio copy it presents instruments in an almost tactile fashion; this coupled with an unusual naturalness creates a deep and ambient acoustic. The standard that can be achieved with this player is almost entirely limited by the software - get hold of a first generation studio copy and you have the event in your car, but with regular musicassettes this is inevitably compromised.

## LAB REPORT

In the lab the *TD-700* backed up findings on audition, turning in a healthy 0.075 per cent wow and flutter figure (DIN weighted) consistent with its remarkable stability. The frequency response was taken with the azimuth set at zero and would have been more level had we adjusted it. As it was, the player turned in a very smooth response that drops by 10dB between 200Hz and 2kHz - one would expect a broad HF lift of at least 5dB if azimuth were optimised.

## CONCLUSIONS

The Nakamichi *TD-700E/PA-300II* is a superb analogue in-car replay device and if you are a devout vinyl user making tape copies at home for listening on the road there's little to better it. For those converted to the bit-stream at home it's less practical, as an in-car CD system makes more economical sense. But if you like the sound of shuffling feet it can't be beat. Recommended, with apologies to Lowell George!

Price: *TD-700E/PA-300II* - £795/£299.



# PIONEER DEX-M300/CDX-M100/GM-3000

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



Pioneer has for some time maintained a high profile on the in-car front, and along with Sony was one of the first companies to introduce CD players for the car. That first system incorporated a boot mounted CD autochanger and the equipment in this review maintains that approach. The *DEX-M300* is a CD control unit and tuner, while the *CDX-M100* is a multi-disc CD player which, when operated by the control unit plays tracks from any one of the six discs in its magazine and can be remotely sited in the car. The final link is the *GM-3000* power amplifier which brings the complete system price up to £1,030.

The *DEX-M300* barely resembles a piece of in-car hardware – in fact in its inactive state it looks more like a shrunken domestic CD player, this being mainly due to the complete lack of rotary knobs – all controls are electronic buttons. It's not the sort of player for those prone to technofear, but given the complexity of the tasks it has to accomplish the multi labeling is excusable, if the lack of a volume knob is not. And of course, it looks very slick for it.

Ergonomically it's something of a disaster as a fair amount of self training has to be undertaken before one is fully conversant with the various functions, but the large liquid crystal display is helpful in this respect. The control panel employs the unusual anti-theft approach of being removable whilst leaving the electronics in the car behind a blank facade, which as the panel is small and light enough to put in your pocket is one up on a slide out design.

The *CDX-M100* autochanger is a fairly large box of pretty bland appearance accepting the same CD magazines that Pioneer uses in its domestic players. These hold up to six discs which have to be placed playing side up in the trays – not a great deal happens if you put them face down! The *GM-3000* power amplifier is a bold and beefy piece of engineering, fitted with a plethora of little switches and lights – enough to give purists the shivers. The quoted power output for 0.08 per cent THD is 80wpc stereo, but the heavily heatsinked case is emblazoned with the legend 2x150W. It can be used in two, four or three channel mode, the latter presumably for a subwoofer, and even accepts more than one input – if you've got the right DIN plug!

## TUNER

Once you've sussed that the display graphics relate to the buttons beneath them, and have discovered the tuning bar, it's possible to locate stations using the seek tuning system. Presetting is I'm glad to say easier, and using the six preset keys one can programme up to 18 FM stations and six AM ones. It's even possible to get the machine to set presets using the BSM (best stations memory) function. An unusual feature is that sensitivity can be adjusted whilst tuning in local mode in order 'to match local conditions'. On maximum local sensitivity I picked up a total of 19 FM stations, of which the majority were stereo.

Given a strong signal the radio can sound reasonably revealing and tight, but for most of the time it sounds like the majority of the bunch – rather compressed and rich. This may well reflect broadcasting, but I've heard better from domestic tuners.

## CD PLAYER

The on/off button also serves as a source selector and its priority is to play CDs, starting with the first track of the top disc in the magazine. From there, what was the seek button becomes a track access control with which one can skip merrily about the disc until a desirable tune is found. The six preset buttons are used to select between discs, the display indicating which disc and track is being played.

Those keen enough to plough through the manual will see it's theoretically possible to programme 32 tracks per magazine for up to 16 magazines (that's if you keep a grand's worth of CDs in the car). Magazines are identified by the top disc, so changing this will mess up the programme. I also found that the various instructions had to be carried out quite swiftly in order to successfully programme selected tracks, another area where practise is required to improve usability.

The combo's sonic signature is essentially neutral. The various discs used sounded, if anything, slightly lacking in detail and resolution, giving the impression that musical information is being squashed together. There seems to be a subtle loss of dynamics and a restricted sense of space in the imaging, however, the musical presentation is by no means unenjoyable with better discs shining through and proving that any veiling of the attack and decay of notes is slight. The combination of upper mid and quite low frequency notes on one of the Yello tracks gave the impression that the response is far from flat. Compared to a reference the higher notes were significantly overshadowed by the lower ones. When it came to testing this in the lab the machine refused to play and feigned death, but judging from the frequency responses created by the other CD players tested one can safely assume that this player, along with its preamp, has a downwards tilting response.

## CONCLUSIONS

In order to highlight the differences between the 'good' and the 'very good' it becomes necessary to sharpen ones critical claws. So, because of the over complex controls and slightly below par sound quality we cannot recommend this Pioneer set-up. However, its advantages to someone who uses a Pioneer multi-play machine at home are enormous, and for this reason along with its theft proofing, it is definitely worth considering.

Price: *DEX-M300/CDX-M100/GM-300* – £300/  
£450/£280



# PROTON 214CD/D275

PORTFOLIO MARKETING, HILLBOTTOM ROAD, SANDS IND. EST, HIGH WYCOMBE, BUCKS HP12 4HT. TEL: (0494) 463345.



The somewhat misleadingly named *214CD* submitted for this review turns out to be an autoreverse cassette/radio of primarily integrated design. However, it does feature both phono and front mounted jack sockets for connecting a separate CD player of either personal or in-car design.

The appearance and styling of the *214CD* lives up to its relatively low £300 price – the quality of plastic is not particularly sumptuous and it seems fairly flimsy. Ergonomically the layout is quite helpful, the controls have legible and straightforward legends, and some logic has been applied to switch grouping. A detail that particularly appeals is the way the four minor rotary controls, for balance, tone and the like, will push in when not in use. On the theft-proofness front it's somewhat ill-prepared, so is best suited to more civilised neighbourhoods, garages or cars with alarms. Don't leave it in your *Viva* overnight in Handsworth!

This Proton is essentially an integrated unit and unlike the other machines in this test can be used on its own without a separate power amplifier. Rated output is 18watts. In line with this the connections sprouting from behind are for a pair of speakers, CD input and rear channel only output, thus it's this signal that was used to drive the *D275* power amplifier in the listening tests.

The *D275* is a fairly large and well finished power amp designed to drive one pair of loudspeakers or to be used in bridged mono mode; its nominal output rating is 85wpc. It has inputs for high or low level signals, enabling it to be used with front-ends not equipped with a line level output. One end of the *D275* bears the legend 'Dynamic power on demand' – but don't let it put you off!

## TUNER

The radio is fairly straightforward and I was able to seek tune in both auto and manual modes and preset stations without so much as a glance at the instruction manual. It has a healthy complement of eight presets for each band, but whether this is adequate for such a sensitive tuner is debatable. It managed to pick up a total of 29 stations on the FM waveband at the test site. Admittedly at least four of these were unlistenable reception-wise, but it still makes the competition

look deaf. It also proves that pirate radio is very much alive down here on the river.

One slightly irritating quirk is that the receiver won't run from one end of a band straight to the beginning – ie on FM, from 108MHz to 87.5MHz. One has to get there backwards. Another minor nuisance is when listening to a strong signal in DX mode one encounters noise and interference. Radio Three, for instance, fluctuated in and out of stereo.

The sound quality under admittedly crude comparative conditions is not significantly different to that encountered on the costlier sets in this test. Given a reasonably strong signal it manages to reveal a fair amount of information in a polite and only slightly veiled fashion, the electronics not apparently hampering its relative performance.

## CASSETTE

I guess Proton's excuse for the suffix on the *214CD* could be that it stands for cassette deck, as it certainly has one of those. And quite a well equipped one at that. Its qualifications include Dolby B and C noise reduction circuits, chrome/metal equalisation, autoreverse and a music search system called APS (automatic program search). The latter is of course subject to the usual limitations – a three second silent gap on the tape is what's looked for and it ain't too fussy where it finds it. However, on most tapes this system is reasonably effective and useful.

On the sound quality front technically it

doesn't offer much competition for costlier CD players, background noise and limited bandwidth being the most obvious failings. However, on purely musical grounds, given a well made bit of software, it can give most in-car systems a run for their money.

A recording of Green on Red's *No Free Lunch* was so emotionally involving that I forgot to analyse the sound and started to listen to the music and ended up listening to the whole album. There was no obvious loss of information and high frequencies seemed well extended and secure. Undoubtedly, comparisons with the likes of the Nakamichi in this test would have revealed shortcomings, but auditioned in isolation this inexpensive Proton player was extremely entertaining.

## LAB REPORT

For a £300 cassette deck the results we measured were by no means shabby, the frequency response apparently being better than the costly Nakamichi in the group (read its lab report for an explanation). It appears to enjoy a reasonably even and flat response between 200Hz and 2kHz, before rolling off to 10dB down at 10kHz. Wow and flutter at 0.22 per cent (peak DIN weighted) is also acceptable at the price and reflects the relative security of long notes encountered on audition. Certain instruments such as pianos and oboes can highlight this level of wow, but the majority of material will not be obviously affected.

## CONCLUSIONS

Given the relatively low price of the Proton combo and its musical coherence, it seems a bargain – though I'm a bitten 'analogophile' and could be accused of being biased. As a sub £500 cassette playing system it offers good power and a level of fidelity appropriate to its price, and if the standard of finish had been less flaky I would have jumped to Recommend it. But under the circumstances it makes the 'well worth considering' standard.

Price: *214CD/D275* – £300/£175



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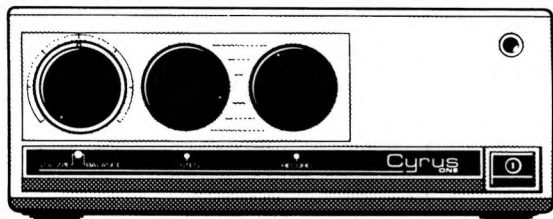
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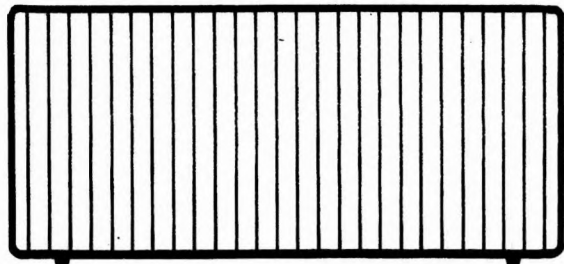
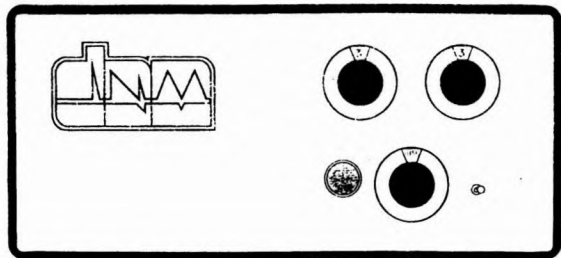
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## BEDFORDSHIRE


ASHTON AUDIO, 6 High Street, Dunstable. (0582) 608003. AR, Cambridge Audio, Denon, JVC, Monster, NAD, Nakamichi, Quad, Rotel, Sony, etc. Credit to £1,000. Access, Amex, Diners, Visa. Service dept. Open 9-5.30, 6p.m. Friday.

## BERKSHIRE

NEWBURY AUDIO, 2 Weavers Walk, Northbrooke Street, Newbury, Berkshire RG13 1A1 (0635) 33929. 6 days 9.30-6.00. Linn, Naim, Roksan, Exposure, A&R Cambridge, Ion Systems, Revolver, Ruark, SD Acoustics, Monitor Audio, Manticore, Nakamichi, Dual, Rotel, Royd. Dem room. Home trial facilities. Free installation. Late appointments. Interest free credit. Access, Visa.

READING HI-FI CENTRE, 4-6 Harris Arcade, Friar St, Reading. (0734) 585463. 'The best equipment, advice and service from Berkshire's premier Hi-Fi emporium'. BADA MEMBER 

## BUCKINGHAMSHIRE

AUDIO INSIGHT LTD, 53 Wolverton Rd, Stony Stratford, Milton Keynes. (0908) 561551. A&R, Audiolab, Heybrook, KEF, Linn, Mission Cyrus, Musical Fidelity, Nakamichi, Nytech, Rotel. BADA MEMBER 

AYLESBURY HI FIDELITY, 98 Cambridge St, Aylesbury. (0296) 28790. Dual, Heybrook, Linn arms, Musical Fidelity, Mission, NAD, Nakamichi, Quad, Rotel, I.T.L. 2 Dem rooms, appointment reqd. Mon-Fri 10-6, Sat 9.30-5.30. Home trial, free installation, credit to £1,000. Access, Amex, Diner, Visa. Service dept.


## CAMBRIDGESHIRE


CAMBRIDGE HI-FI, 1 Hawthorn Way, Cambridge. (0223) 67773. Ariston, I.T.L., KEF, Mission Cyrus, Monitor Audio, Pioneer, Revolver, Technics, Thorens, Kenwood. All credit cards.


CAMBRIDGE HI-FI, 31 Cuthbert St, Bedford. (0234) 325035. Mission-Cyrus, Rotel, Kenwood, Pioneer, Manticore, Revolver, Ariston, I.T.L., KEF, Monitor Audio. Single speaker dem room. 9.30-5.30 6 days. Free installation. Service Dept. Visa, Access. Credit facilities.


STEVE BOXSHALL AUDIO, 41 Victoria Rd, Cambridge CB4 3BW. (0223) 68305. 10-6 - 6 days. Denon, Rotel, Dual, Monitor Audio, Tannoy, Quad, KEF, Roksan, Nakamichi, Revox, SME, Audio Research, Krell, Magneplanar. 3 dem rooms, home trial, appointment preferred. Free installation and service dept. Access, Visa and credit facilities.

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ASTON AUDIO, 4 West St., Alderley Edge. (0625) 582704. Wide selection of equipment in N.W. 2-year guarantee. 3 dem rooms. Tues-Sat 10-6. BADA MEMBER 


DOUG BRADY HI-FI, Kingsway Studios, Kingsway North, Warrington. (Padgate 0925) 828009. 'Largest choice of specialist Hi-Fi in N.W.'. All credit cards. 3 Dem rooms. BADA MEMBER 

NEW DAWN HI-FI, 1-3 Castle St, Lower Bridge St, Chester. (0244) 24179. Linn, Quad, Technics, National Panasonic, Denon, Rotel, Dual, Meridian, Aiwa, Philips. BADA MEMBER 

SWIFT OF WILMSLOW, 4-8 St Annes Parade, Wilmslow. (0625) 526213. A&R, Aiwa, Denon, Marantz, Mission, Monitor-Audio, Pioneer, Trio, Yamaha, NAD. Dem facilities. Tues-Sat. BADA MEMBER 

RICHER SOUNDS, 4 Wellington St, Stockport SK1 3RN. (061) 480 1700. Cheerfully small store by BR station with virtually all major 'budget' names; many on special offer. Facilities: expert advice; free 48 page Hi-fi Guide and monthly Newsletters; part exchange. Mon-Fri 10-6, Sats

10-5. Access, Visa, Richer ChargeCard. Mail Order for all Richer Sounds stores from this branch

CHRIS BROOKS HI-FI, 29 Gaskell St, Stockton Heath, Warrington. 0925 61212/3. Tues-Sat 10-6. 2 dem rooms. Credit facilities. All credit cards. Total absence of bull\*\*\*\*. BADA MEMBER 

## CORNWALL


N.C.E. HI-FI, The Bridge, Boscastle, N. Cornwall (08405) 248. Ariston, Arcam, Creek, Denon, Dual, Gale, Heybrook, Incatech, Marantz, QED, etc. Dem room. Full credit facilities including interest free. Access, Visa.


TRURO HI-FI & E.T.S. Ltd, 25 King St, Truro (0872) 79809. A&R, Denon, Dual, Heybrook, Linn, Mission Cyrus, Nad, Quad, Rotel, Thorens. Dem and home trial facilities. Mon-Sat 8.45-5.30. Credit to £1,000. Access, ETS Visa. Service dept.

## DERBYSHIRE

ACTIVE AUDIO, 12 Osmaston Rd, The Spot, Derby. (0332) 380385. Meridian, Mission, Denon, Yamaha, Rotel, A&R Cambridge, Monitor Audio, Trio, Marantz. Dem and home trial facilities. Open 9.30-6 - early closing Wed. Credit to £1,000. Access, Visa, Diners, American Express. Service dept.

## ESSEX


A.T. LABS, 442/4 Cranbrook Rd, Gants Hill, Ilford. (01) 518 0915. Mon-Sat, 10-6. Two single speaker dem rooms. Access, Amex, Visa. BADA MEMBER 


RAYLEIGH HI-FI, 44a High Street, Rayleigh, Essex. (0268) 779762/747571. 216 Moulsham St, On-the-Parkway, Chelmsford, Essex. (0245) 265242. A&R, Audiolab, Beyer, BLQ, Cyrus, Celestion, Denon, DNM, Epos, Gale. Access, Visa. 3 years parts and labour guarantee on hi-fi systems. BADA MEMBER 

BRENTWOOD MUSIC & HI-FI CENTRE, 2 Ingrave Rd, Brentwood. (0277) 221210. Alphason, B&W, Cambridge Audio, Denon, Harman Kardon, Marantz, QED, Quad, Yamaha. Dem and home trial facilities. Mon-Sat 9.30-5.30 (Thurs from 10am, Sat from 9am). Free installation, credit facilities. Access, Visa, Hi-Fi Markets. Service dept.

LYON AUDIO, 16 Peartree Business Centre, Peartree Road, Stanway, Essex CO3 5JN. (0206) 560259. Audiolab, Beard, Celestion, QED, Rogers, Denon, NAD, Rotel, J.A. Michell, Roksan, Gale, Quad. Dem facilities. Mon-Sat 9-6. Installations. Credit facilities up to \$1000. Access, Visa, Hi-Fi Markets, Eurocheque. Service dept available.


## GLOUCESTERSHIRE


ABSOLUTE SOUND AND VIDEO, 40/42 Albion St, Cheltenham. (0242) 583960. A-R, Denon, Dual, Linn, Meridian, Mission, NAD, Rotel, Technics, Yamaha, etc. (Closed Wed). BADA MEMBER 

AUDIO EXCELLENCE, 58 Bristol Road, Gloucester. (0452) 30046. Audio Research, Dual, Krell, Linn, Magneplanar, Naim, NAD, Yamaha and lots more. Closed Mon. BADA MEMBER 

ROBBS OF CHELTENHAM, 3 Clarence St, Cheltenham. (0242) 584404. Sansui pure hi-fi, Kenwood, Sony ES, Dual, Technics, QED, Heybrook. Dem facilities. Mon-Sat 9-5.30. Instant free credit. Visa, Access. Service dept.


## HAMPSHIRE

ABSOLUTE SOUND AND VIDEO, 4 Feathers Lane, Basingstoke, Hants RG21 1AS. (0256) 24311. A&R, Audiolab, Denon, Dual, Linn, Mission, NAD, Rotel, Technics, Yamaha. Dem and home trial facilities. Mon, Tues, Thurs, Fri 9.30-6, Sat 9.30-5.30. Closed Wed. Free installation. Credit facilities. Access, Visa, Connect, Amex, Diners. Service dept. BADA MEMBER 

HAMPSHIRE AUDIO Ltd, 2-12 Hursley Rd, Chandlers Ford. (0703) 252827/265232. Quality CD and analogue agencies. 5 dem studios. Large free car park. BADA MEMBER 

TRUE-FI SOUND AND VISION, 10/12 Grosvenor Rd, Aldershot. (0252) 26390. Akai, Aiwa, B&W, Nakamichi, Hitachi, JPW, Mission, Mordaunt-Short, Nagaoka, Sony, etc. Dem facilities. Mon-Sat 9.30-6.00. Free installation, credit to £1,200. Access, Visa. Service dept.

## HERTFORDSHIRE

ACOUSTIC ARTS Ltd, 101 St Albans Rd, Watford, Herts. (0923) 45250. A&R, Audiolab, Denon, Magneplanar, Quad, Rogers, Meridian, TDL, Jadis, Krell. Mon-Sat 9.30-5.30. BADA MEMBER 

THE AUDIO FILE, 40 Hockerill St, Bishops Stortford,

Herts CM23 2DW. (0279) 506576. 9.30-5.30 6 days. Linn, Roksan, Rega, Naim, Denon, Mission, Cyrus, Marantz, Quad, Tannoy, Sony. 2 dem rooms. Home trial, free installation service dept. Interest free. Bada Charge Card. BADA MEMBER 

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ISLAND COMPACT DISC CENTRE, Parliament Square, Ramsey. (0624) 815521. Musical Fidelity, Sugden, Celestion, Harman Kardon, Teac, Castle Acoustics, Philips, A&R, JBL, Luxman, Bose, Sansui. Mon-Sat 9-5.00. Dem and home trial facilities. Free installation. Full credit, no limit. Access, Elite. Service dept.

## KENT


JOHN MARLEY HI-FI CENTRES, 2 Station Rd West, Canterbury. (Canterbury) 69329. Also at Dover - (0304) 207562. B&W, Heybrook, Magnum, M.Y.S.T., Nakamichi, Pink Triangle, Rotel, Sansui, Technics, Quad. Dem and home trial facilities. Mon-Sat 9-5.30 closed Thurs. Free installation. Credit to £1,000. Access, Visa, Creditcharge. Service dept.

VJ HI-FI, 29 Guildhall St, Folkestone. (0303) 56860. Mon-Sat 9-6. NAD, Yamaha, Marantz, Cambridge Audio, Denon, Kenwood, Tannoy, Rogers, Mordaunt Short, Dual. Dem and home trial facilities, free installation, credit to £1000. Amex, Diners, Visa, Access. Service dept.

## LANCASHIRE

MONITOR SOUND, 54 Chapel St, Chorley. (02572) 71935. A&R, Dual, Mission, Quad, Rogers, Rotel, Spendor, Thorens, Nakamichi, Yamaha, etc. 2 dem rooms. Open Mon-Sat, closed Weds. Free installation. Credit to £1,000. Access, Visa. Service dept.

## LEICESTERSHIRE


SOUND ADVICE, The Sound Factory, Duke St, Loughborough LE11 1ED. (0509) 218254. A&R, Creek, Linn, Epos, Mission, Cyrus, Naim, Rega, Roksan, Rotel, Yamaha. Dem facilities, appointment reqd. Mon-Sat 9.30-6. Free installation. Credit facilities. Access, Visa, Amex. Service dept. BADA MEMBER 

ALPHA AUDIO, 1-3 Guildhall Lane, Leicester, LE1 5FQ. (0533) 518597 or 530330. Aiwa, Akai, Ariston, Bose, Cambridge, Celestion, Denon, Harman Kardon, Musical Fidelity, Rotel, etc. Mon-Sat 9.30-5.30. Free installation. Credit to £1,000. Dem facilities. Access, Visa.

MJS HI-FI, 80 Stapleton Lane, Barwell, Leicester LE9 8HE. (0455) 469777. The Rock, Audio Innovations, Kelvin Labs, Snell, Helius, Sugden, Ruark, Concordant, Valdi, JPW. Our main aim is for our customers to enjoy music. Dem and home trial facilities. Mon-Sat 9.30-7.00. Free installation and service dept. Visa, Access.

THE LEICESTER HI-FI CO, 6 Silver Walk, St. Martins Square, Leicester LE1 5EW. (0533) 539753. 6 days 9.30-5.30. A&R Cambridge, Heybrook, Marantz, Mission, Musical Fidelity, Nakamichi, QED Hi-Fi, Quad, Revox, Roksan "and oodles more". Largest selection in Leicestershire. 2 dem rooms. Home trial arranged + free installation. Credit facilities. Hi-Fi Markets, Access, Visa, Am. Exp. Service dept.


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A.T.LABS, 159 Chase Side, Enfield, Middlesex. (01) 367 3132. Mon-Sat 10-6. Two single speaker dem rooms. Service dept, car park. Amex, Visa, Access. BADA MEMBER 

AUDIO T, 190 West End Lane, London NW6. (01) 794 7848. Mon-Sat, 10-6. Two single speaker dem rooms. Access, Amex, Visa. BADA MEMBER

CORNFLAKE SHOP, 37 Windmill Street (just off Tottenham Court Road), London W1. (01) 631 0472. Mon-Sat 10-7. DNM, Epos, Koetsu, Marantz, Naim, PS Audio, Rega, Roksan, SME, Yamaha. 2 dem rooms, full delivery and installation. Credit facilities. Access, Visa.

COVENT GARDEN RECORDS, 84 Charing Cross Road. (01) 379 7635/7427. Quad, B&W, Meridian, Mission, Yamaha, Sony, A&R Cambridge, Nakamichi, Rotel, etc. Dem facilities - no appointment reqd. Mon-Sat 10-7.30. Home trial facilities, free installation. Access, Visa, American Express, Diners Club. Service dept.

DOUG BRADY HI-FI, 18 Monmouth St, London WC2H 9HB. (01) 379 4010. Wide range of top specialist hi-fi from Britain, America and Japan. 3 Dem rooms. BADA MEMBER 

GRAHAM'S HI-FI, 86-88 Pentonville Rd, London N1. (01) 8374412. 'FBA Dealer of the year 1985'. Linn, Naim, Rega etc. £300-£3,000-£13,000. BADA MEMBER 

H.L. SMITH & Co Ltd, 287-289 Edgware Rd, London W2

1BE. (01) 723 5891. Aiwa, B&W, Denon, Dual, KEF, Ortofon, Panasonic, Sony, Technics, Yamaha. Dem facilities. Mon-Sat 9.5-3.0, Thurs 9-1. Credit to £1,000. Access, Visa, Diners. Service dept.

KJ WEST ONE, 26 New Cavendish St, London W1M 7LH. (01) 486 8262. A&R, Audio Lab, B&W. Audio Res - Krell, Rogers, Gale, Musical Fidelity, Linn, Nakamichi, etc. SUBJECTIVE AUDIO LTD, 12 Park Avenue, Palmers Green, London N13 5PF. (01) 882 4975. Air Tangent, Apogee, Alphasound, Audio Research, Koetsu, Krell, Meridian, Nakamichi, Oxford Acoustics, Tandberg, etc. 2 dem rooms, appointment reqd. Tues-Fri 10-6, Sat 9-5. Home trial facilities. Design & installation service. All major credit cards. Service dept.

THE SOUND ORGANISATION Ltd, No. 1, Cathedral St, London Bridge, London SE1 9DE. (01) 403 2255/3088. Counterpoint, Denon, Exposure, Koetsu, Linn, Naim, PS Audio, Roksan, Rega, SME etc. Dem facilities, appointment reqd. Tues-Sat 10-7. Free installation. Access, Visa. Service dept.

RICHER SOUNDS 2, 6 London Bridge Walk, London SE1. (01) 403 1988. Major names in esoteric hi-fi, unusually matched to discount offers and special end-of-line purchases. Dem facilities, expert advice, free local delivery & installation (£500+), plus 2 Yr G'tee. Hi-Fi Guide and monthly Newsletters; part exchange. Mon-Fri 10-7, Sat 10-5. Access, Visa, Richer ChargeCard. Service Department.

RICHER SOUNDS, 2 London Bridge Walk, London SE1 2SX. (01) 403 1201/4710. The original bargain hi-fi store, now refitted; 100s of regular and special discounts on most budget/mid price major names. By London Bridge. Facilities: expert advice; free 48 page Hi-Fi Guide and monthly Newsletters; mail order; part exchange. Open Mon-Fri 10-7, Sat 10-5. Access, Visa, Richer ChargeCard. Service Department.

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UXBRIDGE AUDIO LTD, 278 High St, Uxbridge, Middx UB8 1LZ. (0895) 33474/31993. A&R, AR, Ariston, Creek, Cyrus, Denon, Dual, JPW, KEF, Manticore, Meridian, NAD, Nakamichi, Quad, Rotel, Wharfedale, Yamaha, etc. 2 dem rooms. Mon-Sat 10-6. BADA MEMBER

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W.A. BRADY & SON, 401 Smithdown Rd, Liverpool. (051) 733 6859. Largest choice of specialist Hi-Fi in N.W. £100-£20K. All credit cards. 3 dem rooms. BADA MEMBER

PURE SOUND - Birkenhead 051 645 6690 24hrs. Acoustic Energy, Aragon, Audio Technica, Beard, Celestion, Deltec, Denon, Michel, Cyrodec, Ortofon, SME. Home demonstration a pleasure, plus evenings and weekends (Sundays by appointment).

RICHER SOUNDS, 69B Church St, Liverpool L1 1DN. (051) 708 7484. Virtually every major 'budget' name - small store with big discounts and special offers. Facilities: expert advice; free 48 page Hi-Fi Guide and monthly Newsletters; mail order; part exchange. Mon-Fri 10-6, Sat 10-5. Access, Visa, Richer ChargeCard.

## NORFOLK

SOUND APPROACH, 161 Unithank Road, Norwich. (0603) 622833. Ariston, AR, Claymore, Castle, Elite Rock, Heybrook, Mantra, Musical Fidelity, Revolver, Yamaha. Dem and home trial facilities. Mon-Sat 9-6.30. Free installation. Credit to £1,500. Visa, Access, Diners Club. Service dept.

## NORTHAMPTONSHIRE

CLASSIC HI-FI + VIDEO, School Lane, Kettering, Northants. (0536) 515766. ADC, Marantz, Onkyo, Sansui, Teac, Harman Kardon, Pioneer, Proton, Ariston, Thorens, Mantra, Goodmans, Castle, JPL, Mordaunt Short, Seleco TV, Monitor Cable + others.

THE AUDIO SHOP, Coffee Tavern Court, High St, Rushden. (0933) 56651. Tannoy, Mordaunt Short, Castle, Royd, B&W, Goodmans, Ion Systems, Audio Technica, QED, Rotel. Dem room. Ring for opening times.

## WEST MIDLANDS

SOUND ADVICE, 162 Alcester Road, Moseley, Birmingham B13 8HS. (021) 449 3328. A&R, Creek, Linn, Epos, Mission Cyrus, Naim, Rega, Roksan, Rotel, Yamaha. Tues-Sat 9.30-6. BADA MEMBER

ALTERNATIVE AUDIO Ltd, 93-95 Hobs Moat Rd, Solihull. (021) 742 0254 (sales), 0248 (service). A&R, Audiolab, Denon, KEF, Marantz, Meridian, Mission, M.A., The Source, Philips. Tues-Sat 10-6, closed Mon. Home trial facilities, 3 dem rooms, free installation, instant credit. Access, Visa, Amex. Service dept. BADA MEMBER

FIVEWAYS HI-FIDELITY LTD, 12 Islington Row, Edgbaston, Birmingham. (021) 455 0667. A&R, Denon, Dual, KEF, Meridian, Musical Fidelity, Nakamichi, Philips CD, Quad, Revox, etc. Dem and home trial facilities. Tues-Sat 9.30-6. Free installation, credit facilities. Access, Visa. Service dept.

GRIFFIN AUDIO Ltd, 94 Bristol St, Birmingham. (021) 692 1359. Linn, Naim Audio, Rega, Creek, Denon, Nakamichi, Quad, Mission, Monitor Audio, Rotel. BADA MEMBER

HI-FI EXCELLENCE, 163 Medieval Spon St, Coventry. (0203) 525200. Linn, Musical Fidelity, Quad, Mission,

Cyrus, Denon, A&R Cambridge, Rotel, Nad, Nakamichi etc. Three floors of carefully selected hi-fi amidst the eloquence of our 14th century showroom. Dem, home trial and credit facilities. Access, Visa, Diners, Am. Exp. Mon-Sat 9.30-5.30. Closed Thurs. BADA MEMBER

HORTON ELECTRONICS (1987) LTD, 8-9 Lower Temple St, Birmingham B2 4JD. (021) 643 0972. Aiwa, Dual, Marantz, Goodmans, JVC, Mission, Sony, Technics, Wha. fedale, Sennheiser er. Dem facilities. Credit to £1000. Access, Visa. 9-5.30 Mon-Sat. Service dept.

RICHER SOUNDS 2, 12 Smallbrook Queensway, Birmingham B5 4EN. (021) 643 6664. Popular esoteric hi-fi for upgrades, monthly special offers. Dem facilities, expert advice, free local delivery/installation (£500+), 2 Yr G'tee. Hi-Fi Guide and monthly Newsletters; part exchange. Mon-Fri 10-6, Sat 10-5. Access, Visa, Richer ChargeCard. Service Dept.

RICHER SOUNDS, 10 Smallbrook Queensway, Birmingham B5 4EN. (021) 643 1516. An AZ of affordable, popular hi-fi; no-frills environment. Facilities: expert advice; free 48 page Hi-Fi Guide and monthly Newsletters; part exchange. Mon-Fri 10-6, Sat 10-5. Access, Visa, Richer ChargeCard. Service Dept.

## OXFORDSHIRE

ABSOLUTE SOUND AND VIDEO, 19 Old High St, Headington, Oxford. (0865) 65961. A&R, Denon, Linn, Mission, NAD, Rotel, Yamaha. Also 256, Banbury Rd, Summertown. BADA MEMBER

ASTLEY AUDIO LTD, 3 Marketplace, Wallingford. (0491) 39305/34349. AR, Dual, Kenwood, Mordaunt-Short, Mission, Monitor Audio, Philips, Technics, Tannoy, Yamaha. Tues-Fri 9-5.30, Sat 9-5. Records, tapes, 1000+ CD's. Service Dept. Access, Visa, Diners.

WESTWOOD AND MASON, 46 George St, Oxford. (0865) 247783. Linn, Naim, Rega, A&R, Heybrook, Dual, Mordaunt-Short, Spendor, Tannoy, Quad, etc. BADA MEMBER

WITNEY AUDIO, 28 High St, Witney, Oxford. (0993) 2414. A&R, Aiwa, Akai, Dual, KEF, Mordaunt-Short, Pioneer, Philips, Sony, Yamaha. Dem facilities. Mon-Sat 9-5.30. Free installation, credit to £1,000. Access, Visa. Service dept.

## SHROPSHIRE

AVON HI-FI Ltd, 12 Barker St, Shrewsbury. (0743) 55166. A&R, B&W, JBL, Dual, NAD, Nakamichi, Revolver, Trio, Quad, Yamaha. Dem and home trial facilities. Mon-Sat 9-5.30, closed Thur. Free installation, credit to £1,000. Access, Visa. Service dept.

MID SHROPSHIRE AUDIO, 24 Peverill Bank, Dawley, Telford. (0952) 502828. Agencies include Ariston, Ortofon, Helius, Ion Systems (full range), SME, Goldring, Ruark, Sansui. Guaranteed ex-dm and used hi-fi equipment available. Home trial and free installation. 7 days a week. Access.

CREATIVE AUDIO, 9 Dogpole Lane, Shrewsbury. (0743) 241924. Marantz, Meridian, Linn, Naim, A&R, Mission, Nakamichi, Revolver, Castle, Audio Technica. Dem room. Home trial and free installation. Credit to £1000. Access, Visa. Tues-Sat 9.30-5.30. Service dept.

## SOMERSET

WATTS RADIO - THE ENGINEERS, Jim Badman, 1 West Street, Somerton. (0458) 72440. Castle, Dual, Denon, KEF, Mordaunt-Short, Ortofon, Quad, Rogers, Thorens, Yamaha. Dem and home trial facilities. Mon-Sat 9-1, 2-5.30, Wed 9-1. Free installation. Credit to £1,000. Access, Visa. Service dept.

## STAFFORDSHIRE

GRANGE HI-FI LTD, 153 Branston Road, Burton-on-Trent. (0283) 336555. Pink Triangle, VoydValdi, Marantz, Audio File, Systemdek, Audio Innovations, Cambridge, Quad, Rotel, Snell, etc. 2 dem rooms - no appointment reqd. Mon, Tues, Thurs, Fri, Sat. 9-6 Wed 9-1. Free installation. Credit facilities. Visa, Access. Service dept.

## SUFFOLK

EASTERN AUDIO, 41 Bramford Rd, Ipswich. (0473) 217217. Quad, Audio Lab, Denon, Dual, Marantz, Mission, NAD, Nakamichi, Technics, Arcam. Mon-Sat 9.30-6. BADA MEMBER

## SURREY

AERCO Ltd, 11 The Broadway, Woking. (04862) 4667. A&R, Ariston, Exposure, HK, A.R., Heybrook, JBL, KEF, Magnum, NAD, Pt. Quad, Revox. BADA MEMBER

ROGERS HI-FI, 13 Bridge Street, Guildford (0483) 61049. Ariston, Acoustic Research, Akai, Denon, JPW, Mordaunt-Short, Marantz, Onkyo, QED, Tannoy etc. Mon-Sat 9.30-6. Dem. facilities. Instant Credit. Access, Visa. Service dept.

SURBITON PARK RADIO, 48 Surbiton Rd, Kingston-Upon-Thames, Surrey. (01) 546 5549. Quad, Dual, Denon, Kenwood, Nakamichi, Rotel, Pioneer, QED. B&W, Tannoy, Mordaunt Short, Castle, KBL. Dem and home trial facilities. Access, Visa. 9.30-5.00 Tues-Sat. Service dept.

TRU-FI SOUND AND VISION, 2 Cromwell Rd, Redhill, Surrey. (0737) 66128. Akai, Aiwa, Banc W. Nakamichi, JPW, Mission, Mordaunt-Short, Nagaoka, Sony, Technics. Dem. facilities. Mon-Sat 9.30-6. Free installation, credit to £1,200. Access, Visa. Service dept.

UNILET PRODUCTS Ltd, 35 High St, New Malden, Surrey KT3 4BY. (01) 942 9567. Mon-Sat 9-6, Thurs 9-7. Dem facilities. Large stock. Amex, Access, Diners, Visa.

## SUSSEX (EAST)

DEFINITIVE AUDIO, 30 Islington Street, Brighton, East Sussex BN2 2UR. (0273) 672796. Voyd, Systemdek, Helius, Audio Note, Sugden, JPW, Snell, Marantz, Denon, Rotel, etc. Wed-Sat 11-7. Home dems throughout Sussex. Credit facilities. Visa.

JEFFRIES HI-FI, 69 London Rd, Brighton, East Sussex. (0273) 609 431. 2 dem rooms, closed Mon, late night Wed. Parking, bus route. Credit facilities.

BADA MEMBER

JEFFRIES HI-FI, 4 Albert Parade, Green St, Eastbourne, East Sussex. (0323) 31336. 2 dem rooms, closed Mon. Late night Wed. Parking, bus route. Credit facilities. BADA MEMBER

HASTINGS HI-FI, 31-32 Western Rd, St Leonards On Sea. (0424) 442975. A&R, B&W, Mission/Cyrus, NAD, Nakamichi, Quad, Rotel, Systemdek, Tannoy, Yamaha. 2 dem rooms. Mon-Sat 9-6. Home trial facilities. Free installation. Credit facilities. Access, Amex, Visa. Service dept.

## SUSSEX (WEST)

BOWERS AND WILKINS Ltd, 1 Becket Buildings, Littlehampton Rd, Worthing. (0903) 64141. B&W, Dual, JVC, KEF, Nakamichi, Philips, Shure, Quad, Sony, Technics. 2 dem rooms. Mon-Sat 9-5.30, Weds 9-1. Home trial facilities, free installation, credit to £1,000. Access, Visa. Service dept.

CHICHESTER HI-FI, 40 Little London, Chichester PO19 1PL. Tel: (0243) 776402. Linn, Naim, Rega, Creek, Nakamichi, A&R, Denon, Roksan etc. Tues-Sat, 10-1, 2-5.15 (closed Mon). BADA MEMBER

## TYNE & WEAR

RED RADIO SHOP AND HI-FI CENTRE, 11 Olive St, (Off Park Lane) Sunderland. (Sunderland) 5672087. Aiwa, Bose, Denon, JVC, Luxman, Michell, Pickering, Spendor, Thorens, Trio. Dem facilities. Mon-Sat 9-5.30. Free installation, interest free credit. Visa. Service dept.

LINTONE AUDIO LTD, 7-11 Park Lane, Gateshead. (091) 477 4167. Linn, Naim, Rega, Musical Fidelity, Audio Lab, Quad, Cyrus, Denon, Nad, plus all leading Japanese manufacturers. Dem and home trial facilities. Free installation. Access, Visa, Amex, Diners. Credit to £1000. 9-6 Mon-Sat. Service dept.

## WILTSHIRE

ABSOLUTE SOUND AND VIDEO, 60 Fleet Street, S in-don. (0793) 38222. A&R, Denon, Dual, Linn, Meridian, NAD, Rotel, Technics, Yamaha. (Closed Wed).

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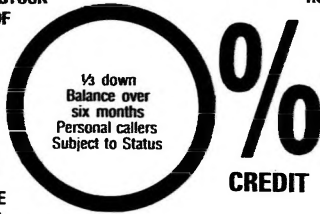
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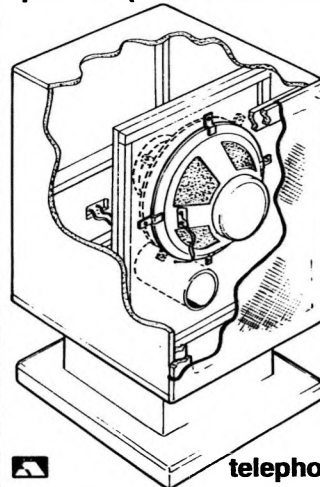
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# THE DIRECTORY

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 so to 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.

## SYSTEM BUILDING

Pre-packaged one-make systems have been commercially very successful, with advantages like cosmetic consistency, competitive pricing, and (assumed) technical compatibility. However, despite the mass market clout of the consumer electronics giants, the hi-fi tradition of specialised separate components seems as strong as ever, and certainly represents the route taken by those who place sound quality ahead of other criteria.

Yet those who choose the separate route still have lingering doubts – usually completely unjustified – over the compatibility of components from different manufacturers. Gross incompatibilities are very rare nowadays, only likely to rear their heads amongst the most exotic components. Here the delicate art of 'supercompatibility' really takes over the major role and might be regarded as the key to 'real' hi-fi.

There are now three different pre-recorded music media competing for the attention of the hi-fi user, and to go for all three will either cost a lot of money or involve substantial compromises in the sound quality of each. For this reason many separate purchasers may start with just one source, adding others or a tuner when funds permit.

There will always be controversy over the relative qualities of LP, CD and cassette. LP is still the choice for ultimate sound quality – particularly for those prepared to spend a substantial sum on a good quality turntable system. Furthermore the vinyl repertoire is still the cheapest, largest and most varied.

Cassette has never really challenged vinyl's superior quality, but it is a multiple role format, offering 'go anywhere' flexibility, a uniquely useful recording capability, plus a broad catalogue of pre-recorded music cassette material. As a hi-fi medium cassette suffers from pre-recorded material which has been improving but is still patchy in quality, and can usually be bettered by a home recording. There is also the worry that a tape made on a specific machine usually replays best on that machine, which may cause aggravation when upgrading a few years hence. It is worth remembering that though such opportunities are rarely possible or practical, a live recording onto cassette using good quality microphones can be the hi-fi equal of any other source.

CD is the latest challenger to these two established media, using a digital instead of analogue storage format. The sound quality remains controversial, hailed as near perfect by its fans but derided by vinyl freaks, so it is probably fairest to say that CD is fine for most listeners, but may not suit everyone; certainly the lack of background noise, defects and deterioration over time are major strengths.

While there will always be arguments about the different music storage and transmission formats available to the hi-fi listener, there is also controversy over the relative importance of the different components which make up the system chain – by which is meant the source, the amplification, and the loudspeakers (and for the pedantic the room itself, though there's often little that can be done here).

For many years the 'weakest link' theory proposed that the loudspeakers needed the most attention, that amplifiers merely had to have sufficient power, and that turntables were pretty well perfect. However, this perspective has become steadily discredited by an alternative 'theory of precedence', which stresses that no subsequent component can make up for the inadequacies of its predecessors – all it can do is supply its own additional degradations. In such a context it is not uncommon to find more than half the system budget allocated to the record player, with scrimping and saving made on amplifiers and loudspeakers, even though these are used all the time whatever the source.

Choosing the components of a system is only part of the task of getting the system as a whole working as well as possible. Good turntables and loudspeakers both benefit to a surprising degree from proper support – from stands that enable them to give their best performance, whether floor-standing or wall mounted.

Siting of components within a room can play a significant role, as can the room itself. Some people may prefer an acoustically more 'live' room than others, but most will agree that the larger it is the better, because this tends to provide smoother and better extended bass reproduction. All rooms create reflections and standing waves, and the effects of these are more severe if all opposing walls are parallel, similar distances apart, and with hard reflective surfaces. Provided that the loudspeakers can be placed fairly symmetrically, slight asymmetry elsewhere in the room is usually helpful.

The loudspeakers are most critical of placement, because it is their job to create the stereo image, and it will be impossible to do this if the sound from each is not roughly similar at the listening position. Each loudspeaker should operate in a similar immediate acoustic environment, unencumbered by other furnishings and structure, and a similar distance from listener, nearby walls, and corners. Some loudspeakers are designed to operate close to a rear wall, others a metre or so out into the room, but all loudspeakers benefit from being closely mechanically coupled via proper stands to the floor.

There is some debate about the best form of fixing, however, adjustable spikes through to the

floor proper or seated into the tops of cross-head screws are generally regarded as the best solution in most circumstances. There is no need for paranoia about using spikes through normal pile carpets because the holes will be almost impossible to find when the stands are removed.

Most decent quality turntables are fairly immune to feedback from loudspeakers, so it should not matter too much if these items are sited fairly close to each other. Indeed it is debatable whether any advantages gained from keeping the turntable well away are not lost through the need to use longer connecting cables.

Mixing and matching the components of a record player to get optimum results can be something of a black art, over and beyond the fairly simple business of choosing a cartridge of roughly the right compliance to suit the arm effective mass. Certainly the combining of turntables and tonearms is not a simple matter, and this is where a good specialist dealer will come into his own, both in terms of recommending good combinations from the models he holds in stock, and then in correctly carrying out the sometimes tricky set up procedures which are often required to get the best results.

The key to getting the best results from a separate system lies in finding an experienced and skilled dealer in the first place, one who takes the trouble to find out what you really want and then demonstrate some likely alternatives, without trying to cram his own particular prejudices down your throat. To some extent the customer's task must be to discover for himself whether the dealer in question is competent or not. Membership of trade organisations like BADA can be a worthwhile pointer to a degree of professionalism, but the bottom line is whether the dealer in question can create a good sound in his own shop. If he can't, there is precious little chance of him doing so in your home. The best dealers should lay on demonstrations so you can hear the differences between components for yourself, and hear the sort of improvements which can be had at different price strata. You can then establish the sort of performance you are prepared to accept within whatever budgetary constraints you have set.

The Directory has been compiled so that it can be used by *Choice* readers as a buying guide. A guide in the sense that you should use the information in it to make a shortlist of equipment suited to your needs and budget, and then audition it at a dealers before taking the plunge. Because tastes inevitably differ it would be unwise to buy purely on the basis of our recommendation and dealers are the most experienced people around when it comes to making systems work as a whole.

# THE DIRECTORY

## TURNTABLES & TONEARMS

The schizophrenic split between consumer electronics and 'real hi-fi' is most obvious amongst turntables. The former are supplied simply as a means of playing vinyl in a system context. Cheaply manufactured in the Far East, these are complete players with a variety of automatic facilities, sometimes tied into system remote control. But engineering compromises severely limit sound quality, cartridge choice may be P-mount restricted, and such machines are rarely stocked by specialist hi-fi dealers these days.

Specialist turntables offer big sound quality

improvements, but lack so-called convenience features (that practised users often find irksome). Such turntables at the cheaper end of the market (sub-£350) tend to be supplied with matching tonearm, and often include a 'starter' cartridge. Still better quality is found at higher prices amongst the separate motor units and tonearms. Careful partnering and set-up is essential for these individual components, but 'naturally sympathetic' combinations do exist, and the good dealer can help.

Listed separately as integrated players and as turntable motor units and tonearms, our sound

quality rating is based on results achieved using a high quality system – but in point of fact the turntable is usually the limiting factor soundwise in any system. **Lab performance** summarises the speed stability, vibration generation and environmental isolation of turntables, along with the friction, alignment and adjustment of tonearms. The tonearm's physical characteristics also define a range of mechanically compatible cartridges (see cartridge listings).

### INTEGRATED TURNTABLES

NAME PRICE	LAB SOUND	COMMENTS	FEATURES ARM EFF. MASS	VALUE	BACK ISSUE FULL REVIEW
Acoustic Research EB101 £230	Good Good	This genuine high fidelity product offers an impressive package at a competitive price	Subchassis, manual, 13.5g	BB	48
Alphason Solo/Xenon MCS £365/£262	Average+ Good	The deck is warm and euphonious with high levels of clarity. Wow artefacts occasionally just audible.	3 point suspended motor unit, optional quartz PSU/speed change 13g		67
Alphason Sonata/HR-100S-MCS £695/£412	Excellent Very Good	Highly capable audiophile system with real resolution and control. Bass is powerful and dynamic ability unbridled	Manual, subchassis, belt drive, 10g	R	60
Ariston Q-Deck £150	Good Average+	Well engineered and good sounding low cost package which is both easy to set up and to use	Semi-auto, belt drive, solid		This
Ariston RD60 £219	Good Good	With the Enigma arm, this balanced and communicative turntable falls only slightly short of the RD90 on sound quality	Manual, belt drive, subchassis, 11.5g		48
Ariston Forte £350	Below Average Average	Heavy on engineering, short of soul? The Forte almost makes it, losing out only because of some residual pitch variations and a lack of bass power. The arm is modestly good	Manual 2-speed belt drive player and detachable arm, 10g		67
Dual CS430 £89	Average Below Average	Ragged, sometimes unpleasant cartridge mixes with a modest pleasing player in a very sharply priced package.	Belt drive, with cartridge, auto return, 5g	R	67
Dual CS503-1 £114	Poor Average	Slated as a replacement for the CS505, the 503-1 needs careful system matching to mask rumble and microphony, but is good enough to benefit from a better cartridge	Semi auto, belt drive, low mass 8g		55
Dual CS505-3 £139	Very Good Good	Continuous steady improvements have kept this model at the forefront of the budget market. Practicality is excellent and the deck has excellent timing bass/mid and stereo imaging	Semi-auto belt-drive, 8g		67
Dual CS5000 £200	Average Average+	The rare facility may give grandma's collection a new lease of life but the player does not merit recommendation on price vs sound	Electronic, belt drive, subchassis, 10g		48
Goldmund ST4 £4,000	Very Good Excellent	The Studio turntable takes on a cheaper tonearm than the T3F, yet provides a similar reference standard objective and subjective performance at £2,000 less, in a neatly integrated though bulky package.	Solid subchassis, direct drive, parallel arm, detachable headshell	R	60
Heybrook TT2 turntable & arm £349/£249	Average Good+	A gradual process of informed evolution and a sensibly designed arm combine to make this a good sounding middle of the road package. Well supported by dealers	Manual subchassis motor with arm, belt drive, 14g	R	67
JVC AL-FQ555 £170	Below Average Poor	Clear midband sound but woolly bass and crude treble. Ease of use however ranks highly, and there's little to go out of adjustment	Auto, direct drive, 5.5g		67
Kenwood DP-990 £300	Average Average	Smart, slick and massive player suitable for low compliance cartridges only. A good but not inspired performer.	Semi-auto 2 speed direct drive, 16g		67
Kuzma Stabi/Stogi £575/£349	Average+ Stabi: Good; Stogi: Excellent	Stabi is powerful, spacious but sufficiently subtle. Stogi is excellent all-rounder with even spread of abilities.	Manual, belt drive, subchassis. 12.5g	Stogi: R	60
Linn Axis £345	Good+ Good+	Setting new performance-for-price standards this cleverly engineered and competent deck has many of the qualities of the Sondek LP12	Electronic, belt drive, semi subchassis, 13g	BB	48/Coll
Linn Sondek/Ittok (Troika) £509/£ 29 (£625)	Excellent Excellent	Superb sound – the best LP12 combination yet. The Troika gives the system real solidity and strength, stretching the deck and arm qualities to the full	Manual subchassis player, belt drive, 14g	R	60
Manticore Mantra £300/£330 (Arm)	Good+ Good+	Fitted with a Rega RB250 arm variant and AT95E cartridge the Mantra fared very well indeed with a fine midrange and good focus	Subchassis, 12g, manual		48/Coll
NAD5120 £89	Average Average	A number of running improvements have given this player a range and tautness denied its lazier sounding antecedents.	Semi-auto belt drive, detachable arm/tube/weight, 5g		67
Omega Point Silver/Black £895/£295	Good Good+	An avowedly stripped down turntable that lacks even an on/off switch, the Omega Point Silver offers fine midrange clarity and good stereo, but some HF compression and a lack of 'wellie'	Manual, solid, belt drive, unipivot, 11g		55
Opus 3/Decca London International (Revised) £399/£99	Poor Good	Heavyweight motor unit with many fine properties, but which needs further development. The idiosyncratic arm is a suitable (though not ideal) platform for the Decca cartridge. For all its faults though, the whole transcends the sum of the parts	Belt-drive manual, damped unipivot arm, 12g		67
Rega Planar 2 £135	Average+ Good	A remarkable product at the price, surprisingly articulate and confident	Integrated turntable, manual, 11.5g		48
Rega Planar 3 £188	Good Good	A long time leader in its price category, the '3 (with its excellent RB300 arm) sounded nicely 'musical' in a balanced and coherent manner	Integrated turntable, manual, 11.5g	BB	48
Revolver Rebel £160	Below Average Below Average	Fat, assured and forward presentation, but ragged and subjective speed stability problems. With a little further development, it will be a winner	Manual, 2-speed belt drive inc cartridge, 13g		67
Revox B291 £660	Average— Average—	Sound quality ranks as below average. Subjective bandwidth is narrow and the music lacks grace and energy. Ease of use however is unrivalled	Automatic, remote controllable, direct drive parallel arm, prefitted cartridge		55
Sansui SR-222 V £159	Average— Average	More than acceptable in most areas, the Sansui is detailed and positive, though a little muddled when stressed. Best suited to low compliance cartridges	Manual 2-speed belt drive, 16g		67
Source/Odyssey RP1 £849/£695	Very Good	Mixed. The turntable has tremendous power and authority, but as tested suffered pitch imprecision. The arm is rather ill controlled and lacks resolution and focus	Manual, belt drive, subchassis, motor, outboard PSU, 15g		55
Systemdek IIX £248	Good Average+	Poised, clean sounding deck, forward and explicit in character. A good value deck under £250, and a relatively cheap and satisfactory suspended model	2 speed belt drive manual turntable and arm, 11g	R	67
Technics SLBD-22 £90	Average— Average—	Not bad for the price and a great improvement on the L20, it performs reasonably when not stretched	Semi automatic, solid plinth, electronic, 6g P-mount	R	48
Technics SL-DD33 £110	Average Average	As with the QD33 though better value	Automatic, direct drive, solid plinth, 7.5g, P-mount	BB	48

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## INTEGRATED TURNTABLES

NAME PRICE	LAB SOUND	COMMENTS	FEATURES ARM EFF. MASS	VALUE	BACK ISSUE FULL REVIEW
Technics SL-L20 £115	Poor Average-	A rather lightweight parallel tracker achieving a poor overall rating, with little to recommend it unless you dig facilities	Electronic, solid plinth, 5g, P-mount		48
Technics SL-QD33 £140	Average Average	The quartz speed controlled version of the DD is short on sound quality but not features. But it did have fair focus and some depth	Automatic, Quartz, direct drive, solid plinth, 7.5g, P-mount	R	48
Thorens TD280 £150	Average Average	Extremely competitively priced package with a trace of lower-mid overhang, but it's very well behaved elsewhere	Semi-auto belt-drive 2-speed, 13g	BB	67
Thorens TD166 Mk II £179	Average Average+	A polished and professional design consisting of a first rate budget suspended subchassis turntable and a mildly disappointing arm	Manual 2-speed, 13g	BB	67
Thorens 160S Mk IV £249	Average+ Average+	Fine, familiar suspended player and arm. Faults are few, but include poor arm bearing adjustment. The arm can sound a little messy	Manual 2-speed, 7g	R	67
Thorens TD320 Mk II £349	Good Good	Good, consistent sounding deck with much improved (but not ideal) arm. A little expensive for performance offered	Semi-auto two speed belt drive, 14g		67
Well Tempered Turntable & Arm £1690	Average Very Good	Intriguing and challenging design. Musically it is not ideal, but it has a limpid quality and a lack of artificiality that sets standards as well as turning the ear, though it's not completely uncoloured. A charmer yet mainstream enough in its virtues to be viable	Manual 2-speed, damped, suspended arm, 7.5g	R	67

## MOTOR UNITS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Ariston RD90 Superior £900	Good+ Good	Good but slightly damped sound quality, with powerful and stable bass. The pro quo is a certain lack of pace, energy and resolution	Belt drive, subchassis, electronic		55
Audio Labor Konstant £2,560	Good+ Very Good	The space-station-like solid alloy frame needs a substantial shelf, but absolute stability renders a confident, neutral sound	Belt drive, subchassis	R	48/Coll
Goldmund Studio £2,350	Very Good Excellent	A reference point for high end audio, only exceeded by the even more extravagant Reference. Currently being reworked into a more competitive (!) package	Electronic, direct drive, solid subchassis	R	60
Michell Synchro £265	Good Good	A particularly happy blend of qualities endows the Synchro with a blend of subtlety and force - the mailed fist in the velvet glove. Easy on the ear in the best sense.	Manual, belt drive, suspended motor unit	R	67
Michell Gyrodec £595	Good Good	Sweet and natural sounding player, well exploited by the Rega RB300 arm. Aesthetics, and the acres of acrylic, are unique	Manual, belt drive, suspended motor unit		55
NVA Turntable £499	Average Good	A surprisingly fast and assured performer, but with lightweight bass and a little aggressive. Easy to set up, the price (necessarily includes stand	Manual, belt drive subchassis, stand, 33 1/3rpm		60
Oracle Alexandria Mk III £825 - £995	Very Good Very Good	One of the most beautifully presented players made, and fully supported by superb separation, dynamics and a euphonious style of delivery.	Manual 2-speed belt drive	R	67
Oracle Delphi III £1450	Very Good Very Good	Stable imaging, good bass and refined detail, it's well made and consistent in service - but very expensive	Manual, belt drive, subchassis	R	60
Oxford Acoustics Crystal Reference £1955	Very Good Excellent	This big, open and powerful sounding turntable works beautifully with Airtangent arm to give superb 3-D imagery	Manual, belt drive, subchassis, stand	R	60
Pink Triangle PT 100 £650	Good Excellent	A state of the art player, easy to set up but extremely fussy about partnering equipment and state of tune. The test sample suffered flutter derived roughness (presumed not typical)	Manual 2-speed, outboard PSU	R	67
Rega Split Slab Modification Kit £74	Good Good	Clever and cheap upgrade kit that protects the initial investment and which adds clarity and environmental isolation to a fine but microphonic original	Conversion suspended chassis kit for Rega 2/3		67
Roksan Xerxes £655	Excellent Excellent	This unique design cuts a swathe through the conventions of turntable design, providing superb resolution and stereo. Setting is critical, for experts only	Manual, belt drive, solid/decoupled	R	67
SEE Revolver £135	Average Average	Nicely balanced, but unimpressive timing and lightweight bass made this deck rather average for the price. Manufacturer has since made several changes, but not re-submitted for review	Manual, belt drive, solid plinth		48
Source So £675	Good Good+	Now an extremely tidy sounding deck, the So has a grip range at low frequencies that knows few peers, and is at least sufficiently good elsewhere. A successfully refined version of a promising original that didn't quite deliver	Manual belt-drive 2-speed, outboard PSU	R	67
Systemdek IIXE £248	Good Good	Fine, honestly specified and well built player which easily betters its closest stablemate, the IIX	Manual 2-speed, external PSU	R	67
Systemdek IV £495	Good Very Good	The level of wow is a theoretical concern at least, but elsewhere this player shines, combining euphony, information and imaging in a polished, untemperamental package	Two-speed manual belt drive	R	67
Thorens TD521 £629	Average Average+	Nice product. Unexciting, rather undynamic and insubstantial sound quality, but facilities such as ability to accommodate 12 inch arm compensate	Manual, belt, suspended motor unit, 78rpm, pitch control		55
Townshend Avalon £299	Good Good	Some smear and coloration, probably due to structural shortcomings of the plinth, take the edge off this otherwise well turned out and well priced machine. Worth trying if you can't afford the full-blown Rock	Manual 2-speed belt drive	R	67
Townshend Rock £450	Good Good+	Tight, tidy sounding player which works with a wide variety of (non-tangential) arms, giving almost CD like precision and clarity. Good bass depth, dry balance - our Editor's favourite deck, in fact	Manual, belt drive, solid, arm damping, various optional extras	R	55

## TONEARMS

NAME PRICE	LAB SOUND	COMMENTS	ARM EFF. MAS	VALUE	BACK ISSUE FULL REVIEW
Airtangent II £1998	n/a Excellent	A complex but superbly built arm for high quality systems, giving excellent stereo and resolution	7.5g (vertical)	R	60
Alphason Opal £110	Good Average	This is a straightforward adequate sounding low cost arm, priced just above where it rightly belongs	10g		55
Alphason Delta £165	Good Average+	A highly competent design from Alphason gives good sound quality but with slight blurring and treble fizz	16g	R	48
Alphason Xenon £210	Good Good+	A trimmed down HR100S, the Xenon has inferior bearings and a simpler finish, but sounds crisp and coherent. Fits any Linn cutout	12.75g	R	55
Alphason HR100S £395	Good+ Very Good	This S-shaped arm sounds smooth, but nevertheless reproduces transients with fine attack	10g	R	48/Coll
Ariston Enigma £99	Average Average+	Good but not the best in its class: mid-band sounds a little uneven; treble a trifle "brash"	11.5g		48
Audio Technica AT1130 £186	Good Good	Well suited to most cartridges including high compliance ones, the AT is smooth and tonally neutral, if slightly lacking in 'balls'	8.5g	R	67
Decca International £49	Average+ Average+	This uni-pivot design gives a rather rich tonal balance and some bass muddling. Could be good with Decca cartridges, but not well built	12g		48 Summary
Eminent Technology £960	Good+ Good+	One of the best sounding tonearms around, the linear tracking Eminent delivers impressive stereo imagery, focus and transparent sound	9g (vertical)	R	48/Coll

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## TO NEARMS

NAME PRICE	LAB SOUND	COMMENTS	ARM EFF. MAS	VALUE	BACK ISSUE FULL REVIEW
Goldmund T3F arm £3950	Excellent Excellent	This complex parallel tracker created an "ear-opening" experience when tested with a (since updated) Goldmund Studio turntable	16.5g	R	Coll 2
Grace G707 £299	Good Good+	This venerable is still capable, if not competitive with modern alternatives	7g		48
Helius Orion 2 £490	Very Good Very Good	Very expensive but with a performance that merits recommendation	12g	R	48
Linn LV Plus £129	Good+ Good	The fixed headshell provides an improvement over the LVX resulting in better clarity, detail and punch	13g	BB	48
Linn Ittok LVII £429	Very Good Very Good	Suitable for many turntables this top-quality arm performs best with the LP12, the combination exceeding the sum of both parts	13.5g	R	48/Coll
Linn Ekos £895	Very Good Very Good	Superb, state of the art design which builds significantly on Ittok's strengths	9g	R	67
Manticore (Logic) Datum 2 £140	Very Good Good++	Rated sonically very good with fine depth focus and transparency, good air and life, albeit slightly 'untidy'	15g	R*	48/Coll
Mission Mechanic £700	Good Good+	Nearly right, but inconsistency with level and vague imagery spoil what is otherwise a firm, powerful advocate for black vinyl!	11g		55
Moth Arm £ 5	Good Good+	The ultimate budget arm? Refined, detailed, sweet and natural – performance improves in line with the rest of the system	12g	BB	60
Rega RB300 £90	Good++ Good++	Despite its modest price this sets exceptional performance standards and could be used on a number of high-quality turntables	10-11g		60
Roksan Artemiz £350	Average Good	Excellent but flawed arm which needs some development and refinement before it can be wholeheartedly endorsed. Watch this space. Fits Rega cutout	8g		67
SME 3009 Series IHS £165	Good Average+	A simplified less flexible (as regards adjustment) Series III with a similarly 'soft' sonic character	5g		48
SME 3009 Series III £229	Good Average+	Comprehensively adjustable and very well made, suited to MM and high compliance MC cartridges	5g		48
SME 3009R £291	Average+ Average+	A higher mass version of the Series III designed for low compliance MC cartridges	12g		48
SME Series IV £810	Excellent Very Good	Superb engineering and finish with a finely balanced sound giving impressive stereo focus and low coloration	10.5g	R	60
SME Series V £1206	Excellent Very Good	Excellent in terms of design engineering and sound quality, this arm arguably sets a new reference standard regardless of price	10.5g	R	60
Souther Tri-Quartz £895	Average Good	A unique parallel tracking arm that makes up for what it lacks sonically in its unusual appearance	3-4g		48

## CARTRIDGES

Very much the 'slave' of turntable and tonearm and to some extent undermined by the supply of free 'starter' cartridges on many turntable systems, the cartridge is still worth taking seriously. The quality of both the stylus itself and the cartridge's tracking performance are important in preserving that most important part of the hi-fi system – the record collection – and the cartridge also plays a significant role in determining the overall balance of a system.

Cartridges fall into two groups: high output models, capable of working directly into any amplifier, and more expensive low output models. Stereotypically, low output cartridges use the moving coil principle and operation, have better mechanical integrity and tighter tolerances, and give better performance but at much higher cost. Most under-£150 amplifiers and many valve designs need either an extra head amp or transformer to cope with the low output. **Cartridge/amplifier**

interfacing can be very subtle, but even basic high output moving magnet designs benefit in overall balance from optimised amplifier capacitance loading. Still more important, the mechanical cartridge characteristic of cantilever compliance ('springiness') needs to be considered in the light of the effective mass of the tonearm which will be used (see Turntable & Tonearm entries).

NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
A&R C77 £20	Average+ Average+	A sensible moving magnet package with good bounce at a competitive price	6-16g Normal, MM	BB	48
A&R C77Mg £30	Average- Average	Punchy sound quality with plenty of extra energy to liven things up. The solid body seems well worth the extra £10	4-8g Normal, MM	BB	67
A&R E77Mg £47.50	Average Average	Our sample had a disappointing stylus, but gave a coherent, rich and laid back sound, with good 'scale'	3-8g Normal, MM	R	48
A&R P77Mg £60	Average+ Average+	Cautiously recommended, the P77Mg was preferred to its cheaper partner by virtue of a better tip. Channel balance could have been better	4-9g Normal, MM	R	48
Audionote IO2VDH £795	Good Very Good	One of the best, giving 'an extraordinarily relaxing midrange clarity'. But it picked up a bit of surface noise and dust and needs a transformer	8-18g Very low (transformer), MC		43
Audioquest MC5 £200	Average Average	Offers high-output benefits but the drooping frequency response and severe VTA error preclude recommendation	10-20g Normal, MC		54
Audio Technica AT95E £17	Average- Average	Clear, dynamic if richly balanced, the magnetic '95E is a definite Best Buy	8-14g Normal, MM	BB	48
Audio Technica AT-420E OCC £30	Average Average	Better suited to pop recordings this MM bears some of the sonic hallmarks of the Linn K5	7-14g (damp) Normal, MM	R	67
Audio Technica AT-430E OCC £42	Average+ Average	A rising high frequency response yields something of a treble sting, not a good all-rounder	3-7g Normal, MM		67
Audio Technica AT-F3/OCC LE £70	Average+ Good	Though the 'limited edition' badge is a trifle tongue-in-cheek the F3 still offers excellent value	8-15g Low, MC	BB	67
Audio Technica AT-F5OCC £100	Average+ Good	Decent output, good channel balance and a thoroughly refined sound sets the standard at £100	9-20g Low, MC	BB	54
Audio Technica AT-F5/OCC LE £100	Average Good+	This latest sample demonstrated some technical weaknesses but its spacious, fluid sound quality still represents a benchmark at this price	4-10g Low, MC		67
Audio Technica ATOC7 £250	Good+ Good+	Technically and subjectively this cartridge represents a new dawn for AT, in the twilight of analogue audio	6-13g Low, MC	R	54
Audio Technica ATOC9 £400	Average+ Very Good	Tonal colours were reproduced faithfully while stereo images were clearly isolated and focused despite contributing to a thoroughly integrated whole. Slightly less transparent than more costly MCs	6-14g Low, MC	R	60
Azden YM10VE £12.50	Average Average-	A good tracker. Sounds rather bunched-up but not totally incoherent – for very basic systems only	5-15g Normal, MM		54
Azden GM1E £30	Average- Average-	Of academic interest only, this high o/p MC is seriously flawed in sonic terms	8-18g Low/normal, MC		54

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## CARTRIDGES

NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
Azden CMP5L £108	Average + Average +	Although no P-mount system will do this cartridge justice, it can still be enjoyed in its universal mode. The subtle balance may prove irresistible to some	4-10g Low, MC	R	54
B&O MMC5 £24	Average + Average	Cheapest in the family – smooth treble and good focus, but the bass was left in the wings	5-15g Normal, MM		38 (Summary)
B&O MMC4 £43	Good Average +	Solid and well balanced in the midrange, the '4 lacks bass impact	5-15g Normal, MM		48
B&O MMC3 £57	Good Average	Slightly "laid back" sound quality but a good performer for the price. Best suited to B&O equipment	5-15g Normal, MM		48
B&O MMC2 £87	Good Average +	Only a modest improvement on its cheaper brothers (and sisters)	5-15g Normal, MM		48
B&O MMC1 £112	Very Good Good	Great clarity and detail at high frequencies but a slightly plodding bass. It may appeal more to the classical enthusiast	5-13g Normal, MM		48
Cello Chorale £799	Good Very Good	Looking like a piece of NASA gadgetry the Chorale's transparent treble delicacy was without equal. A serious audiophile choice	4-10g Low o/p, MC	R	48/Coil
Clear Audio Gamma £295	Average Average +	Brimming over with enthusiasm, the unusual-looking Gamma is more than an audio oddity, but it lacks a little subtlety at times	4-11g Low, MC		54
Clear Audio Delta £450	Average + Good	Midway between the Gamma and exotic Pradikat, the Delta sounds like neither! Nevertheless, it delivers the goods	6-17g Low, MC	R	54
Clear Audio Pradikat £1225	Average + Very Good	Sounded absolutely glorious, creating a full sense of scale and a large well-focused soundstage – but watch for record wear	8-18g MC		Coil
Clear Audio Accurate £2,000	Good Excellent	A remarkable cartridge, only by virtue of its effortless and highly neutral sound quality also because this has been achieved with the same basic design as Clearaudio's cheapest MCs	4-11g Low, MC	R	60
Denon DL110 £69	Good Good	Firmly recommended as a fine all-rounder, this high-output moving coil model is likely to perform well in nearly all circumstances	6-16g Normal, MC	BB	48
Denon DL160 £89	Average + Good	Although listeners just preferred the 110 its brother here proved a twin in lab tests and is still "thoroughly competent"	6-16g Low, MC		43
Denon DL 103 £99	Average Good	This classic spherical stylus model gives a lively sound with powerful bass, and is popular in broadcast studios	6-16g Low, MC	R	48
Dynavector DV-50X £60	Good Average	A high-output MC model with impressive lab performance, but whose tip and sound quality both disappointed	6-14g Normal, MC		48
Dynavector DV10X IV £60	Average Average +	Fine sounding and realistically priced, damping is recommended to ensure successful tracking ability	8-18g Normal, MC	R	48
Dynavector DV23RS £150	Average + Good	Sound quality was described as "shut-in", lacking energy and sparkie but with some "edginess" in high frequencies	10-22g Low, MC		28
Dynavector DV XX-1 £360	Good Good +	The XX-1 embodies a power and solidity rarely encountered amongst the breed, nevertheless it did exhibit a peculiarly suppressed character that will suit lively rather than wholly neutral systems	7-17g Normal, MC		60
Empire 800 Mk II £33	Good Average	This very high output MM appears to be based on the classic Ortofon VMS series. A trifle uninspiring overall	7-17g Normal, MM		67
Empire MC-5M £110	Average + Good	A very low compliance renders this MC best suited to heavy tonearms while its sweet, non-aggressive sound quality earns it a recommendation	13-20g Low, MC	R	67
Glanz MFG 110EX £24	Average Average	A little bright but giving detailed bass and clear treble this was competitive at the price	6-16g Normal, MM	R	Systems
Glanz GMC-10EH £49	Good Good	The rising HF trend of this high o/p MC may cause problems in certain systems but with a favourable wind its seductive qualities will win out	8-14g Normal, MC	R	67
Glanz GMC-10LX £79	Average + Average +	Bearing some of the hallmarks of the '10EH, the '10LX is still less competitive in the sonic stakes	7-15g Low, MC		67
Glanz GMC20E £129	Average Average	You could try haggling but we thought the makers of this number were demanding too much lucre for their product	3-6g Low, MC		48
Goldmund Clearaudio £1500	Average +	Something of a mixed bag overall, its sonic character bears a strong resemblance to the Pradikat though it shares some of the hallmarks of the more expensive Accurate	5-12g Low, MC		60
Goldring Elan £15	Average + Average	A lightweight and frisky-sounding MM that appears to be based upon the same body as the Nagaoka mm4	7-15g Normal, MM	R	67
Goldring Epic II £23	Average Average +	An excellent budget choice though the limitations of the stylus are rather obvious at higher frequencies	5-12g Normal, MM	R	67
Goldring G1010 £36	Average Average	A bit fiddly to set-up but rewarding once accomplished. The big and bouncy sound belies its price. Sensitive to amp loading	10-20g Normal, MM	BB	54
Goldring G1020 £53	Average + Average –	This one strutted finely onto stage but couldn't project to the "gods"	8-16g Normal, MM		43
Goldring G1040 £79	Average + Average –	High frequency extension was improved by the van den Hul tip, nice looking model – no great actress	8-16g Normal, MM		48
Goldring Eroica L £95	Average Average +	Open and relaxed sounding, the L version is just that bit more refined than its high output brother	7-18g Low, MC	R	54
Goldring Electro II £149 complete	Average Average +	A pretty decent allrounder that did not excel sufficiently to warrant recommendation	8-16g Normal, MC		43
Grace F9E II £240	Good Good	For lively presentation, excellent separation and generally satisfactory sonic delivery – consider this model	5-10g Normal, MM		48
Grado XTE + I £20	Average – Average	Bass and treble are a trifle coloured but the midband proved highly enjoyable. Ideal for budget systems	6-13g (damping) Normal, MM	R	54
Grado XF3E + £43	Average – Average	Downtilting balance disguises the brightness of this cartridge, bit of a mixed bag at this price	9-20g (damping) Normal, MM		54
Highphonic MCA3 £360	Very Good Good +	Exquisitely crafted by a group of ex-Denon engineers, this superb tracker had a sweet and seductive (if rather bright) treble	5-12g Low, MC		43
Kiseki Blue Silver Spot £395	Average + Good	Solid performance from a very solid cartridge but lacks some of the magic of other Kisekis. Compliance too high	5-12g Low, MC		54
Kiseki Purpleheart Sapphire £695	Good + Good +	Rare, beautiful to look at and sweet to listen to, our review of this high-flyer conjured up images of Japanese art	5-14g Low, MC		Collection
Kiseki Blackheart £1595	Good Good	This cartridge demonstrated refined poise and a delicate but at once potent security, however, the price does seem a little on the high side compared to other Kisekis	6-16g Low, MC		60
Kiseki Lapis Lazuli £3500	Good Very Good	Combining very sensible design concepts at a silly price, the Lapis Lazuli is best thought of as combining the detail of the MC3000 and the fluidity of the Clearaudios	4-12g Low, MC		60
Koetsu Black K £577	Good + Good +	Impressive in scale and dynamics but with some criticism of bass muddling and high treble fizz. Listen before deciding	6-18g Low, MC	R	48/Coil

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NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
<b>Koetsu Red</b> £896	Good + Very Good	Named like a rare, and perhaps dangerous, little oriental fish this famous cartridge sounded "almost larger than life"	10-25g Low, MC	R	48/Coll
<b>Koetsu Red Signature</b> £1298	Good Excellent	Technically this cartridge suffers no faults whilst on a subjective level it offers rare musical insight	10-21g Low, MC	R	60
<b>Linn K5</b> £30	Average Average +	As crisply focused as the costlier Linn magnetics, the K5 offers a smoother presentation	7-16g Normal, MM	R	67
<b>Linn K9</b> £69	Average Good	Linn threw this model into the leading pack by beefing up the Basik's bodywork, adding a super stylus, and keeping the price fair	6-15g Normal, MM	BB	48/Coll
<b>Linn Asaka</b> £279	Good + Good +	Disciples of Linn who are trying to realise their true "Karma" may find that saving money is not a short cut to heaven	9-18g Low, MC	R	48/Coll
<b>Linn Karma</b> £435	Very Good Very Good	A specialist which is strongly recommended for Linn-based systems; results may be less predictable in more general application	9-18g Low, MC	R	48/Coll
<b>Linn Troika</b> £625	N/A Very Good	Ex-Karma users have been seen with glazed expressions indicating smug self-indulgence the morning after fitting a Troika	8-18g Low, MC		Coll
<b>London Maroon</b> £109	Average Average +	Now manufactured under the London brandname this Decca cartridge is as iconoclastic as ever	9+20g (damp) Normal, MM		67
<b>London Super Gold</b> £248	Average— Good +	Sometimes a bit fierce in emphasising record surface faults, it is perhaps best at revealing the excitement and tension in music	8-20g + damping Normal, MM	R	48/Coll
<b>Madrigal Carnegie One</b> £685	Average + Good	Looks like a duck but sounds much better, certainly worth auditioning. Compliance too high	5-11g Low, MC		54
<b>Milltek Aurora</b> £198	Good + Good +	An overall feeling of relaxed ease characterised this clear and atmospheric Kiseki-built cartridge	8-16g Normal, MC	R	48/Coll
<b>Milltek Olympia</b> £298	Average + Good +	Warm and detailed sound – packs the punch of the best MCs with high output as a bonus	12-20g (damping) Normal, MC	R	54
<b>Mission 773HC</b> £150	Good Good	A sufficiently well-balanced and competitively priced "old-timer" which still warrants recommendation	6-16g Low, MC	R	38
<b>Monster Alpha 2</b> £479	Good Good +	In the final analysis this fine allrounder is insufficiently exceptional in any specific respect to justify fully its high price	6-14g Low, MC		Collection
<b>Nagaoka MM4</b> £8	Average— Average—	Clear punchy sound that delivers the rudiments of a good performance	6-16g Normal, MM	R	54
<b>Nagaoka MP10</b> £17	Average Average	High frequencies sounded "shut-in" with this spherical-stylus model, but mid and bass were energetic, bouncy and punchy	5-13g Normal, MM	R	48
<b>Nagaoka MP11 Boron</b> £38	Average Average +	Responding well overall in PM's equipment and listening room, this model was mildly criticised for low level and dynamic limitations	5-13g Normal, MM	BB	48
<b>Nagaoka MP10SB</b> £40	Average Average +	Stilton's mods have improved the fine detail resolution of this popular budget model	5-15g Normal, MM	R	54
<b>Nagaoka MP11 Gold</b> £45	Average— Average +	There were mild criticisms directed at most areas, but in general the sound was clear, open and even	3-8g Normal, MM	R	48
<b>Nagaoka MP11 Gold SB</b> £70	Average— Average	Excessive price loading for a blob of aluminium	2-6g Normal, MM		54
<b>Ortofon OM5E</b> £15	Average— Average—	The OM10 is a hi-fi cartridge – the OM5E is not	5-16g Normal, MM		43
<b>Ortofon VMS5E II</b> £14	Average Average	Sound quality was thought fair for the price, though a little 'untidy'	8-18g Normal, MM		38 (Summ y)
<b>Ortofon OM10</b> £20	Average Average	One of the leading "cheapies", this gives a fine level of sound quality for the price, with good matching compatibility	5-15g Normal, MM	BB	48
<b>Ortofon VMS 10E II</b> £21	Average— Average—	Some of its stablemates fared rather better, and showed less evidence of tracking problems to boot	Normal, MM		38
<b>Ortofon VMS20E II</b> £35	Average Average	One of the most popular cartridges ever, sound quality was a bit laid-back and tracking could have been better	3-10g Normal, MM		48
<b>Ortofon OM20</b> £40	Average Average +	This turned out to be the listening panel's favourite among Ortofon's moving magnet models	5-16g Normal, MM	R	48
<b>Ortofon 520</b> £50	Average Average +	Very sensitive to load capacitance this new Ortofon maintains the company tradition for a lively, effervescent SQ	7-16g Normal, MM	R	67
<b>Ortofon X1</b> £50	Average Average	The cheaper X1 scored higher marks with our listening panel than the X3, and both were a disappointment	6-15g Normal, MC		48
<b>Ortofon VMS30E II</b> £52	Average + Average	Rather a soldier in relation to turntable technology, it will perform undemandingly in demanding circumstances	5-13g Normal, MM		38
<b>Ortofon MC10 Super</b> £70	Average Good	"What a delightfully sweet-sounding cartridge this is..." we said	5-15g Low, MC	BB	48
<b>Ortofon X3</b> £70	Average Average	A lack of bass power, definition and a "zitty" top end makes this competent but uninvolved	5-15g Normal, MC		48
<b>Ortofon OM40</b> £80	Average Average +	Highly competent engineering, secure tracking and decent sound quality are major strengths. But it's a little cold, a little polite	3-8g Normal, MM		48
<b>Ortofon 540</b> £100	Average— Average	Graced with an advanced FGI stylus our sample possessed too high a compliance for broad arm matching. It could also sound a little unforgiving	3-8g Normal, MM		67
<b>Ortofon MC20 Super</b> £170	Average + Good +	An "inviting" sound quality, polite rather than exciting it approaches much more expensive models, but does not better them	6-15g Low, MC	R	48/Coll
<b>Ortofon MC30 Super</b> £250	Very Good Good +	Beautifully engineered and well-balanced, it was slightly criticised as bland, though some may appreciate the lack of rough edges	5-14g Low, MC		Coll
<b>Ortofon MC3000</b> £800	Good Excellent	Quite simply, the most accurate transcription device yet created – not one for the faint hearted	6-16g V. Low, MC	R	60
<b>RATA RP20</b> £22	Average— Average	Good integration, a clear dynamic midrange and the beginnings of fine stereo imagery merits clear recommendation	6-14g Normal, MM	R	48
<b>RATA RP40</b> £44	Average Average +	The '40 did a good job of sorting out the layers and complexity of the mix, with good focus, excellent stereo spread and fine scale	6-15g Normal, MM	R	48
<b>RATA RP70</b> £77	Average Average +	Clearer and sweeter than the '40 this also seemed heavier and less lively. For £99 you can have a van den Hul stylus	6-14g Normal, MM		43
<b>RATA RP70vdH</b> £99	Average + Good	Able to retrieve bags of musical detail (thanks to the vdH stylus), RATA's top cartridge ranks as one of the most articulate MM's available	11-18g Normal, MM	R	67
<b>Rega Bias</b> £34	Average Average +	Difficult to mount in some arms due to its shallow build, the bias offers a gentile, refined SQ that certainly makes it worthy of audition	4-10g Normal, MM		67

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# THE DIRECTORY

## CARTRIDGES

NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
Rega RB100 £38	Average Average+	Remarkable mechanical performance in the right system context, but "try before you buy"	5-12g Normal, MM	R	48
Rega Elys £74	Good Good	Clearly superior to the Bias, despite their common heritage, the Elys is both more detailed, accurate and musically convincing	8-15g Normal, MM	R	67
Revolver £20	Average+ Average	This modified AT-95E enjoys a very lively mid and treble even if the bass is somewhat 'slower' in protection. A firm budget buy	8-16g Normal, MM	BB	67
Shure M92E £15	Average- Average	Though lacking depth, the overall sound quality was competent, but treble was not its forte	10-15g Normal, MM		43
Shure M99E £26	Average- Average-	Sister to the 92E this is a solid but not particularly exciting cartridge	5-10g Normal, MM		38 (Summary)
Shure ME75ED £24	Average Average-	Rather bright and splashy in the high frequencies but nevertheless a competent model	5-10g Normal, MM		38
Shure M104E £32	Average- Average	Capable in many ways, giving substantial improvement over the 92E in our view	5-15g Normal, MM		38
Shure ME97HE £44	Average Average+	It won't turn a sow's ear of a turntable into a silk purse, but will at least keep going and produce an acceptable result	8-20g Normal, MM	R	48
Shure M105E £45	Average Average-	A slightly 'spitty' sound lacking deep bass and dynamic contrast, but can be used in virtually every system where it will perform "unobtrusively"	5-12g Normal, MM		38 (Summary)
Shure M110HE £55	Average Average	Sound quality was thought eminently presentable, but not exciting; smooth clear high frequencies, but a loss of bass definition	5-10g Normal, MM		38 (Summary)
Shure M111HE £67	Average Average	Early reviews of this cartridge complained principally of the price - which has since come down	5-10g Normal, MM		38 (Summary)
Shure ML120HE £95	Average+ Average+	Quite decent sound quality and a generally fine balanced performance	6-18g Normal, MM		48
Shure ML140HE £120	Average+ Good	Qualitatively the treble of this well-balanced moving magnet model was a match for many moving coil cartridges	6-16g Normal, MM		43
Shure V15 VMR £195	Good Average+	Initial listening gave promising results, but extended familiarity gave the feeling of a lack of energy and a "shut-in" sound	5-12g Normal, MM		38
Shure Ultra 500 £452	Good Good	There was doubting the accomplishments of what could well be the finest moving magnet cartridge around	6-14g Normal, MM		48
Stilton/AT-F3 £110	Good+ Good+	At a premium of some £40 this modified AT-F3 offers a startlingly refined performance and is strongly recommended	8-18g Low, MC	R	67
Supex SM100E £115	Average Average+	Delivers as much musical information as many moving coils - the bass in particular having an attractive bounce	6-15g Normal, MM		38
Supex SD900IV £350	Average+ Good+	The 900 is an inherently fine cartridge, but despite a recent update it is beginning to show its age	10-18g Low, MC		48/Coll
Supex SD901IV £375	Average+ Good+	This high output model delivered sufficient subjective and objective performance, plus good compatibility, to justify its price tag	8-18g Normal, MC	R	48
Supex SDX2000 £651 L £721 H	Good Good+	The high-o/p 2000 was preferred on listening tests to the low-o/p model, which even so has a unique place among the top designs	6-16g Either, MC		48
Van den Hul MC10 £699	Good Good+	A neutral balanced performer giving transparent midrange, fine depth and focus with firm extended bass. Gosh!	5-10g Low, MC	R	60
Van den Hul MC One £799	Good Very Good	This extended all the positive qualities of the '10 but added greater authority and scale - worth it for the extra money	6-12g Low, MC	R	60

## AMPLIFIERS

The amplifier sits at the heart of the system, processing the outputs from all the various music sources as necessary and then driving the loudspeakers. These two (quite separate) functions are integrated into a single box at the low-to-middle price points; separated pre- and power amplifiers become increasingly common as one moves upmarket. At the upper end of the specialist market, valve amplifiers provide a popular alternative to the transistor types amongst enthusiasts.

There is a substantial difference between specialist (sound quality oriented) amplifiers and the consumer electronics style models. The former

are bleakly simple, avoiding all unnecessary features to provide the most direct signal path in the interests of best sound quality. The latter range from models with just basic tone controls and tape recorder switching, to those with elaborate facilities such as graphic equalisers, remote control (including volume), surround sound options etc. etc.

Lab measurement provides some useful data, particularly in regard to an amplifier's ability to drive a wide range of different types of loudspeakers, but this is only obliquely related to sound quality. We also include our measured power output (RMS, 8ohm load, 1 channel driven) - but

again, paradoxically, this doesn't necessarily correspond to the loudness capability of the amplifier, which has as much to do with the elegance of the overload characteristics within a given system (valve amplifiers invariably sound more powerful than their rating would suggest). The listing of features provides some indication to the complexity of an amplifier: many users prefer to retain the option of tone controls to 'shape' the overall sound according to taste; many others have found living without tone controls surprisingly easy, with additional benefits in terms of transparency.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
A&R Arcam Delta 90 £350	Good Fair	Well balanced and sweet-natured in any given system with MC capability, but pricey	70W MM/MC 5 inputs tone controls		50
Albarr M408 II £649 pr.	Good+ Good+	Unusually styled transistor monoblok power amplifiers reintroduced with improved performance and sound quality. Needs good warm-up for best sweetness and clarity	40W Power amp only	R	56
Albarr M1008 II £899	Very Good Good	A larger version of the similarly styled M408II, fairly good all round but only of average quality for the price	80W, monoblok		62
Aria Acoustics Aria 12 £299	Poor Very Good	A plain looking valve power amp that's something of a wolf in sheep's clothing giving many dearer amps a run for their money	12W	BB	63
Audio Innovations Series 300 £389	Poor Good++	Something of an anomaly the 300 is an integrated valve amp that looks awful in the lab but sounds remarkable in a system	10W, MM, 6 inputs	BB	63
Audio Innovations Series 1000/2nd Audio Amplifier £1199/1999	Poor Excellent	This valve combination offered awesome dynamic range with superb transparency and power to match. Compatibility with other brands is unpredictable	15W, MM, 6 inputs, monoblocks	R	63
Audio Research SP9 £1700	Very Good Very Good	This new high performance valve/FET hybrid preamplifier sets a high standard for versatility, build quality and sound	5 inputs, MM/MC	R	60
Audio Research SP11 II £5250	Very Good Excellent	Current state of the valve preamp art. A reference point	Straight line MM/MC Disc + phase invert	R	60
AudioLab 8000C £325	Excellent Good	A well established preamp with a highly controlled sound, though it could do with more life and depth	MM/MC, 5 inputs, 10db, tone controls	R	62

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# THE DIRECTORY

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
<b>Audiolab 8000A</b> £350	Very Good Good	A long running and high dependable classic, versatile and consistent via all inputs	50W, MM/MC, 5 inputs, hdph, tone controls	R	62
<b>Audiolab 8000P</b> £495	Excellent Very Good	A dynamic powerhouse, load tolerant and sonically reliable	100W	R	62
<b>Beard Audio CA35/P35mkII</b> £595/£795	Fair+ Very Good	Good build quality and a very smart finish combine with a characteristic valve sound to make a first class amplifier capable of giving hours of musical enjoyment	35W, MM/MC, 4 inputs	R	63
<b>Beard 506</b> £1195	Good+ Good+	A versatile valve preamp – the bass sounded lively if a touch softened while the treble was detailed but lacked a little sparkle and air.	4 inputs MM/MC		50
<b>Beard M70</b> £1995 pair	Good Good+	A substantial British monoblok power amplifier, but not a great deal more impressive than the P35 at half the price	70W		50
<b>Burmester 838</b> £1490	Very Good Good	A disc-only minimalist preamp, strong points include excellent build, extreme neutrality, very clean bass and notably sharp stereo focusing	MC only, MM option		Collection
<b>Burmester 846</b> £1599	Very Good Good+	Usually coupled with the 838 this high-level preamp provides many versatile input facilities	6 inputs		Collection
<b>Burmester 850</b> £3995	Good+ Good	Each of these mono power amplifiers contains separate high current 25W amps giving a refined coherent sound over most of the frequency range	100W		Collection
<b>Cambridge Audio P40</b> £200	Good Good+	A very fine sounding integrated amplifier with simple facilities and MC cartridge capability	5 inputs 40W MM/MC straight line	BB	50
<b>Cambridge Audio C75</b> £279	Good+ Good+	Whilst not quite on par with the A75 companion this preamp provided excellent stereo imagery but was a touch "heavy" in character	MM/MC disc	R	50
<b>Cambridge Audio P55</b> £290	Very Good Very Good	A grown up P40, the P55 suffers slight noise on the moving coil input but offers great sound for the money	55W, MM/MC, 5 inputs, hdph	BB	62
<b>Cambridge Audio A75</b> £299	Very Good Very Good	This strong power amplifier sounded open and effortless, with fine bass drive and dynamics, albeit a touch grainy and harsh at high frequencies	100W	R	50
<b>Cello Audio Suite</b> £5280	Excellent V Good/Excellent	Cello's preamp represents a whole new ball game in flexibility and sound quality (or war of attrition on your wallet)	Optional inputs MC etc	R	50
<b>Conrad Johnson PV7</b> £785	Very Good 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> £1699	Good+ Good+	Coupled with the PV5, this CJ power amp performed well in audition	50W		Collection
<b>Conrad Johnson Motif MC-8</b> £1995	Very Good Very Good	A cheaper alternative to the '7, this preamp is an undoubted success in maintaining the Motif sound but does not compare on sound quality	MM/MC	R	50
<b>Copland Pre and power amps</b> £649 each	Good+ Fair	At £649 each this simple Danish valve pre/power combination is expensive, though the power amplifier sounds very easy on the ear	3 inputs MM, 12W		50
<b>Counterpoint SA7</b> £747	Average+ Good	Simple valve Californian preamp offering inspiring transparency for the price	4 inputs straight line MM/MC		Collection
<b>Counterpoint SA12</b> £1250	Good+ Good+	A real power-house power amp, beefy and load-tolerant although like the SA7 a trifle untidy at frequency extremes	100W		Collection
<b>Creek CAS 4040 II</b> £179	Good Good	The Mk II has no problems and is a fine all rounder	30W, MM, 4 inputs, tone controls	BB	62
<b>Creek CAS 4140 S2</b> £219	Good+ Good	Redesigned for '88, this is a fine allrounder with good moving coil input, plain presentation	40W MM/MC 3 line inputs	BB	62
<b>Croft Micro</b> £150	Average+ Good	A real upsetter, this excellent valve preamp put the cat among the pigeons proving good sounds can be made at budget price levels	4 inputs MM straight line	R	Collection
<b>Croft Super Micro A</b> £500	Average+ Very Good	The looks are somewhat improved, while this 'hot rod' version with tuned components performed very well indeed. There is still no gain on the line inputs	4 inputs, MM, straight line	R	57
<b>Croft Series IV(S)</b> £730	Good Good	The original IV is still available now supplemented by the higher price and power (S); both are fine performers	40(60)W channel	R	57
<b>Croft Series IVSA</b> £1000	Good Very Good	Featuring tuned components chosen for their sound quality, the 'A' variant is an impressive example of Croft's technique in valve design	60W special supply regulation	R	57
<b>Deftec DPA 100S</b> £2200	Very Good Very Good	A top-quality transistor power amp, sounding fast, articulate and well controlled, though maybe a touch clinical for some tastes	80W	R	50
<b>Denon PMA 250 II</b> £125	Good Fair	Despite a claimed increase in power this competent model now slips behind the competition on sound quality grounds	30W, MM, hdph, tone controls		62
<b>Denon PDA-6600</b> £1,000/pair	Excellent Excellent	Delivers abundant high quality sound, solid engineering expertise and content clearly compensating for any compromising of purist audiophile principles	250W monoblok, remote power	R	60
<b>DNM 3A</b> From £1000	Good+ Very Good	The DNM3 in its acrylic case is a remarkably revealing and neutral state of the art preamp	5 inputs MM/MC twin vol controls	R	44
<b>E.A.R. 802/509mkII</b> £920/£1550	Average Very Good	Extremely well made and combining the sonic strengths of both transistors and valves this EAR combo warrants attention	100W, MM, 6 inputs, monobloks	R	63
<b>E.A.R. £3,000/pair</b>	Very Good Very Good	A valve monoblok that measures up as a solid state amp is itself an achievement, but exceptional power delivery and bass 'slam' is not fully matched by the delicacy and transparency elsewhere	200W monoblok, bias setting		60
<b>Exposure VII/VIII</b> £360/£340	Very Good Good	Supplied as a combination without the separate preamp power supply, this pre power combination performed satisfactorily especially on the moving coil input	50W, MM/MC, 3 inputs, straight line		62
<b>Goldmund Mimesis 6</b> £2,500	Very Good Very Good	Small and discrete for those who'd rather not flaunt it, this is no powerhouse but sounds subtle, delicate and refined	80W stereo power amp		60
<b>Grant G60AMS</b> £948 pr.	Good Very Good	This neat and compact 60W valve monoblok gave good sound on the 8ohm tap, better still on 4ohms. The midrange was particularly natural	60W monobloks 41 8ohms	R	57
<b>Hafler DH120 kit form</b> £295	Fair	I didn't build one; see below	60W		44
<b>Hafler DH120 assembled</b> £360	Very Good Fair	Sound quality results were decent enough, but this power amp won't set the world on fire at this price	60W		44
<b>Harman Kardon 640 Vxi</b> £225	Good+ + Good	Moderately priced but built to HK's high standards; good value and good load tolerance	50W MM, 5 inputs tone controls		56
<b>Harman Kardon PM645Vxi</b> £300	Very Good Good	Fits in well with the Harman Kardon series, giving a competent all round performance at a fair price	75W, MM/MC, 5 inputs, hdph, tone controls		62
<b>Harman Kardon 655 Vxi</b> £449	Very Good Good	Plenty of well built integrated amplifier for the money, with lots of power to drive almost anything, plus versatile inputs	100W MM/MC 6 line inputs tone controls		56
<b>Harman Kardon PM665Vxi</b> £699	Good Good	A versatile and meaty amplifier with high current capability, but sound quality lags behind certain home grown alternatives	150W MM/MC tone controls (switchable)		60
<b>Inca Tech Dirk</b> £215	Good+ Good+	This tiny, minimalist model is effectively a power amplifier with volume control, providing inputs for CD player and tape recorder but not tuner!	50W, 2 line inputs, straight line		56

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A100 (50w)	£459
PR3A Pre-amp	£379
P140 Power (70w)	£349
P172 Pre-amp	£599
P170 Power (85w)	£599
MVT Pre-amp	£1199
P270 Power (135w)	£1299
MA50 Mono blocks	£875
MXV Pre-amp	£2299
A370 Power (185w)	£2299

**SPEAKERS**

Apart from having the best selling range of amplifiers the MF range of speakers is fast establishing itself as a best selling brand.

**MODELS/PRICES**

Reference 2	£199
Reference 4	£399
MC 2	£299
MC 4	£499



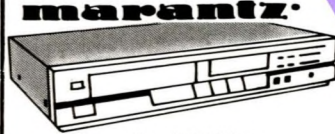
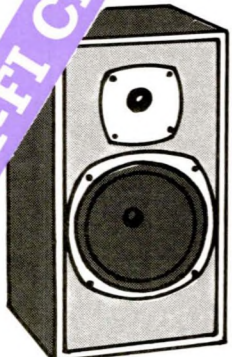
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**TANNOY**

Two models in the Tannoy range have received 'Best Buy' awards in this magazine and it is not difficult to realise why. Their all-round versatility on a wide range of music means they integrate well into most systems. Good dynamics, clarity and firm bass sum up their best characteristics.

**MODELS/PRICES**

Eclipse	£119.90
Mercury 'S'	£159.90
M20 Gold Mk 2	£199.90



**CD65 Mk 2 Special Edition**

The current Marantz range of CD players keeps winning accolades from the press. The 'special edition' versions of the CD65 and CD75 have been 'tweaked' for extra refined performance. Indeed the CD65 Mk 2 SE was recently voted CD player of the year by What Hi-Fi magazine and enjoys a 'Best Buy' rating in this magazine. Through the range they are excellent machines and to be fully recommended.

**MODELS/PRICES**

CD65 Mk 2 SE	£299.90
CD75 Mk 2 SE	£349.90
CD 85	£499.90
CD94	£799.90
CDA94 D to A converter	£799.90

**HI-FI CHOICE RECOMMENDED**

**INTERCONNECTS Stereo pairs terminated gold plated RCA phono plugs**

Description	0.5m	0.75m	1.00m	1.5m	2.0m	3.0m	Cable per metre
QED INCON	13.95	—	14.95	16.50	18.00	21.00	1.20
QED INCON (screened)	17.95	—	18.95	19.95	21.95	25.95	1.75
DNM Solid Core	22.90	23.90	25.00	27.25	29.50	34.00	2.30
DNM Solid Core (shielded)	23.50	25.00	26.50	29.50	32.50	38.50	3.00
Deltec Slink	29.00	30.50	32.00	35.50	39.00	46.00	—
Deltec Black Slink	126.00	139.00	152.00	178.00	204.00	256.00	—
Monster Interlink 400	24.00	27.00	30.00	36.00	42.00	54.00	—
Kimber PSB	30.60	33.70	36.80	43.00	49.20	61.60	—
Monster Interlink CD	31.00	37.50	44.00	57.00	70.00	96.00	—
AQ Livewire Ruby	37.00	41.00	45.00	53.00	61.00	77.00	—
Kimber KC1	39.25	46.70	54.20	69.00	83.95	113.75	—
VecTeur 8045	39.00	—	49.00	59.00	69.00	79.00	—
AQ Livewire Quartz	47.00	55.00	63.00	79.00	95.00	127.00	—
Van den Hul D102 Mk2	53.00	59.50	66.00	79.00	92.00	118.00	12.95
Monster Reference	62.00	—	88.00	114.00	140.00	192.00	—
AQ Livewire Emerald	68.00	83.00	98.00	128.00	158.00	218.00	—
Musical Fidelity Lifeline	43.50	46.25	49.00	60.50	72.00	95.00	11.50
Van den Hul Thunderline	89.00	114.90	139.90	189.90	239.90	339.00	—

**SPEAKER CABLES Stereo pairs terminated 4mm plugs (state if other termination required)**

Description	2m	3m	4m	5m	7m	10m	Cable per metre
AQ Livewire BC 2	16.00	18.00	20.00	22.00	26.00	32.00	1.00
AQ Livewire BC 4	20.00	24.00	28.00	32.00	40.00	52.00	2.00
AQ Livewire Brown	26.00	33.00	40.00	47.00	61.00	82.00	3.50
AQ Livewire Type 6	31.00	39.00	47.00	55.00	71.00	95.00	4.00
KIMBER 4TC	76.00	108.00	140.00	172.00	236.00	332.00	16.00
QED 79 Strand	12.50	14.30	16.10	17.90	21.50	26.90	0.90
QED 79 Strand (Flat)	13.70	16.10	18.50	20.90	25.70	32.90	1.20
QED 200 Strand (Flat)	18.50	22.50	26.50	30.50	38.50	50.50	1.95
NAIM NACA 4	19.95	24.42	28.90	33.38	42.34	55.78	2.24
LINN LK20	18.90	22.90	26.90	30.90	38.90	50.90	2.00
DNM Solid Core	19.70	24.30	28.90	33.50	42.70	56.50	2.30
MUSICAL FIDELITY Lifeline	56.00	79.00	102.00	125.00	174.00	240.00	11.50
SUPRA 2.5mm	16.95	19.95	22.95	25.95	31.95	49.95	1.49
SUPRA 4.0mm	20.95	25.95	30.95	35.95	45.95	60.95	2.49
SUPRA 10.0mm	41.00	54.00	67.00	80.00	106.00	145.00	6.49
Van den Hul CS122	37.00	48.00	59.00	70.00	92.00	125.00	5.50
Van den Hul CS352	67.00	93.00	119.00	145.00	197.00	275.00	12.95
VECTEUR 9040 (CV90)	35.00	45.00	55.00	65.00	85.00	115.00	4.99
VECTEUR 8120 (CV90)	99.00	—	—	199.00	—	389.00	—

**BRANDS STOCKED:** Air Tangent, Albany, Alphason, Arcam, Apogee, Audioplan, Audiolab, Audio Research, Avance, Beard, B & W, Cambridge, Croft, Celestion, DNM, Denon, Dual, Epos, EAR, Foundation, Goldmund, Harbeth, Heybrook, Jadis, KEF, Koetsu, Kiseki, Kinergetics, Krell, Kuzma, Linn, Linx, Magneplanar, Martin Logan, Manticore, Marantz, Meridian, Michell, Milltek, Mod Squad, Musical Fidelity, NAD, Naim, Nakamichi, Nitty Gritty, Oracle, Pink Triangle, PS Audio, Quad, QED, Rata, Revox, Revolver, Rotel, Rogers, Stax, SD Acoustics, Sonus Faber, Spica, SME, Surmo, Slate Audio, Systemdek, Tannoy, Voyd, Wharfedale, Yamaha, Zeta.

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# THE DIRECTORY

## AMPLIFIERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Inca Tech Claymore £396	Good + Good +	Limited facilities but a strong, clear, well-focused sound results in auspicious <i>Choice</i> debut for this relatively young company	50W MM/MC 3 line inputs straight line	R	56
ITL MA-80 £150	Good Good	A promising start for this young company, the MA-80 gave a fine sound with CD but was less wonderful on the moving coil input	30W, MM/MC, 5 inputs	R	62
Jadis JP30/JA30 £6,790	Fair Excellent	Two-box preamp plus monoblok power amps, classic valve design gives stereotype valve sound. Beautiful build, nostalgic styling and delightful sounding midrange transcend limitations at frequency extremes, in lab, and re cartridge matching	30W 2-box pre-, monoblok power, MM-only, 4 line inputs	R	60
JVC AX-222 £110	Good Fair	Not very impressive, JVC need to pull their socks up if their budget amplifiers are to score	35W, MM, 4 inputs, hdph, tone controls		62
Kelvin Labs Junior/J30 £295/£295	Good Good	Their heart is in the right place but the class A Junior combination is a bit expensive for what you get	20W, MM/MC, 5 inputs		62
Kenwood KA-550D £130	Very Good Fair	Having dropped its moving coil input, this latest version has British style dynamics and rhythm but is not first grade yet	35W, MM, 4 inputs, hdph, tone controls	R	62
Le Tube £585	Good + Good	If moving coil sensitivity is not required then this preamplifier will offer a clean view with very good stereo	3 inputs MM	R	44
LFD £2,995 +	Very Good Excellent	Can set the subjective standards that others merely aspire to, but this outstanding if unconventional multi-box preamp needs careful matching to ancillary components (cartridge, power amp)	MC (with care), passive line extra	R	60
Luxman LV100 £205	Good Fair	Nicely finished modern integrated amplifier, generally competent though not exceptional	45W MM 4 line inputs tone controls		56
Luxman LV105u £685	Very Good Good	This very well equipped and beautifully finished Japanese integrated amplifier has two valves in the early section of the power amplifier. Pleasant and musical it sets no value for money record here	9 inputs 80W, MM/MC tone controls		57
Magnum A100 £1995 pair	Good + + Good +	Given their massive power rating a pair of A100's make a fine stereo power amp; ideal for high levels and with a wide dynamic range for digital programme	320W		50
Marantz PM25 £125	Good Fair	Soft and sweet like the rest of the range, the PM25 is inoffensive and undemanding	25W, MM, 5 inputs, hdph, tone controls		62
Marantz PM35 £170	Very Good Good	This new generation Marantz is a good allrounder, and shows that extra care is being taken over sound quality; well equipped and versatile	45W MM/MC 3 line inputs tone controls		56
Marantz PM45 £200	Good + Fair	Generally pleasant and polite with above average clarity; there was some softening in the bass, restricting dynamic output somewhat	40W MM/MC tone controls		50
Marantz PM94 £1,000	Very Good Good	At 23kg the PM94 is no lightweight in either physical or sonic respects. A very powerful and comprehensively equipped amplifier	140W MM/MC tone controls (switchable)		60
Meridian 201/205 £599/£425 each	Very Good Good +	A fine preamp with additional luxury option of full system remote, plus competent and attractive monoblok power amplifiers with generally good performance	100W MM/MC 6 line inputs remote capable straight line	R/—	62
Mission Cyrus One £180	Very Good Good	A red hot class winner, which caused the whole issue to be re-rated! It's even well built - however, the headphone socket will only take a 3.5mm jack	30W, MM/MC, 5 inputs, hdph, straight BB line		62
Mission Cyrus PSX £230	Very Good Very Good	The PSX does make the Cyrus Two sound better; and also improves the PCM II CD player giving more wallop and clarity	Auxiliary power supply	R	62
Mission Cyrus Two £300	Very Good Very Good	Also a top performer in its group with fine moving coil and compact disc sound. Again, only 3.5mm headphone socket	50W, MM/MC, 5 inputs, hdph, straight line	R	62
Mordaunt Short MS-A5000 £350	Very Good Good	With a recognisable pedigree, Mordaunt Short engineers have made a good job of this one. A musical all rounder	50W, MM/MC, 6 inputs, hdph, tone controls	R	62
Musical Fidelity A1 £269	Good Good +	Fine-ranking in terms of overall sound quality for money, the excessive heat output could be hazardous to your vinyl if you're careless	20W MM/MC 4 inputs straight line	BB	56
Musical Fidelity B200 £299	Very Good Good +	Running cooler than other MFs, the B200 delivered fine musical and dynamic sounds with plenty of power	80W MM/MC 4 inputs straight line	BB	62
Musical Fidelity Pre 3/P140 £379/£349	Very Good Very Good	Delivering true audiophile sound quality well ahead of their price, both components shine in their own right	70W MM/MC 4 line inputs straight line	R	56
Musical Fidelity A100 £459	Good + Very Good	This is another recommended for fine sound with which you could keep your Chinese carry-outs warm	50W MM/MC 5 inputs straight line		62
Musical Fidelity P170 £599	Very Good Very Good	Acquitted itself well, later samples showing steadily increasing refinements	85W	R	50
Musical Fidelity MA-50 £875 pair	Good Excellent	An audiophile bargain. One of the best sounding power amplifiers made	50W, monoblok	R	62
Musical Fidelity MVT Mk 3 £1199	Very Good Very Good	The MVT preamp was "strong in its class", providing competition for £1500-plus amplifier systems, now rivalled by the MF3B	MM/MC 5 inputs	R	50
Musical Fidelity P270 £1299	Very Good Excellent	If the hot-box aspect is not a deterrent, this is something of a bargain. A big amplifier scale of sound which is just a little rough-edged	135W	R	50
Musical Fidelity MVX £2229	Very Good Excellent	Soundwise this preamp puts Musical Fidelity on terms with much more expensive exotics, with top class transparency, focus and dynamics	MM/MC, phase invert	R	60
Musical Fidelity A370 £2229	Very Good Excellent	Arguably the finest sounding power-amplifier manufactured in the UK	185W	R	50
NAD 3020e £120	Good Fair	A little light in balance and "weight" but superior to run-of-the-mill budget amplifiers	20W MM/MC 4 inputs	R	50
NAD 3220PE £140	Good Fair	Like the 3020E but with more peak power and loudness thanks to the 'power envelope'	20W, MM, 5 inputs, hdph		62
Naim NAIT 2 £322	Average + Fair	Well built with good load tolerance the NAIT delivered a fully competitive sound in spite of its modest measured power output. Recent modifications as yet unchecked	15W per MM 3 inputs	R*	50
Naim Separates £560-£8,000	Very Good Good	A consistent and coherent series of 'building blocks' for conventional passive or active operation. Sound quality ignores conventional audiophile standards of presentation, but achieves fine musical communication	40-70W, MM/MC etc	R	60
Nakamichi CA-5E £750	Very Good Good	A fine lab performance and high build quality but rather disappointing sound quality for a preamp of this price	MM/MC, 6 inputs, hdph, tone controls		62
Nakamichi PA-5E £1150	Very Good Good	A strong sound in several respects but one which ultimately failed to satisfy	100W		62
Nakamichi CA7E/PATZ £2500/£1700	Very good Good/Good +	Exceptional build and finish, plus good general performance, remote control and versatility, but expensive	200W MM/MC 6 line inputs, remote, tone controls		56
Nuance £795	Very Good Good	A subtle civilised pre-amp though a little lacking in resolution and detail; suited to some tastes but not top-drawer	4 inputs MC		50
Oakley Image £425	Poor Very Good	An interesting valve preamp from Yugoslavia, the Image on first impression needs a bit of tweaking to warrant <i>Choice</i> commendation but is a nice product nonetheless	MM, 5 inputs straight line		63

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

# THE DIRECTORY

## AMPLIFIERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Orell SA-040 £359	Good Good+	This promising newcomer from a brand new company sounded pretty good and should improve as production settles	45W MM/MC, 4 line inputs, straight line	R	56
Pink Triangle PIP £2670	Excellent Excellent	This state-of-the-art preamp is one of the few truly high end products to come out of this country this year. It will most certainly worry the competition	MM/MC, 4 inputs, battery supply	R	62
Pioneer A333 £149	Very Good Fair	A rather average but nonetheless competent performer that is pleasant enough	55W, MM, 5 inputs, hdp, tone controls		62
Philips FA860 £249	Very Good Fair	Well balanced model from Philips' Japanese factory, with versatility, good build and finish	70W MM/MC 5 line inputs tone controls		56
QED A240 CD II £169	Good+ Good	Latest 240CD is fine value for CD and has competent MM disc input as well	45W MM 5 line inputs straight line	BB	62
QED A240 SA II £219	Good+ + Good+	Redesigned 240SA represents a significant allround improvement over its predecessor, and provides a good moving-coil disc input in a competitive price	45W MM/MC 5 line inputs straight line	BB	62
Quad 34 £285	Very Good Fair	This well-built durable preamp has useful filtering and above average tone controls but was found lacking in sound quality (viz: detail/dynamics)	4 inputs MM/MC tone controls		44
Quad 405 £349	Very Good Fair	Not an impressive power amp but easy on the ear if not pushed and very reliable	100W		44
Quicksilver Mono £1495	Good Good+	Moderately improved for '88 the Quicksilver still rates well despite up and coming competition	60W monoblok 4/8ohms		57
Radford SC25 £862	Very Good Very Good	A very fair price for a solid, well built valve preamp, combining good allround performance and a neutral sound	5 inputs, MM, straight line	R	57
Radford MA75 £977	Good Very Good	A fine quality valve monoblok with good load tolerance and a neutral accurate sound, offering significant gains in power and focus over the STA25	75W monobloks	R	57
Radford STA25 Renaissance £1115	Good Good+	Offering superb midrange performance if not quite as good at the extremes, the Renaissance valve power amp is a genuine audiophile product	25W	R	50
Revox B250 £1188	Very Good Good	With much improved sound over its predecessors plus amazing remote control facilities, this could form the heart of a round-the-dream-house system	150W MM/MC system/house remote tone controls		56
Robertson Forty Ten £987	Very Good Good	Here is a neat little power amp (60W) you can fit and forget; it proved most satisfying over long listening sessions	60W		Collection
Rose RV-23 £370	Average Very Good	A very attractive little British valve preamp with a sound that was rich, colourful and reasonably sharp via the CD input but was less impressive on disc	MM, 4 inputs, straight line		63
Rotel RA810A £100	Very Good Fair	As a cut price RA820AII this is a very successful little amp that loses little in sound quality to its predecessor. Excellent value	20W, MM, 5 inputs, hdp, tone controls	BB	62
Rotel RA820A £130	Good+ + Good	This A version of an established budget favourite delivers the goods sonically and is fine value for money	35W MM 4 line inputs tone controls	BB	56
Rotel RB/RC850 £145/£125	Good+ + Good+	Quality separate pre and power amplifiers at near budget integrated amplifier prices. A notable achievement	60W MM/MC 4 line inputs tone controls	BB	62
Rotel RA820BX3 £165	Very Good Good	The latest upgrade is not that impressive, but the BX remains a fine amplifier and now has a moving coil disc input	30W, MM/MC, 5 inputs, hdp, straight line	BB	62
Rotel RA870BX £300	Very Good Good+	A powerful blockbuster with solid and well focused sound, good versatility and fine load tolerance	85W MM/MC 7 line inputs tone controls	R	56
Sony TAF 500ES £349	Good+ Fair	Not too hot at the price, lacking in bass action, rating poorly on vinyl, and only marginally improving on CD	75W hdp tone controls MM/MC		50
Sony TAF 700ES £500	Good+ + Fair	Scoring higher than the 500 but still not offering the sort of standards set by the competition. But many buttons to push	100W MM/MC tone controls		50
Sumo Nine + £1200	Very Good Excellent	Macho styling of this class A stereo power amp conceals a sonic subtlety that is exceptional for the price, limited by lots of waste heat and a noisy fan on our sample (being improved)	65W	R	60
Tannoy SR-840 £1713	Very Good Good	A "muscle" power amp, capable of impressive levels into difficult loads while remaining quite subtle and revealing	250W		50
Vacuum State FVP £999	Good Very Good	This well thought out valve preamplifier is designed for optimum musicality and transparency, a goal which is handsomely achieved	5 inputs, MM, straight line	R	57
Yamaha AX-300 £100	Good Fair	A lively and dynamic performer, offering a credible if bright sound at a competitive price	30W hdp tone controls (MM)		50
Yamaha AX500 £200	Very Good Good	A well built versatile performer with generous power, decent sound	90W MM/MC 5 line inputs tone, var. loudness		56
YBA 2 pre & pwr £1395/£1695	Good+ + V Good/Excellent	Superbly finished French audiophile separates, with very good space and transparency, slightly softened bass. Needs extra transformer (£300) for MC cartridges	70W MM (MC extra) straight line	R	56
YBA 1 preamp £2895	Very Good Excellent	A front line French audiophile product. Great stereo and a fine Krell style finish	MM/MC, 3 inputs, straight line	R	62
YBA 1 power amp £2995	Good Excellent	This equally well finished power amp offers front rank stereo staging and transparency, and is capable of driving the most difficult loads	85W	R	62

## LOUDSPEAKERS

Last item in the hi-fi chain, to some extent the loudspeaker is merely the slave of what has gone before, capable only of reproducing a signal as good as it is fed. Nevertheless the distortions (colorations and stereo effects) introduced by loudspeakers (and rooms) tend to be more immediately obvious than those anywhere else in the chain, so careful choosing according to taste is very important.

The average loudspeaker consists of a smallish enclosure, much of which may have begun life as

part of a tree, plus a couple of drive units hidden behind a removable grille. Inside the box lurks a simple electrical circuit known as a crossover, which divides the incoming (full range) signal into the right bits for the drivers to handle. Variations on the above formula are specifically identified in the entries. The designer's primary task is to balance the sensitivity of the loudspeaker (how loud it goes for a given electrical input) against the bass extension (how low does it go) for the given box size. After that such subtleties as coloration and

dispersion come into the equation.

Careful placement of the loudspeakers within the room is as important as the initial choice of model. For good stereo they need to be more or less the same distance from nearby walls, and preferably on similar rigid stands. The listener should be about the same distance from and listening angle to each loudspeaker. The ideal placement depends on the way a particular model has been balanced (not to mention a number of other factors), and our recommendation is given in the entries.

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
Acoustic Energy AE1 £700	Good Very Good	To the author's knowledge, the most awesomely dynamic and articulate miniature ever made	29.5 x 18 x 25cm semi-open space	88dB/W 60Hz	R	59
Acoustic Energy AE2 £1138	Good Very Good	Dynamic, solid and lively, a great allrounder if a bit small considering the price. AE proves that metal one/dome drivers really work.	39 x 23.5 x 29.5cm heavy stands in free space	88.5dB/W 45Hz	R	66
Acoustic Research AR122 £140	Average Average	Despite a promising enough list of ingredients, the 122 failed to excite real enthusiasm amongst the listening panel	38.5 x 19 x 22cm stands near rear wall	87dB/W 68Hz		This



# THE DIRECTORY

## LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
Alexander Aurora £350	Average Good—	The unusual metal case and slim shape of this grown up miniature provide welcome diversity. It sounds pretty good too	42.5 x 14 x 19cm matching stands in free space	85dB/W 55Hz		66
Apogee Caliper £2550	n/a Very Good	Near state of the art performance, not materially worse than bigger Apogeess, just less bass. Rich, subtle and slightly dull, with a clear, articulate midband, but uncommonly system fussy.	122.5 x 71 x 10cm ex. rear foot, free standing, away from walls	n/a n/a	R	60
Apogee Scintilla £4990	Good Very Good	These take-me-to-your-leader speakers gave exceptional transparency and can achieve excellent results in a true audiophile system	145 x 88 x 9cm free space on floor	79dB/W 20Hz	R	46/Coll
A&R Arcam Three £150	Average+ Average—	Arcam's baby speaker did not delight our listeners, but it might do better in less expensive systems	34 x 18 x 23cm close to wall at head height	88.5dB/W 95Hz		53
A&R Arcam Two £260	Good Average	Most things to most men this compact is unlikely to disappoint with its lively "balsy" character though lacking weight... a bit	38 x 23 x 28cm near wall shelf or 40cm stands	88dB/W 55Hz		59
A&R Arcam One Plus £359	Good Average	Provides a solid, weighty and rich sound, but is a little raw in the treble and indefinite in the midband	22.3 x 28.1 x 37.8cm open space, on stands	88.5dB/W 60Hz		59
AR 112 £120	Average Average—	Nicely presented and engineered, but sounds a bit small and boxy without true coherence.	36 x 19 x 18.5cm stands near rear wall	87dB/W 75Hz		66
AR 132 £180	Average+ Average—	Good presentation and detail engineering was not sufficient to counter bass heavy balance problems on auditioning	44.5 x 23 x 25.5cm stands 1ft from rear wall	87dB/W 50Hz		66
Ariston Image £185	Good Average	Good engineering content at a reasonable price, the Image delivers fine stereo with low coloration, but sounded too bassy under our listening conditions	42 x 22 x 27cm stands in free space	87dB/W 55Hz		66
Ariston QLN1 Mk 2 £350	Very Good Good+	This very sophisticated loudspeaker has much of the euphony of a LS3/5A but with rather more 'oomph'. A little 'romantic' for some tastes - Schubert and Sting rather than Stockhausen or the Stones perhaps?	35 x 25 x 26.5cm free space, 24 inch stands	84.5dB/W 65Hz	R	59
Audiostatic ES200 £1495	Average Average+	Sounding forward and unbalanced with limited bass power, these excelled in transparency and detail, and might suit some tastes	150 x 53 x 23cm low stands, free space	79dB/W 45Hz		46
Audiostatic ES300 £1995	Average+ Good	Marred by similar problems to its cheaper ES200 stablemate, this line source electrostatic was superb in the upper-mid and treble but lumpy in the bass	44 x 5 x 93cm free standing	82.5dB/W 30Hz		46
Audio Electronics TC10 II £599	Good— Good+	Oddball appearance is rescued by a respectable technical performance, interesting and impressive engineering and fine sound quality at a realistic price.	70 x 33.5 x 33.5cm low stands in free space	87.5dB/W 40Hz	R	This
Avance 120 £279	Average+ Average+	This unusual "after eighties" looking speaker has the recipe for success, but quite the right seasoning yet	42 x 30 x 30cm 30cm from wall on 40cm stands	86.5dB/W 60Hz		53
Avance Concrete 2000 £970	Below Average Below Average	Very low cabinet talk, but the system sounds terminally uneven - lumpy bass and over-forward midband dominate	86.5 x 29.2 x 43cm clear of walls	84dB/W 40Hz		60
B&W DM560 £200	Average+ Average—	Fine cosmetic presentation and good engineering for the price; overload protection may be handy but listening panel was underwhelmed	49 x 23.5 x 30cm stands in free space	88dB/W 55Hz		66
B&W LMI Mk II £249	Average+ Average	Probably one of the best 'micros' ever made, worth considering for special applications (boats or vehicles). Upgraded since our review	24 x 15.5 x 20cm shelf or flush mount	86.5dB/W 80Hz	*	31
B&W DM1600 £399	Good Good	Crisp, dynamic loudspeaker with light but not especially deep bass and a tweeter that sometimes sounds overcooked	49 x 23.6 x 30cm free space, open stands	87.5dB/W 60Hz	R	59
BLQ 02 £275	Average— Average	Early a good loudspeaker, the basic balance is good, but the midband is very uneven and there are severe losses of resolution, 'space' and dynamics	43 x 25.1 x 24.5 semi open on stands	87.5dB/W 70Hz		59
Bose 6.2 £570	Average— Average—	Wishy-washy (but not unpleasant) sound and vague imagery are the hallmarks of this unusual design	25.4 x 50.8 x 24.4cm free space, on stands	87.5dB/W 55Hz		59
Boston A4011 £110	Average Average—	Competent performance for size and price but below average relative to the UK competition	34 x 21 x 20cm on stands near wall	88.5dB/W 63Hz		41
Canton 60 Karat £600	Average+ Good	Looks a bit of a throwback designwise, but is nicely presented and has a lively, dynamic and generous sound	58 x 31.5 x 31cm stands in open space	90dB/W 48Hz	R	66
Castle Clyde £149	Average+ Average	A tidy little performer packing punch, but beginning to show its age in the light of new competition	37 x 21.5 x 22cm open space on stands	89.5dB/W 64Hz	R	46
Castle Durham £199	Average+ Average	Listening results were encouraging, well engineered and finished, but lean on treble and a bit weak on bass; still recommended	41 x 21.5 x 25cm near rear wall	89dB/W 67Hz	R	46
Castle Pembroke £309	Good Average+	Comfortably recommended, a sweet smooth sound with good overall balance of engineering-based performance	55 x 37.5 x 30.5cm open space on stands	88dB/W 46Hz	R	31
Castle Warwick £169	Good Average—	Excellent presentation and fine engineering with overload protection, but a sonic disappointment in bass and dynamic qualities	46.5 x 25 x 23cm stands 1ft from rear wall	88dB/W 50Hz		66
Celef Cirrus £180	Average Good	It's nice to see Celef back in the UK, with this decent sounding small reflex box that seems unusually tolerant of siting	39 x 20.5 x 23cm stands in free space	84dB/W 60Hz	R	66
Celestion DL6 Series Two £149	Good Average	Good tonal colouring and plenty of bass for the enclosure size; the metal dome tweeter is excellent, but bass and mid lack clarity and 'bite'	45.4 x 24.5 x 26.2cm near wall, on stands	87dB/W 65Hz		59
Celestion DL8 Series Two £199	Very Good Good	A refined middle market speaker has a smooth but slightly dull quality, with good definition and deep, if slightly boxy bass	50 x 27.5 x 27.8cm open, stands	87.5dB/W 60Hz	R	59
Celestion SL12Si £580	Average Average	Careful setting up does reveal elements of fine sound quality, but this 'grown up' SL6 variation has a lumpy response alongside its improved power handling	53 x 20 x 27cm matching stands clear of walls	85dB/W 50Hz		66
Celestion SL600Si £780	Good+ Good	This Aerolam high tech miniature has certain remarkable qualities that some will find irresistible, and which go a long way towards justifying the highish price. Needs careful system and room matching.	27 x 20 x 23cm matching stands in free space	82dB/W 52Hz		This
Celestion SL700 £1349 inc stands	Good Good	Very sophisticated, mostly smooth and accurate transducer, with fast but not very deep bass and a rather bright treble	37.5 x 20 x 23.5cm free air on tall stands	83dB/W 45Hz		60
Celestion 6000 £1470	Very Good Very Good	A genuine fullrange audiophile quality speaker system - with Star Wars styling to suit a high tech environment	Complex, on floor in free space	82.5dB/W	R	60
Chameleon 500 £349	Average— Average—	Sounding badly coloured, dull and compressed, it is also amateurishly constructed, despite using good quality materials	38 x 25.3 x 31.3cm free, stands	89.5dB/W 75Hz		59
dbx 1000 £450	Average— Average—	This system sounds soft and woolly, with an effusive bass, an occasionally sharp treble, and a recessed midband. Stereo positioning is poor.	78.7 x 35.6 x 27.9cm against rear wall	91dB/W 60Hz		59
Energy 22 Pro Monitor £600	Good Good	Presentation is a bit rough for the price, but this Canadian entrant is an impressive sonic allrounder that will appeal to most listeners	62.5 x 27 x 30cm stands in free space	87dB/W 40Hz	R	66
Gale 301 £280	Average Average+	Of unusual, distinctive appearance this produced a mixed response, being lively but lacking depth	44 x 23.5 x 22cm on stands quite near wall	86.5dB/W 63Hz		46
Gale GS402 £700	Average+ Average+	Clean but rich and powerful bass; stereo focus was not a strong point, but it is worth considering. (Recent revisions not yet checked)	61 x 35.5 x 28cm on matching stands near wall	88dB/W 48Hz	*	46
Goodmans Maxim Two £80	Average+ Average	More wham-bam-thankyou-mam sound that imitates much bigger speakers when you let these babies yell. (A well-controlled yell)	26 x 17 x 19cm near wall on shelf or stand	86dB/W 85Hz	BB	59

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## THE DIRECTORY

## LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
Goodmans Point 3 £90	Average+ Average-	Recommended as good value for money, but our listeners' differing opinions mean your ears should judge for themselves	47 x 25 x 20cm shelf/ high stand near wall	90dB/W 80Hz	R	53
Goodmans Point 7 £170	Average+ Average	Basically competent performance-mix and a lot of speaker for the money, but a certain lack of refinement nonetheless	69 x 33 x 26cm free space on 35cm stand	89dB/W 47Hz		53
Harbeth LS3/5A £300	Good Average	Still a classic miniature, though not to every taste, and none the better for the recent update under our listening conditions. Limited dynamic range	30.5 x 19 x 16cm stands in free space	81dB/W 60Hz		66
Harbeth HL Compact From £455	Very Good Average	The clean and neutral sound lacks resolution and gives rather unobtrusive though well differentiated stereo. Can be bi-wired to advantage	52 x 27.2 x 28.1cm open space, on high stands	87.5dB/W 65Hz		59
Heybrook Point Five £129	Average Average	Disappointingly prosaic performance on listening tests, wooden and hollow, with restricted dynamics and 'space'. Earlier samples sounded better	37.5 x 23 x 23cm near wall, on matching stands	86dB/W 65Hz		59
Heybrook Point 7 £170	Average Average	Physically an attractive package, but not entirely convincing in lab or listening panel test; interesting for all that	40.5 x 23 x 23cm stands against rear wall	85dB/W 60Hz		This
Heybrook HB1 £189	Good Average+	No longer an over-bright character, a strikingly clear sound and fine transient performance now merits recommendation	47 x 29 x 23cm on stands near wall	88dB/W 61Hz	R	46
Heybrook HB100 £250	Average+ Good	Well matched for wall siting, the HB100 is a lively and informative performer in the tradition of the popular HB1	47 x 26 x 28cm stands near rear wall	86dB/W 50Hz	BB	66
Heybrook HB200 £369	Average Average	This luxury successor to the HB2 is lively and informative, but sounded insufficiently balanced to convince our listening panel	46 x 23 x 26cm stands against rear wall	87dB/W 55Hz		66
Infinity RS2000 £140	Good Good+	Fast, detailed and assured miniature with quick but not very deep bass. The top end is detailed but sometimes jangly	36.2 x 22.5 x 20cm near rear wall, high stands	91.5dB/W 70Hz	BB	59
Infinity 6 Kappa £650	Good Good	Interestingly styled US loudspeaker has unusual high tech drivers and good neutrality, but the sound seriously lacks excitement	63 x 38 x 24cm stands, free space	85dB/W 35Hz		66
Jamo Concert 2 £240	Good Average-	A thoroughly respectable 'bookshelf' performer that needs free space siting but includes attractive cabinetwork and a neat grille	41 x 24 x 25cm stands in free space	85dB/W 48Hz		66
JBL L 60T £399	Good+ Good	Well balanced and offering realistic value for money, the fine treble and extended bass make it suitable for larger rooms	78 x 30.5 x 26.5cm low stands or floor	88dB/W 40Hz	R	46
JBL L80T £559	Good Average	Large scale, dynamic if rather unwieldy sounding, this is a performer of integrity, if not much subtlety	85.1 x 35.6 x 30.3cm floorstanding, open space	89.5dB/W 55Hz		59
JBL 18Ti £599	Good+ Good	Beautifully engineered, well finished miniature with many good points, but unexceptional overall. Try the cheaper L20T	34 x 24 x 22.5cm 50cm from wall on rigid stands	85.5dB/W 53Hz		46
JBL 250Ti £3599	Good+ Good+	In general this speaker did not show the required level of dynamic presentation transparency and stereo depth expected of a pricey flagship model	132 x 57 x 36cm free space on floor	89dB/W 53Hz		46
JPW P1 £125	Good Average+	Honest and basically articulate if not very sophisticated, resolution is good but it can sound a little wearing in bright systems or with rough sounding material	44 x 25.9 x 26.1cm free space on stands	89dB/W 60Hz	R	59
JPW AP2 £145	Good Average+	Few grounds for criticism but purchasers should check out the treble qualities to avoid hammering the ear anvil	46 x 26 x 25cm 40cm from wall on 45cm stands	89dB/W 65Hz	R	53
JPW AP3 £210	Good Average+	Pretty good stereo and well balanced overall it had its own character which is well suited to vinyl replay	52 x 25 x 29.5cm near wall on stands	90dB/W 57Hz	R	46
KEF R102 £335	Very Good Very Good	High class near-miniature with expressive, articulate midband and clean, accurate bass and top. The sound quality of the Kube circuitry, however, is suspect; what would an audiophile Kube sound like?	33 x 20.7 x 26.3cm near wall or open on stands	89.5dB/W 60Hz	R	59
KEF 103/3 £630	Good+ Good	Technically impressive, excellent bass/power handling for size, but not for the audiophile system. Better among cheaper components, and good in a large room	56 x 27 x 30cm supplied stands free space	90-95dB/W 35Hz		53
KEF 104/2 (inc KUBE equaliser) £849 (£948)	Very Good Good+ +	A reference point for dynamics, preferred without KUBE, suited to many rooms. Good stereo, high sound levels	90 x 28 x 41.5cm floor standing in free space	92dB/W 50Hz	R	60
KEF 107 £1890	Very Good Good+	A welcome sense of ease and lack of strain at most normal levels. Minor criticisms included a dulling in the extreme treble. Excellent bass extension	116.5 x 33 x 45cm on floor in free space	87.5dB/W 20Hz	R	60
Linn Helix £259	Average+ Good	Attractive presentation is coupled with an attractively lively sound which is more neutral if less committed than earlier Linn loudspeakers	51 x 25.5 x 28cm stands 1ft from rear wall	88dB/W 53Hz	R	66
Linn Nexus £350	Good Average	Good features include a solid, meaty bass plus good imagery and tonal balance. The catch is that Nexus lacks resolution and timing	49 x 23.5 x 30.4cm near rear wall supplied stands	89dB/W 60Hz		59
Linn Sara £749	Good Very Good	The new Sara is now much smoother and sweeter, with much better imaging. Bass power and dynamics are as good as ever, and the system is no longer as fussy as before	43 x 34.4 x 26.5cm stand mounting, near wall	88dB/W 50Hz	R	60
Magneplanar SMGa £675	Average- Average	Tonally 'rich', in the right room it proved a satisfactory musical experience	122 x 48 x 4.5cm on floor clear of wall	85dB/W 56Hz		46
Magneplanar MG2.5R £1897		Offers the low coloration and profound musical insight of better electrostatic loudspeakers but without loss of low frequency extension	183 x 56 x 4.5cm Open space	83-85dB/W 35Hz	R	60
Magneplanar MG11a £2650	Good Very Good	Another excellent true-audiophile loudspeaker this American panel speaker helps to convey much of the original character of the music	180 x 62 x 38cm well clear of walls	84-86dB/W 35Hz	R	46
Marantz LD20 DMS £150	Average Average	Recommended more for CD users than vinyl keepers, soundly engineered and built but should be heard before bought	36 x 23 x 24cm free space on 45cm stands	86.5dB/W 55Hz		53
MB Quart 390 £499	Below Average Poor	An aggressive, messy sounding design whose uncouthness undermines the positive level of detail	52 x 31 x 30.5cm open space, on stands	89.5dB/W 60Hz		59
Meridian M30 £725	Average+ Average	Pricy but easy on the ears and worth considering especially where space is at a premium	38.5 x 18 x 32cm free space on stands	Active 40Hz		46
Mission 70 II £100	Good Average	Lively and transparent, the 70 II was favoured for its speed, though the sound had a mildly 'thin' tonal balance	35 x 21 x 21cm on stands or shell near wall	89dB/W 68Hz	BB	46
Mission 761 £120	Average Good	One helluva speaker for the price, if a shade small and short of subtlety and refinement - should prove a worthy successor to the 70 and 700	38 x 21 x 21cm stands near rear wall	87dB/W 60Hz	BB	66
Mission 700LE £140	Good Average	Mission re-submitted this popular model and again got positive review - which proclaims their (and our) consistency	38 x 21 x 21cm straight ahead stand near wall	89dB/W 66Hz	R	59
Mission 762 £180	Average Average-	Mission's 'bookshelf middleweight' offers high sensitivity and loudness capability, but at the expense of a somewhat untidy and rather 'heavy' sound	50 x 25 x 27cm stand, experiment advised	91dB/W 55Hz		66
Mission R737 Renaissance £250	Average Average	Effusive, over-the-top bass and obtrusive treble get in the way of a marvellously lucid and transparent midband. Inconsistent on audition - wonderful piano, bloated orchestras etc	54 x 25 x 27cm near wall on dedicated low stands	88.5dB/W 60Hz		59
Mission 763 £280	Average+ Average+	A very artful combination of generous volume and good bass extension at a surprisingly modest price that works well in the listening room despite a few rough edges	77 x 25 x 32cm near rear wall	86dB 40Hz	BB	This
Mission Argonaut £500	Good Good	Perhaps not the most subtle or sweet these were recommended for their excitement, drama, power handling and... good looks	95 x 23 x 31cm floor- standing near wall	91dB/W 40Hz	R	60

# THE DIRECTORY

## LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
Monitor Audio R100 £159	Average+ Average-	Tonally quite neutral, but with small box character, negligible low bass and a rather 'hard' midrange	40.5 x 25 x 21cm free space on stands	87.5dB/W 70Hz		46
Monitor Audio R352/MD £300	Average+ Good	A good value large box that sounds more engaging than subtle, providing a good compromise between bandwidth and sensitivity	64 x 25 x 32cm stands in free space	89dB/W 45Hz	R	66
Monitor Audio R452/MD £399	Average Average	This big, efficient, dynamic sounding loudspeaker has a clean, open treble but a pinched, two-dimensional midband. Can be tiring in the long run	64 x 25 x 31.8cm open space, low stands	89dB/W 55Hz		59
Monitor Audio R852/MD £399	Good+ Good	This finely crafted design has a sharp and clear if occasionally rather rough sound quality. Bass is light but qualitatively very good - an intriguing performer	45 x 25 x 27.5cm open space near rear wall, high stands	89dB/W 68Hz	R	59
Monitor Audio R852/Gold MD £450	Good Good	Luxury build and 'high tech' tweeter or not, this compact model offers good refinement and detail on an open soundstage	45 x 25 x 26cm stands in free space	86dB/W 50Hz	R	66
Monitor Audio 1200 Gold MD £800	Average Average+	This smooth and civilised slimline floorstanding loudspeaker is well built and nicely presented. But it is also expensive	94 x 20 x 26cm in free space	85dB/W 48Hz		This
Mordaunt Short MS10 II £90	Average Average-	One of the best miniatures around. A borderline Best Buy because of the bass limitations, which may depend on your taste	29 x 20 x 17cm wall bracket	86dB/W 75Hz	R	53
Mordaunt Short MS100 £189	Average+ Average+	A 'mid forward' tonal balance is its main drawback but other aspects such as ambience, transparency and stereo depth compensate	32.5 x 22.5 x 21.5cm stands near wall	85dB/W 80Hz	R	46
Mordaunt Short 45Ti £230	Good Average	A sensitive tandem-bass number that can be driven loud but loses its balance a bit and can be unsubtle	63 x 26 x 30cm low (20cm) stand near wall	90.5dB/W 52Hz		53
Mordaunt Short MS300 £319	Average+ Average+	Not considered particularly competitive in its class, though it has good power handling and stereo focus	51 x 22.5 x 25cm stands near wall	89dB/W 65Hz		46
Mordaunt Short 442 £1150	Good+ Good++	A resounding success with the listening panels. Make sure your room can accommodate the bass	95 x 26 x 38cm floor standing in free space	87.5dB/W 40Hz	R	60
Musical Fidelity MC-2 £300	Very Good Very Good	This exceptionally clean and clear design offers real subtlety and finesse. Bass quality is light but exceptionally clear; the treble is smooth if slightly shallow	48.5 x 25.5 x 16.5cm open space and stands	87.5dB/W 65Hz	BB	66
Musical Fidelity MC-4 £499	Very Good+ Very Good	Achieving a very high standard, the MC-4 sounds detailed and coherent like the MC-2, but with more bass depth and solidity, and large image scale	56.5 x 26.9 x 29cm open space on stands	87.5dB/W 60Hz	R	59
Opus 3 Capella £495	Good Good	The sound of this Scandinavian curiosity certainly benefits from the crushed marble enclosure, though presentation is strictly DIY	32 x 40.5 x 26(ave)cm amongst books in bookcase	86.5dB/W 45Hz		66
Quad ESL-63 £1538	Good+ Good++	With its unusual but subtle characteristics this classic electrostatic may not be punchy in the bass, but has strengths that some cannot live without	92 x 66 x 27cm open stand well clear of wall	84dB/W 34Hz	R	60
Richard Allan CD5 £242	Average- Average-	This neatly presented small reflex design can sound engagingly communicative, but is flawed sonically and technically and quite expensive too	38 x 19 x 23cm on rigid stands	88dB/W 80Hz		This
Rogers LS7t £399	Good+ Good+	A fine combination of classic qualities at reasonable price produces the "R" tag, but try to get a pair home on approval to check for bass 'heaviness'	56 x 27 x 28cm free space on 40cm stands	88.5dB/W 48Hz	R	59
Rogers Studio 1a £565	Very Good Good-	The classic BBC monitor style sound sensitively updated - transparent and natural with fine stereo, but a touch 'heavy' in balance	63.5 x 30.5 x 30.5cm stands in free space	87dB/W 36Hz	R	66
Roksan Darius £1265	Average Poor/Very Good	A controversial speaker which when set up right can deliver impressive performance, but with a far from neutral balance	98 x 31 x 51cm integral stands near side walls	88dB/W 50Hz		53
Rotel RL850 II £130	Average+ Average+	Strongly recommended. Well-balanced, clear, with decent focus and fine stereo, but tendency to 'aviness' needs decent stands and space	44 x 25 x 24cm free space on 40cm stands	86.5dB/W 50Hz	BB	59
Royd A7 Series 11 £99	Average+ Average	Lively clear sound; good upper bass and dynamics, but treble "ramp" made vocals sound shut in. Try before you buy	31 x 20 x 17cm shelf or 50cm stands near wall	86dB/W 75Hz	R	53
Royd A25 £100	Average+ Average-	Receiving mixed reactions on audition, the A25 is flawed but offers a lot of speaker for the money	51 x 29.5 x 24cm, stands near wall	87dB/W 52Hz	R	46
Royd Eden £235	Average Average+	Delightful mid/treble speed and transparency but determinedly bass light, this oddball miniature threatens cult status but could use a sweeter tweeter	31 x 20.5 x 18.5cm stands close to rear wall	87dB/W 85Hz	R	66
SD Acoustics SD1 £1050	Average Very Good	A large scale, airy and unusually detailed system with excellent dynamics. Balance is light and bright, and the original model could upset some systems/listeners. Current model has more civilised top-end and warmer overall balance	123.5 x 38.2 x 31.9cm free standing, away from walls	90dB/W 50Hz	R	60
Sony APM 10ES £100	- Average	An obvious Best Buy at its highly competitive price point, it can do justice to a good hi-fi system of Sony or specialist origins	40 x 25 x 20cm, 40cm stands 40cm from wall	87dB/W 55Hz	BB	59
Sony APM 22ES £249	Good+ Good	Sounding notably clear, the 22ES scored well on listening tests was easy to drive and achieved high sound levels	51.5 x 29 x 30cm free space on 40cm stands	88. B/W 46Hz	R	46
Sony APM 66ES £700	Average+ Average+	Powerful heavyweight sound with a brilliant midband - clear articulate and transparent. But the bass is on the boomy side and the treble can sound grainy	66 x 38 x 36.5cm open space, low stands	89dB/W 60Hz		59
Spendor Prelude II £345	Good+ Good	Good clarity and detail were evident everywhere in this speaker. Though a little boxy or muddy in the midrange it is strongly Recommended	50 x 26 x 28cm open stands in free space	88dB/W 52Hz	R*	46
Spendor SP2 £450	Very Good Good+	Conceding little to the SP1, this 30 litre model displayed good tonal balance with a highly articulate midrange, only slightly marred at frequency extremes	50 x 25 x 30cm free space, stands	87dB/W 45Hz	R	59
Spendor SP1 £680	Very Good Good	A very subtle and musical performer that works particularly well with digital material. An exceptional allrounder	63.5 x 29.5 x 30.5cm stands in open space	87dB/W 41Hz	R	60
Spendor SA3 Passive £1400	- Good+	Same as Spendor SA3 active	85 x 38 x 46cm low	89dB/W 32Hz	R	46
Spendor SA3 Active £2708	Good+ Very Good	Substantial speakers designed to deliver high sound levels and killer bass. Suited to larger rooms and power hungry ears	85 x 38 x 46cm low rigid stands in free space	89dB/W 32Hz	R	46
Spica TC-50 £595	Average+ Good	These American wedge-shaped-cabinet speakers were detailed and clear. However, we've not heard the current version with new drive units	40 x 33 x 28cm free space on 50-60cm stands	85dB/W 48Hz	R*	59
Spica Angelus £1195	Good Average	A little bass shy and soft in the bass and lower mid, the Angelus is otherwise tidy, extremely lively and fluid, if uneven overall	116.8 x 53.3 x 26cm free standing away from walls	86.5dB/W 50Hz		60
Studio Power Sapphire £130	Poor Average-	Balance difficulties are improving, though still prevent the potential of this interesting metal-cone new miniature from being fully realised	30 x 20 x 19.5cm stands near rear wall	85dB/W 70Hz		66
Tannoy Eclipse £120	Average+ Good	Although a little 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 65Hz	BB	59
Tannoy Mercury S £160	Good Good	A fine budget allrounder in the now established Mercury tradition; good balance and reasonable refinement will ensure wide appeal	49.5 x 25 x 21.5cm stands in free space	87dB/W 50Hz	BB	66
Tannoy M20 Gold £200	Good Average+	Luxury version of Mercury S with real wood and bi-wire frills doesn't necessarily sound any better overall, but still fine value	49.5 x 25 x 21.5cm stands in free space	87dB/W 50Hz	R	This
Tannoy DC2000 £300	Good Good	Remarkably high sensitivity from unique dual concentric driver that has an involving but characteristic sound. Bass could be better	68.5 x 26 x 27cm floor in free space	93dB/W 55Hz	R	66

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# THE DIRECTORY

## LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
Tannoy Westminster £3400	n/a Good+	These awesome horn loaded speakers are remarkably controlled and impressive, if only suited to a few pockets and rooms	Huge, flat against rear wall, away from corners	96dB/W (manuf.)	R	Coll
TDL Monitor £1600	Very Good Very Good	Fine solidity and good accuracy, with enough bass extension to satisfy even organ freaks. Needs a big room and can sound a bit lazy and a shade tinkly	118.5 x 30 x 47cm 0.5m from walls	85dB/W 28Hz	R	66
Technics SBC 250 £130	Average+ Average-	Despite a fairly even tonal balance, the 250EK sounded muddled in the midrange and dull in character	36.5 x 23.5 x 20.5cm free space, stands	86dB/W 60Hz		46
Technics SB-RX50 £500	Very Good Average+	With its unique coaxial drive unit the RX50 proved a smooth and well balanced loudspeaker, its minor weakness being a mildly excessive low bass	48 x 30 x 26cm free space on 40cm stands	86dB/W 40Hz	R	46
Toshiba S33-M £90	Average Average	Providing a benchmark for budget loudspeakers, this Toshiba-inspired but UK designed and manufactured model is a lot of loudspeaker for the money, if a shade on the cheap	40 x 26 x 21.5cm stands in free space	86dB/W 55Hz	BB	This
Wharfedale Delta 30 £79	Good Average	Very clear and surprisingly neutral for the price, with good dynamics and stereo within limited volume ceiling	37.9 x 20 x 16.9cm near wall on high stands	88.5dB/W 80Hz	BB	59
Wharfedale Delta 50 £99	Average+ Average-	"There's nothing obviously wrong, but it seems a bit mundane," is what we said when the Delta 50 was £129. But since then the price has dropped by 30 per cent, making it great value	48 x 27 x 19cm near wall on 40cm stands	88dB/W 55Hz		53
Wharfedale Diamond 111 £99	Below Average Average-	This latest version of the long running Diamond sports a better tweeter, but bass, though deep, is soft, and the midband is indistinct and uneven	24 x 18.5 x 20.5cm near wall, stands	86.5dB/W 75Hz		59
Wharfedale Super Diamond £139	Average Average-	Although there are improvements on the basic "legendary" model, listening panelists did not get airborne about this upgrade	24 x 19 x 19cm close to wall at head height	88dB/W 57Hz		53
Wharfedale 504/2 £140	Average Average	Not strictly accurate, this musically involving miniature sounds unusually coherent and well integrated, if a shade dull in balance	29 x 18.5 x 19cm stands against rear wall	84dB/W 60Hz	R	This
Wharfedale 505/2 £169	Average Good	This lively Wharfedale provides plenty of speaker with unusual refinement for the money, and should be fairly tolerant of room siting	44 x 25.5 x 24cm stands 1ft from wall	86dB/W 55Hz	BB	66
Wharfedale 510.2 £299	Average Average-	Even in it's latest guise, this loudspeaker still sounds hard, cluttered and lacking innate clarity. The bass is uneven and midband coloured	61.5 x 28 x 29.6cm near wall, high stands	89dB/W 50Hz		59
Yamaha NS 1000M £900	Good Good+	Living up to its monitor label, and tonally well suited to digital material, the NS 1000M is superbly crafted and capable of high levels	67.5 x 37.5 x 32.5cm 30cm from wall, stands	90dB/W 40Hz	R	46

\* rating refers to original, tested model.

## 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 an effective technique. Many decks have manual bias a justment and some match up to the tape automatically.) Lab performance and sound quality often go hand in hand, and are frequently somewhat dependent upon factory alignment. The mechanical integrity of the mechanism itself is another crucial factor, that is often reflected in the asking price.

All modern hi-fi decks have Dolby B and the majority have Dolby C besides; the very worthwhile

HX Pro system is becoming steadily more widespread. Remote control remains rare, though sometimes it is available as a system option. Three-head recorders allow simultaneous checking of the recording being made. Auto-reverse is a useful convenience feature, but usually with some mechanical compromise, while double-mechanism 'dubbing' decks of dubious quality are fashionable at the bottom end of the market. The welter of different 'music search' systems available is some indication of their frequent ineffectiveness.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa AD-F370 £130	Average Average	Adequate but uninspiring recorder with detail shortcomings but good control layout and successful sounding with recorded musicassettes	Dolby B, C, HX Pro, bias adjust		63
Aiwa AD-WX707 £180	Poor Average	Not a high 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
Aiwa XK-007 Excelia £400	Good Good	Downmarket version of XK-009 with simplified bias/equalisation adjustment section and more forgiving but less informative sound. Still good, but less exciting than XK-009	Dolby B, C, dbx, HX Pro, 3 Head, tape alignment		63
Aiwa AD-WX909 £400	Good Good	Convenience meets sound quality, and both win. An essentially clean, positive recorder which works alongside an auto-reverse player of lower standard – a sensible compromise	Dual deck, auto-reverse, track search, Dolby B/C/HX Pro, bias adjust, 3 Head	R	57
Aiwa XK-009 Excelia £550	Very Good Very Good	Excellent detail, stable articulate midband and slightly obvious treble. The most interesting Aiwa for yonks	Dolby B, C, dbx, HX Pro, 3 Head, tape alignment, CD direct	R	63
Akai GX-52 £249	Very Good Very Good	Well finished and a pleasure to use this well specified deck sounds clean and defined with all tape groups, with or without Dolby	Dolby B, C, HX Pro, track locate features	BB	57
Akai GX-6 £350	Good Good	There is a strong sense that someone has really thought this one through; it has an indefinable 'specialness'	Real-time counter, track search, Dolby B, C, bias adjust	R	52
Denon DR-M07 £125	Average+ Excellent	Despite minor operational and measured shortcomings, sound quality is excellent for the price	Dolby B, C, bias adjust	BB	52
Denon DR-M10HX £180	Good Good	Very well laid out, a sensible range of features and smooth cam-operated transport. Replay-only sound quality suspect, but the deck is successful as a recorder – clean, precise but slightly 'grainy'	Dolby B, C HX Pro, memory counter, bias adjust	R	63
Denon DR-M12HX £220	Good Good+	Well constructed and pleasant to use, a lack of true pitch constancy kept it from sounding superb	Track search, Dolby B, C, HX Pro, bias adjust	R	52
Denon DR-M24HX £290	Good Good+	This deck will slot into many high grade systems without disgracing itself – or the cassette medium. Very presentable high resolution sound with good stereo with or without Dolby	Dolby B, C, HX Pro, bias adjust, 3 Head	R	60
Denon DR-M34HR £320	Very Good Good+	Prerecorded cassettes sounded grey and dull, but this may have been a sample fault. As a recorder, the DR-M34 is refined and detailed – and good value	Dolby B, C, HX Pro, 3 Head, manual tape calibration, memory counter		63
Denon DR-M44HX £400	Excellent Excellent	A well designed deck that also performed fine sonically, working very well with ferric and metal tapes	Real-time counter, Dolby B, C, HX Pro, tape alignment adjust, remote control, 3 Head	R	60
Dual CC8010 £110	Average Average+	The only limitation worth noting is a slight opaqueness, the Dual otherwise sounds stable and effective. An excellent low-cost design	Dolby B & C, microphone input	BB	63
Harman Kardon CD491 £695	Good 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
Hitachi D-003 £130	Average- 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
Hitachi D-007 £180	Average- 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

# THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

# THE DIRECTORY

## CASSETTE DECKS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
JVC TD-V711 £380	Very Good Excellent	This is a complex recorder which is built on the back of some important ideas with audiophile roots. It has a (mostly) superb technical performance and is very capable, if not always strictly accurate	Dolby B, C, HX Pro, 3 Head, variable bias, track search, 3 line inputs	R	63
JVC TD-W222 £150	Below Average Below Average	Well endowed but somewhat user-hostile twin deck. Sound quality is very tape dependent, but offers tolerable stability with considerable loss of resolution and scrappy musical presentation.	Dual deck, auto reverse, Dolby B/C		63
Kenwood KX-440HX £140	Average+ Poor	Uneven, unstable sounding player with limited resolving power, but good control layout and finish	Dolby B, C, HX Pro, intro scan		63
Kenwood KX-660HX £170	Good Good	Well designed control system with useful search aids. Sound quality is positive and detailed	Dolby B, C, HX Pro, track & blank search, intro-scan, bias adjust	R	63
Luxman K-105 £349	Average Average	Rating quite well for an auto reverse deck, and featuring complex track search facilities, it was not sonically competitive on price	Auto reverse, track search, Dolby B & C, remote control		52
Luxman K-112 £349	Average Average	Build quality is not truly consistent with the price. Nor is sound, which veers on the warm, lousy side of neutral	Dolby B, C, HX Pro, bias adjust, 3 Head		57
Marantz SD-35 £160	Good Good+	Rock steady tape transport gives very competitive sound quality for the price, but the slightly bright replay may not appeal to some	Dolby B & C, bias adjust	R	52
Marantz SD-45II £200	Good+ Good+	Well built and dynamic sounding player, working better as a recorder than with musicassettes	Dolby B & C, bias adjust Auto selection		52
Marantz CP230 £300	Average Average	This is a competitively priced portable recorder though not suited to replay of musicassettes	Dolby B, bias adjust	R	52
Marantz SD-55 £349	Good Very Good	Slightly tacky feel and restricted signal/noise performance are the main shortcomings of an excellent sounding piece of kit	Real-time counter, track search, Dolby B/C/HX Pro, bias adjust, 3 Head		57
NAD 6300 £649.95	Very Good Very Good	Solid and homogeneous sound quality and very good replay compatibility thanks to 'play trim'. Distinctive, musical – and costly	Dolby B, C, HX Pro, 3 Head, bias adjust	R	63
Nakamichi CR-1E £345	Very Good Good	Modestly equipped by any standards, the CR-1E stands out falls by its build quality, which is high, and sound which is highly competent	Dolby B & C		57
Nakamichi CR-2E £395	Very Good Good+	Ordinary look at, in some respects rather awkward to use (tape switching especially), the CR-2E sounds very slightly better than the CR-1E, and therefore ranks well. But it doesn't come cheap	Dolby B & C, bias adjust, remote control	R	57
Nakamichi RX-202E £545	Good Very Good+	Fine, clear and articulate sounding player. Excellent with prerecorded material, but idiosyncratic and sometimes obstructive control system	Auto reverse, Dolby B, C, 2 Head		63
Nakamichi CR-3E £595	Very Good Very Good	The user interface is a little clumsy, though conceptually straightforward. Sound quality approaches the CR-4E, and is amongst the best at the price.	Dolby B & C, bias adjust, remote control	R	57
Nakamichi CR-4E £745	Very Good+ Very Good+	High class deck with a reasonably full range of features and superb sound at a slightly unlikely price	Dolby B & C, bias adjust, remote control, 3 Head	R	57
Nakamichi CR-7E £1500	Excellent Excellent	Remarkably this deck is not only ergonomically but also sonically superior to the Dragon, particularly on record/replay	Real-time counter, track search, Dolby B & C, tape alignment adjust, bias adjust, remote control, 3 Head	R	60
Nakamichi Dragon £1750	Excellent Excellent	Previous to the birth of the CR-7E, this machine stood head and shoulders above the rest. It is still the ultimate for musicassette replay	Auto reverse, Dolby B & C, tape alignment adjust, bias adjust, remote		60
Onkyo TA-2120 £120	Average+ Good	Clear, vivid sound with good timing and resolution when using Type II tapes without Dolby. The controls are less inspiring – the meters in particular are plainly inadequate	Dolby B/C, auto tape sensing, block/side repeat		63
Onkyo TA 2130 £140	Average+ Average+	Rating fairly well on both pre-recorded and record/playback, ergonomics were a little poor but overall performance was generally consistent	Track search, Dolby B & C, bias adjust		52
Philips FC566 £179	Average+ Average+	Mostly well equipped, though some tape search facilities fail to exploit the auto-reverse capability. Sounds clean and stable – with prerecorded tapes too	Auto reverse, track search, Dolby B & C		57
Philips FC567 £279	Average Poor	Well equipped but ergonomically substandard; sound quality is messy and lacking in clarity and dynamics	Dual deck, auto reverse, track search, Dolby B & C		57
Pioneer CT-443 £180	Average Good	Structurally sound and subtly musical recorder. Sophisticated, mildly damped sound quality	Dolby B & C, fine bias adjust, track search	R	63
Pioneer CT-737 £300	Average- Average-	Interesting design and a pleasure to use with rather too many rough edges to really work properly	Dolby B, C, HX Pro, 3 Head, bias adjust, memory counter		63
Proton AD-200 £140	Poor Poor	Sound quality is essentially on a par with many portables, and has nothing to do with high fidelity. The main problems are an unrelenting hardness and an almost total lack of detail	Dolby B & C		57
Proton AD-300 £200	Average- Poor	High levels of flutter give sound a roughness and coarseness that rules it out for high quality work. The record and replay electronics certainly deserve better	Auto reverse, Dolby B & C		57
Revox B215 £1461	Good Average+	Superb engineering and good sound, but lacking the subjective qualities that characterise the very best hi-fi equipment	Real-time counter, Dolby B & C, tape alignment adjust, remote control		52
SAE C102 £549	Average+ Good	Looking most unlike a cassette deck designed in the States and proving competitive in its price group. Not sonically that outstanding, however	Real-time counter, track search, Dolby B & C		52
Sony TC-FX 150 £90	Average+ Average+	Recording and playing back on this deck itself gave acceptable results, whereas prerecorded stuff was a joke. But it's a good £90 worth	Dolby B & C		52
Sony TC-W300 £150	Poor Poor	Deeply unimpressive and messy sounding deck with bloated quality and poor pitch integrity. Dubbing performance substandard	Dual deck, Dolby B & C		63
Sony TC-RX50 £180	Average- Poor	Terminal inability to play at a steady pitch, or (on prerecorded material) in tune spoiled this simple but otherwise attractive design	Auto-reverse, Dolby B/C/HX Pro		63
Sony (WMD6C) ProWalkman £249	Good+ Excellent	"One of the finest sounding cassette decks on the market today. A mandatory Best Buy, which also fits in your pocket"	Dolby B, C	BB	60
Sony TC-RX6DES £250	Average Average	For once a stable sounding auto-reverse deck but sound quality is rather 'dirty' and compressed, especially with Dolby C	Auto-reverse, Dolby B/C/HX Pro, auto tape recognition		63
Sony TC-RX00ES £350	Average+ Good	Clean, powerful and detailed sound, especially without Dolby C. table pitch – but prerecorded cassettes sounded disappointing	Auto reverse, Dolby B/C/HX Pro, bias/level adjust	R	63
Sony TC-K700ES £499	Excellent Excellent	Firmly in the esoteric league, this is easy both to operate and to listen to. Best points: first class imagery, focus and stability	Auto reverse, track search, Dolby B & C, tape alignment adjust	R	60
Tandberg 3014A £1650	Good 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-250 £89	Average Average	Ultra-basic design which works quite well. Lack of pitch integrity is the main shortcoming, but it wasn't always noticeable	Dolby B	R	63
Teac V-270C £109	Average- Average-	Not quite cheap enough to compete solely on price, the V-270C is a rather messy and unstable sounding deck	Dolby B & C, bias adjust		63
Teac R-515 £299	Average+ Average+	Expensive, this deck is basically a competent but pedestrian performer which will not fully satisfy the critical user	Real-time counter, auto reverse, Dolby B & C, bias adjust		57
Teac V-870 £399	Good+ Good	Cut-down V-970X for the proletariat. Expensive and carefully engineered with mostly very good but slightly cold sound quality	Dolby B, C, HX Pro, 3 Head, manual tape calibration	R	63

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## CASSETTE DECKS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
<b>Teac V-970X</b> £499	Very Good Very Good	Excellent sounding deck with useful features (tape calibrat on etc) that fully justifies price	Real-time counter, track search, Dolby B/C/dbx & Dolby HX Pro, bias adjust, remote control, 3 Head	R	57
<b>Technics RS-T230</b> £160	Average— Average	Satisfactory with prerecorded material but otherwise unexceptional, the main features of this deck are its excellent user interface and value for money	Dual deck, Dolby B/C		63
<b>Technics RS-B355</b> £140	Good Good	Good sound let down by inadequate meters and poor prerecorded replay only sound quality	Dolby B, C, microphone inputs, cue and review	R	63
<b>Technics RS-B505</b> £160	Average+ Average+	Neatly made recorder with Dolby HX Pro that sounds precise and stable, though sometimes a little processed and grainy too	Track search, Dolby B/C/HX Pro		57
<b>Technics RS-B605</b> £180	Good Average+	Mixed but generally good sound. Weakest points are dbx and prerecorded sound, best are Type IV (metal) recordings which sound sharp and precise	Track search, Dolby B/C/HX Pro & dbx		57
<b>Technics RS-T330R</b> £200	Average+ Average+	One of the very few dual cassette decks with any real pretensions to audio quality, the RS-T330 is a considerable success musically as well as being a pleasure to use	Dual deck, Dolby B & C	R	63
<b>Technics RS-B705</b> £250	Average Average—	3 heads for the price of two, but not the sound quality to go with them	Track search, Dolby B, C, HX Pro, bias adjust, 3 Head		52
<b>Technics RS-B905</b> £350	Good Good	Good, well set up cassette deck with a clean, accurate sound but some compression. dbx circuit sounds poor	Dolby B, C, HX Pro, dbx, bias adjust, 3 Head		57
<b>Technics RS-T80R</b> £400	Poor Poor	Flexible and pleasant to use but poor transports led to poor sound on our latest sample	Dual deck, auto reverse, track search, Dolby B, C, dbx		52
<b>Yamaha KX-200</b> £120	Good— Good	Cheap, well-equipped and workmanlike with the sound quality less obviously processed than most – the whole is more than the sum of the parts	Track search, Dolby B & C, remote control	R	52
<b>Yamaha KX-300</b> £150	Average+ Average—	Uncommonly well equipped and adequately made and presented, this model turned out to be a disappointingly uncertain proposition on audition	Track search, Dolby B, C, HX Pro with 'play trim', bias adjust, remote control		57
<b>Yamaha KX-400</b> £200	Good Good+	A highly commercial package with every widget under the sun. Happily it sounds good too.	Auto reverse, track search, Dolby B, C, HX Pro, remote control	R	52
<b>Yamaha KX-500</b> £210	Very Good Very Good	An accomplished performer, strongest in the areas of pitch and spatial stability, but slightly rough around the edges	Real-time counter, track search, Dolby B/C/HX Pro with play trim, bias adjust, remote control	R	57
<b>Yamaha KX-800</b> £330	Good Average	The present Yamaha range seems oddly inconsistent. This sophisticated model sounds fine (almost) but came a clear second best to the KX-500	Real-time counter, track search, Dolby B, C, HX Pro with play trim, bias adjust, 3 Head		57
<b>Yamaha KX-1200</b> £500	Excellent Average+	A veritable rats' nest of buttons and dials, albeit well laid-out. This is nearly a great recorder, but lacks simplicity of sound	Real-time counter, track search, Dolby B, C, dbx, HX Pro, bias adjust, remote control		52

## DAT RECORDERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
<b>Aiwa Excelia XD-001</b> £1300	Very Good Very Good	Clear and very listenable recorder roughly comparable to but slightly sweeter sounding than the Sony DCT-1000ES – but with an inferior front panel design	Track ID and search, remote	R	63
<b>Luxman KD-117</b> £1499	Good Good	Slightly soggy, earth-bound sound quality, this model trails the other DAT decks tested so far	Two analogue inputs, remote twin address		63
<b>Pioneer D-1000</b> n/a	Excellent Excellent	Fine, clear, colourful and consistent sounding deck. The Pioneer is lavishly (uneconomically?) constructed and equipped. It shows what is possible, but will probably never go on sale	Many search and memory facilities	R	63
<b>Sony DTC-M100</b> £799	Very Good Very Good	Clean, clear sounding 2nd generation model with most of the features and sound of the DTC-1000ES	Mid-width, alpha-numeric display, remote, optical interfaces	R	63
<b>Sony DTC-1000ES</b> £1299	Very Good Very Good	Fine, consistent performer with accomplished tape handling and good build quality	Standard track ID and search, remote	R	63

## CD PLAYERS

This all-digital music source is well established, despite still high disc prices and the opposition of many hi-fi enthusiasts. Compact Disc's strengths over conventional vinyl are complete freedom from surface noise with automatic and programmable play, plus track skip and fast music scan – frequently under full remote control. However, many vinyl enthusiasts find CDs sound less involving than

top quality vinyl replay.

Introduced five years ago at around £500, CD players now average less than half that price, and for the main offer improved performance besides. Even cheaper players may have the latest decoding chips and the most useful play features; extra money can buy remote control, remote volume control, audio 'tweaks', plus improved build and component

quality control.

Compared with many hi-fi components, CD players give impressive lab performance, though there are differences between players nonetheless. Sound quality variations are even more marked, particularly in a good quality system. As it behaves very like a preamp, there are problems connecting a player to a normal amplifier.

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
<b>Acoustic Research CD-04</b> £290	Good Fair	Stylish but basic player, based on Philips 14-bit 4 x oversampling with respectable sound and remote control	Remote Control, headphones		51
<b>ADC CD-250X</b> £230	Good+ 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
<b>ADC CD 2000E</b> £330	Good+ Fair+	One of the slimmest players in the business but nothing special inside. Nice ergonomics but overpriced	Remote, timeshared 16 bit		64
<b>Aiwa DX-M45</b> £149	Fair Fair	Cutdown Philips technology, but results are quite good for this British made machine	Manual	R	64
<b>Aiwa CD-001</b> £300	Good Good	Pretty close to Recommendation, delivering a respectable sound quality and lab performance from an ergonomically attractive package, but ultimately failed to excel in any particular respect.	Track entry/volume remote, direct recorder connection etc.		58
<b>Aiwa XC-007</b> £499	Very Good Good	Creditable sound despite inverted output, high tech engineering with very good lab performance. A worthy contender but not cheap	Remote, keypad, timer, digital output, pseudo 20 bit, dual DAC		64
<b>Akai CD-52</b> £249	Good Good	A nice surprise from Akai, genuinely good sound from this mid-priced model. Better linearity will help further	Remote, digital output, headphone socket	BB	64
<b>Akai CD-73</b> £450	Good Average	A little uneven musically, the Akai tends to smother fine detail, but has first class dynamics and stereo imagery. Worth auditioning	Track entry keypad remote, menu display (switchable)		62

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## CD PLAYERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
<b>Akai CD93</b> £700	Good Very Good	Undoubtedly a CD player of real class in build, presentation, lab performance and sound quality, but also a shade expensive for formal Recommendation – though that's not to dissuade lovers of black lacquer wood finish.	Track entry remote, menu display etc.		58
<b>Arcam Delta Black Box</b> £249	n/a Very Good	This rich, powerful and articulate sounding DAC transforms the majority of medium price CD players	Needs D-out  players	R	
<b>Arcam Delta 70</b> £500	Good Very Good	This solidly built British player has attractively understated presentation with straightforward, simple ergonomics. The very good sound quality shows a steady improvement over earlier samples.	Simple remote, headphone socket etc.	R	58
<b>Cambridge Audio CD2</b> £650	Fair Very Good	The finest midrange in digital audio is sufficient grounds for Recommendation, though there remains a tinge of disappointment that the CD2 didn't get closer to big brother elsewhere, notably in  bass.	16x oversampling, remote control	R	58
<b>dbx DX5</b> £640	Good Poor	Sound quality proved a single disappointment, though it's refreshingly unique in providing semi-pro post-production facilities that some users will undoubtedly relish.	Track entry/volume remote, compression, impact recovery, ambience etc.		
<b>Denon DCD 610</b> £200	Good+ Fair+	Lots of Denon player for the money, well equipped with good all round performance	Remote, versatile programming 2x 0/S	BB	64
<b>Denon DCD 010</b> £250	Very Good Fair+	A good value allrounder bettered  sheet value by the 610 and 910; power volume could sound better	Remote, digital output, programming	R	64
<b>Denon DCD 910</b> £300	Very Good Fair+	A well equipped deck of impressive appearance and solid sonic and  performance	Remote volume, programming, 8x 0/S	BB	
<b>Denon DCD-1500II</b> £500	Very Good Very Good	The extra build quality over cheaper Denons is justified in terms of sound quality and lab performance, while the feature list is comprehensive and quite nicely presented.	Track entry/volume remote, menu display etc.	R	60
<b>Denon DCD 1700</b> £650	Good+ Very Good	The overall sound was strong and coherent approaching reference standards. Fine build quality and facilities make this a firm contender	Remote, skip, scan, headphone socket, programmable	R	58
<b>Denon DCD-3300</b> £1200	Good+ + Very Good	Sounding tight and coherent though not significantly better than the cheaper 1700. Very well built and comprehensively equipped	Remote control, with volume, keypad programme, scan, search, headphone		51
<b>Dual CD 1030 RC</b> £170	Fair Fair	An up and down performance on test but it is hard to deny the overall value for a machine that includes remote control at this price	Remote, headphone socket, 2x 0/S, timeshared 16 bit	R	64
<b>Ferguson CD007</b> £130	Good Fair	cheapest recommendation in the test group; don't expect the earth but the value is good	Manual, digital output, headphone socket	R	64
<b>Ferguson CD008</b> £150	Fair Fair	Not as strong as its relatives, sample fault perhaps? Though performance is fair enough overall	Remote, midi digital output, 2x 0/S, timeshare 16 bit		64
<b>Goodmans GCD550</b> £199	Average+ Fair+	A slow autochanger with a weakish lab performance but the sound is fair enough, the features good and the price is low	Remote, 6 disc autochanger, 2x 0/S		64
<b>Hitachi DA-7000</b> £150	Good 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		58
<b>JVC XL-Z444</b> £255	Good Fair+	An average performer, unremarkable though well equipped and fair value for money	Full feature remote, digital output, headphone socket		64
<b>Kenwood DP-660SG</b> £180	Below Average Below Average	Build quality and ergonomics are good, and the range of features far exceeds the price norm. However, sound quality is messy with a soft bass, recessed mid and sometimes spiky top.	Remote control, calendar/menu display, keypad, 20 track memory		62
<b>Kenwood DP-880SG</b> £250	Very good+ Fair+	A fine  transport for the price, fine sound, very good lab results, good for a decoder?	Remote volume, programming, headphone socket		64
<b>Kenwood DP-990SG</b> £400	Very Good Good	Falling just short of the required subjective standard for Recommendation at this price level, this is a doughty player nonetheless, with a build quality and technical performance that arguably justifies its premium price.	Track entry remote, menu display, sprung feet etc.		58
<b>Kenwood DP-1100SG</b> £450	Very Good Good	Something of a high tech flagship, this model doesn't quite make the grade on sonic grounds but is well built	Full remote, optical and coax digital outputs, headphones		
<b>Kinergetics KCD-30</b> £1700	Very Good Very Good	Definitely a technical oddball with its distortion-cancelling circuits, the pricey KCD-30 nevertheless does sound very good, and also noticeably 'different' – not necessarily to our collective tastes, but possibly to your's	Favourite track selection, remote, high output (vol, bal)		60
<b>Luxman D-90</b> £300	Fair Good	Despite technical ingredients that do not seem particularly inspiring, this is a nicely judged package that is ergonomically neater than most, with decent sound quality for the price and distinctive finish and presentation.	Track entry remote, programming etc.	R	58
<b>Marantz CD651ISE</b> £300	Very Good Very Good	Scorching sound quality from a competitively priced player, which is the new middle market reference	Remote, programming, digital output	BB	64
<b>Marantz CD94</b> £800	Good+ + Very Good	Clearly the best Marantz CD player, with high build quality and good objective and subjective performance	10 digit keypad, headphone socket, favourite track selection, remote	R	58
<b>Marantz CD94/CDA94</b> £1600	Very Good Excellent	Taking its logical place at the top of the Marantz CD hierarchy, this two-box combination delivers reference standard lab and listening test results, albeit at a price which seems a little steep. Very refined	Favourite track selection, remote, balanced output etc	R	60
<b>Meridian 207</b> £950(+)	Very Good Excellent	Not only arguably the prettiest model around, but also one of the best sounding and most versatile – on-board preamp now accepts vinyl disc for an extra £100, and Meridian plans round-the-house future-readiness	On-board preamp, remote (inc volume)	R	64
<b>Mission PCM2</b> £500	Good+ Good	A matured design with good features it is the best sounding power volume player available, it even tests well. It accepts the £200 PSX power supply option	Remote volume, display and phase invert	R	64
<b>NAD 5220</b> £230	Average— Poor	Conforms sonically to a stereotype of the medium that most players have grown out of. Hard, thin and raw sound with poor stereo and resolution.	Time/track display, memory		62
<b>Nakamichi OMS-1E</b> £400	Good Good	This neat enough player doesn't really follow the Nakamichi tradition of providing exceptional sound quality while at the same time perpetuates that of selling at an above average price	Simple remote etc.		58
<b>Nakamichi OMS-3E</b> £995	Good Good	Superbly built and presented this expensive machine was a bit of a "stuffed shirt" when it came to sound quality	Remote control, skip and scan, headphone socket		51
<b>Nakamichi OMS-4E</b> £1200	Very Good Very Good	Solidly controlled and comparatively simple this clearly represents one of the major benchmarks for CD sound quality, though the midrange sounded a touch thin	Skip and scan, headphone socket		51
<b>Nakamichi OMS-5EII</b> £1500	Good+ Very Good	"... delivers near state of the art performance and build quality in a deliberately starkly functional package, but at a very high price..."	Skip and scan, simple track programming, manual control		51
<b>Nakamichi OMS-7EII</b> £2000	Good+ 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>Onkyo DX-1500</b> £170	Average Fair	Ruled out on the grounds of a poor DAC filter, but it's not so bad really given the price	Manual, 2x 0/S, timeshared 16 bit		64
<b>Onkyo DX-2500</b> £200	Average— 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	61
<b>Philips CD473</b> £250	Good Good	In the forefront as regards sound quality, this is one of the best sounding Philips players yet; we were unable to catch it out on classical through Jazz program	Favourite track selection, remote control with volume, headphones etc	BB	58
<b>Philips CD000</b> £500	Very Good Very Good	The '880 is an impressive blend of luxury build quality and features at a far from extravagant price, and also delivers the subjective goods.	Volume remote, FTS, menu display etc.	R	60

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## CD PLAYERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
<b>Pioneer PD-6100</b> £249	Good Good	A budget audiophile player; fine sound even if its lab performance seems a little uneven	Full feature remote, digital output, variable hdph	BB	64
<b>Pioneer PD-M500</b> £269	Good Good	A high performance autochanger for the money, good value all round and generously featured specification	Full remote, digital output, variable hdph	BB	64
<b>Pioneer PD-M700</b> £400	Very Good Fair+	Top class autochanger, surprisingly fast, high specification and a good allrounder	Remote, optical digital output, headphone socket		64
<b>Pioneer PD-91</b> £800	Excellent Excellent	Close to state of the art in nearly all areas - soundstaging, clarity and simple lack of artificiality. A well made and sophisticated player	Track entry remote, calendar display, index search, etc.	R	64
<b>Revox B226</b> £658	Good+ Good	The traditional Revox house style is combined with the fine Philips 16 bit chip set, but this player doesn't really offer sound quality to match the price	Infra-red remote control, full search, scan, programming		51/Coll
<b>Rotel RCD820B</b> £210	Good+ Fair+	A budget Philips based player of dependable sound quality and offering very good value. Build is a touch lightweight	Remote, basic facilities	BB	64
<b>Rotel RCD820BX2</b> £250	Good Very Good	Start with a good base and then make it sound better, the '820BX2 CD player maintains the reputation established by its namesakes, and comfortably deserves Recommendation.	Direct track entry remote etc.	R	58
<b>SAE D102</b> £700	Good Good	Considering the high price of this player, most of the innards seem fairly prosaic. Sound quality and lab performance are both respectable enough, but hardly justify the price premium involved, though styling is unusual.	Remote (inc volume), skip, scan etc.		58
<b>Sansui CD-X501i</b> £300	Fair Fair	Weak dynamic range for an upmarket player which shows in both lab and listening tests	Remote, programmable, digital output, headphones		64
<b>Sharp DX-620</b> £199	Good Good	A surprising achievement but it shows what can be done. Another high value budget package	Remote, headphone output, 2x 0/S, timeshare 16 bit	BB	64
<b>Sharp DX-R700H</b> £225	Average- Poor	A workmanlike player that does not offer exemplary lab or sound quality but which is well-built with good facilities and should perform well in use	Remote control, track selection keypad, skip, scan repeat programming		53
<b>Shure Ultra D6000</b> £495	Average+ Fair	Ergonomically well thought out with full function remote control, but not really scoring sonically considering its price	Remote control (full function inc volume)		51
<b>Sonographe SD1 (by CJ)</b> £799	Good Very Good	Distinctive with oak end-cheeks, using Philips based 14 bit x 4 oversampling, Conrad Johnson electronics make this a musically rewarding player	Full search programme and timing	R	51/Coll
<b>Sony CDP-M35</b> £170	Fair Fair	There is no disguising the lightweight plastic construction of this player, but the technical performance, sound quality, aesthetics and ergonomics all deliver more than one has the right to expect for £170.	Skip, scan, programming etc.	R	58
<b>Sony CDP-M55</b> £190	Fair Fair	£20 buys a remote control handset to operate your M35. Sony call it an M55 (see CDP-M35 review).	Simple remote, skip, scan, programming etc.	R	58
<b>Sony CDP-550</b> £200	Good+ Fair+	Another dependable Sony, it doesn't have a digital output but at the price who's complaining? Fit and forget	Full remote headphone output, 4x 0/S	BB	64
<b>Sony CDP-M75</b> £230	Good Good	This midi version of the '750 saves £20 on the price (see CDP-750 review).	Track entry remote, menu display ect.	BB	58
<b>Sony CDP-750</b> £250	Good Good	A seductive blend of fine presentation and solid performance, all at a very realistic price that should ensure its success.	Track entry remote, menu display etc.	BB	58
<b>Sony CDP-M95</b> £280	Very Good Fair+	Very well equipped mid sized player fine build and finish, incorporating Sony's custom file disc labelling	Remote, programmable, variable hdph output	R	64
<b>Sony CDP-337ESD</b> £550	Good Very Good+	Well built, high grade player with excellent if undemonstrative sound. Excellent resolution, dynamics and bass weight, though arguably not control	Random access remote, calendar display, FIS, memory	R	61
<b>Sony 557ESD</b> £1000	Excellent Good+	Superbly built flagship model that produced excellent lab results and very good sound. Many luxury features though not that good value	Full remote, disc directory, digital output, power volume, 8x 0/S, 18 bit		64
<b>Teac PD135</b> £180	Fair Fair	Particularly easy to use, this lags a little behind the pack when it comes to sound quality, but it still represents a valid alternative for those who find the presentation attractive.	Skip, scan, programming, repeat.		58
<b>Technics SL-P350</b> £250	Very Good+ Good	Nicely built, good features and fine sound, what more do you want for £250?	Remote, digital output, variable hdph output	BB	64
<b>Technics SL-P770</b> £350	Excellent Good	Sophisticated, high resolution player, but inconsistent with level with some coarseness and compression during loud passages	Remote, 18 bit, rotary cue wheel, comprehensive display	R	61
<b>Technics SL-P990</b> £450	Excellent Good	An obvious technical tour de force, with ample engineering and build quality to justify the price, but some subjective reservations nonetheless.	Track entry remote, menu display, search dial etc.		58
<b>Technics SL-P1200</b> £800	Good+ + Good	Looking more like a desk workstation than a stackable component, this will appeal to the creative recordist and semi pro user. Sounded pretty good	Headphones, remote control, search dial cueing, etc		51
<b>Toshiba XR-931B</b> £150	Good Fair+	A basic Philips based player perhaps but just look at the price/performance equation	Remote via system, manual, non oversampled, 16 bit	BB	64
<b>Toshiba XR-912B</b> £200	Very Good Good	A well equipped Philips clone with a very good performance for the price	Remote, programmable, digital output, hdph	BB	64

## CD MIDI SYSTEMS

So you want a hi-fi, but you don't want to make a fuss about it. A pre-packaged system with everything matching up and no aggravation may not rank with carefully chosen separates - sound quality, but there's no denying the attractiveness or popularity of this approach - the market for pre-packaged component hi-fi systems is at least as big as that for separate items, even ignoring the vast numbers of low-cost single unit stacker systems. The arrival of compact disc led to a new fashion for shelf-standing compact systems, or 'midis' as

they are known in the trade, as a replacement for earlier floor-standing rack systems (themselves the upmarket development from music centres). Only some 330mm wide, midis can more or less match full-size (430mm) rack components for performance, and are certainly cheaper to make, ship, sell and buy.

Whereas specialist hi-fi is moving steadily towards ultra-simple 'no frills' components, midi systems tend to be sold on a feature count at a price point, usually with little opportunity for

demonstration and comparison. Our test programme includes extensive auditioning and lab testing, while making allowance for the different aspirations of designers and expectations of users. Key features valued highly by customers include system remote control, automatic switching, double 'dubbing' cassette decks, and elaborate equaliser tone controls. And the top end of the market is developing with surround sound audio/video-ready packages.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
<b>Aiwa X-55</b> £380	Average Average-	The turntable was slightly better than usual, the cassette deck highly limited, but the deadful loudspeakers are the clincher	Combined cassette tuner-timer/amp, dedicated T/T speakers, & optional CD		65
<b>Aiwa X-78</b> £550	Average+ Good	Good. The loudspeakers are disappointing and the turntable is excessively microphonic, but the rest of the system works well.	Auto reverse cassette/tuner/amp & timer, T/T and CD	R	65
<b>Aiwa V1500DX</b> £999	Good Good	Remarkable features level even includes independent record feeds to each cassette. High class build, satisfying sound, but best without loudspeakers	Separates system, twin auto-reverse cassette, remote, timer	R	54
<b>Akai M.50CD</b> £550	Poor Poor	Cassette lacks Type II compatibility, general sonics mediocre or less	Devolved from M.80 but simplified, part remote		65

## THE WORLD'S NO 1 GUIDE TO BUYING HI-FI



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## CD MIDI SYSTEMS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Akai M.80CD £800	Good Good	Good all rounder with minor ergonomic shortcomings but generally practical layout	Separates based, twin auto-reverse cassette	R	65
Goodmans 5300CD £400	Average— Average+	Crisply styled system with gutsy amplifier and sophisticated speakers. CD player works well, other sources are variously mediocre	Combined cassette/tuner/amp, plus T/T and CD with remote	R	65
Goodmans Maxim-Midi System £520	Average Average+	De-luxe version of 5200 system – very good value for money and readily upgradeable. Sonics rough but OK and speakers good; CD crude	All separates with twin cassette	R	54
JVC Midi-W900CD £1000	Good Good+	A competent allrounder, with important convenience related features, and powerful linked recording facilities. Less strident speakers would be appreciated	Separates system, equaliser, auto-reverse cassette	R	65
Marantz MX583 £750	Below Average Poor	The system has potential in an A/V context, but is patently lacking in a purely audio one. Only the CD excels	Component system with A/V amp, no speakers		65
Marantz MX673CD System £900	Average+ Average	Tremendously flexible audio/visual system. Sound quality is satisfactory at best and ergonomics a mess	Various A/V inputs, remote, speakers optional		54
Philips F777 £850	Good Good	Excellent CD player, tuner and amplifier, offset partly by poor cassette deck and turntable	Separates system, optional remote, no speakers		65
Pioneer System 300 £1000	Very Good Very Good	Sharp, articulate and powerful system that works. The turntable is a weakness as usual, but the only real weakness in an uncommonly sophisticated package.	Remote separates system, optional multi-disc CD	R	65
Proton AI-3000 £550	Good Good	There are a host of minor problems, including no LW, but the unit is attractively packaged and can be made to sound very good despite a woolly sounding amplifier	One piece CD, cassette, tuner and amp, remote	R	65
Sanyo System 22 £350	Average Average+	Some careful detail design has given this system sound quality out of keeping with ordinary appearance. More than the sum of its parts	Single pie e, plus speakers	BB	65
Sanyo W40CD £380	Average Average	Low cost, no options package with attractive displays, cassette had high wow and flutter, but the rest worked OK	Semi auto T/T, auto record start, twin asstette	R	54
Sanyo System 33 £400	Average Average+	Similar to the 22, and better when extended, but the price (and value) advantage is dissipated.	As 22, separate T/T, remote	R	65
Sharp SA-CD880H £700	Average Average—	A superficially high grade, high spec system, the SA-CD880H actually sounds clean but a little 'synthetic'	One-piece, 6-disc CD, no T/T		54
Sony Compact 350CD £480	Average— Average—	Visually stunning appearance hides very basic audio attributes, the turntable and cassette deck suffering severe pitch related shortcomings. CD is too expensive in this company.	Integrated one piece, (ex CD), 5 disc non-cartridge player		65
Sony Compact 500CD £550	Average+ Average+	Impressive visuals are matched to electronics which in audio terms lack inspiration. The speakers are particularly poor	Combined amp/cassette, 36 preset tuner, T/T component CD		65
Sony Compact 700CD £700	Average+ Good	Loudspeakers and (to a lesser extent) turntable spoil a fine sounding and stylish – if rather costly – package	Separates system, auto reverse cassette, 36 preset tuner		65
Sony Series 1000CD £1500	Very Good Excellent	Very sharp, articulate sounding system from CD and FM. Cassette deck good and flexible, turntable as usual is not in keeping	Separates system, twin auto-reverse cassette, amp with DAC	R	65
Technics X900CD £470	Average Average—	Good build and mostly good sound is offset by mediocre amplifier and loudspeaker and some operational oddities	Main cassette/tuner/amp, separate T/T and CD		65
Technics X950 System £850	Good Good	Fine sound from CD, FM and AM radio and cassette. The record deck is a little better than normal too, but the loudspeakers are disappointing	Component based, CD, twin auto-reverse cassette, tuner, auto T/T, amp and speakers	R	65
Technics X990D System £1250	Good Very Good	Powerful, flexible and well built system – loudspeakers apart. Even the turntable is on the rough side and the loudspeakers should be changed if possible. The rest of the system is A1	Twin deck, programmable T/T, amp, CD, speakers	R	65
Toshiba V17CD £370	Average Average+	Loudspeakers are the weak link, with cassette and turntable also indifferent. Tuner and CD worked well though, so reasonable value for money	Twin cassette, semi-auto T/T	R	54
Toshiba V18CD £400	Poor Poor	Neat and simple to use basic system with good CD but poor elsewhere and abysmal loudspeakers	Integrated amp/cassette deck, other components separate but dedicated		65

## TUNERS

The radio medium operates at a much lower profile than TV, but in areas outside pop music the BBC service is the envy of the world. Live Prom concerts can rival all other sources from a hi-fi perspective. Only the FM (VHF) bands give stereo hi-fi sound, though AM (MW & LW) are useful for receiving certain transmissions in the UK.

Something of a hi-fi afterthought, tuners are often selected merely to match a chosen amplifier

cosmetically. However, the task they carry out is far from simple (or cheap), combining the skills of RF (reception) and audio (signal processing) engineering. The importance of the former will depend on local reception conditions, but money invested in a high quality outside aerial system is well spent.

Tuners come in two basic types. Analogue models tune gradually (and usually manually) across

the bands, and can have analogue or digital displays; they are often preferred for sound quality, and are certainly best for AM bands. Digital tuners offer convenient automatic tune facilities and hold many station positions in pre-set memories.

(The Lab and Sound results for models tested in issue No. 65 refer to FM only. For AM results see under Comments.)

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Akai AT-52L £150	Very Good Very Good	Holds its own on FM against many much more expensive tuners, but AM is very poor	All bands	BB	65
Akai AT-93L £250	Good+ Good+	By AM standards presentable (good) while FM delivers the goods	All bands, aerial switch	R	65
A&R Arcam Alpha £149	Good Average+ +	Attractively classic British analogue tuner with sound quality comfortably better than most	FM/AM Analogue	BB*	50
A&R Arcam Delta £270	Very Good Very Good	Hi-fi sound on FM, good on AM, a dependable British all-rounder	6AM, 6FM presets. FM/MW. LW display manual tune	BB	55
Denon TU 450L £130	Average+ Average+	Poor AM sound quality may be a deterrent but the FM performance fully merits recommendation	FM/AM Digital	R	50
Harman Kardon TU920 £299	Good Average	Rather weak sound quality for the price despite good lab test results	16 presets, AM/FM, digital auto scan, active tracking		55
Harman Kardon Citation 23 £559	Good Very Good	Fine performance, interesting features and ease of use are this tuner's forte, and the sound quality is top notch	FM/AM seek/manual adjustment muting. 16 presets remote control	R	60
Hitachi FT-MD 5500 £200	Excellent Good+ +	A powerful, good sounding tuner with versatile facilities	16 presets, FM, AM, MW auto scan digital, signal meter	BB	55
Hitachi FT5500 II £200	Very Good Good+	Soundwise highly rated on FM, and on AM basically satisfactory – a versatile all-rounder	Auto and manual tuning. 16 presets	R	44
Kenwood KT-660L £130	Fairly Good Fairly Good	You get your money's worth of gadgets and the radio's basically sound although programming is complicated. AM – fairly good	Timer, clock, all bands	R	65
Kenwood KT-1100D £300	Good+ Good+	Behind a gaudy and rather useless display the radio is much better than you might first think. AM – good	Firework display. FM/MW bands only	R	65

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## TUNERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Marantz ST35L £125	Good + Average -	It works well enough but the sound could be better for the money	16 presets, AM/FM, digital auto scan, active tracking		55
Meridian 204 £525	Good + Good	Pleasant sounding with a fine finish but does not make the grade at this price	FM only, auto scan, digital, remote, clock timer		55
Musical Fidelity TI £300	Good + Very Good	Top class FM stereo sound on good signal strengths from this audiophile model. Watch out for local CBI!	FM only, analogue box dial, manual tune, signal meter	R	55
NAD 4020B £139	Good Average +	Not the quietest or most sensitive tuner tested, it still provided good sound for the money, being "musical and ambient"	Analogue FM/AM	BB	50
Naim NAT 01 £1098	Very Good Very Good	There may be better sounding tuners in the world, but we have yet to hear one	No presets. Two box, flywheel tuning FM only, Analogue	R	50
Nakamichi ST-7E £750	Good + + Good +	Exceptionally good for weak-signal areas, and good all round	16 AM/FM presets, Schotz enhanced sensitivity, auto time digital		55
Pioneer F551L £100	Good + Good +	High value budget tuner, very little to argue about (includes long wave)	12 FM, 12 AM presets, auto scan, digital and signal strength meter	BB	55
Pioneer FT 443L £130	Poor Poor	The pretentious 'computer controlled' features don't amount to much. AM - very poor	All bands		65
Pioneer F-737 £230	Good + Good +	Terrific separation and selectivity on FM, but still lacking. AM - fair	FM/MW only	R	65
Pioneer F91 £350	Excellent Good + +	Easy to use, this model has excellent RF performance and scored very high ratings on the listening tests	FM/AM 24 presets	R	60
Proton AT-300 £199	Good Good	The AT-300 is pretty on the outside, orthodox on the inside and rather dear. AM - poor	FM/MW only	R	65
Quad FM4 £289	Very Good Good +	Fine sound, excellent ease of use, good build and finish and a more than satisfactory technical performance	7 presets. Digital	R	50
Revox B260 £918	Excellent Very Good	Sophisticated and expensive, the B260 is ideally suited to the rest of the Revox range and should also work well in other systems	FM - virtually everything	R	60
Rotel RT-830AL £110	Good + Good	Fine sounding budget audiophile material, no frills, no fuss	Manual dial analogue, FM, MW, LW	BB	55
Rotel RT-850AL £160	Good + Good +	Scoring well on listening tests and one of the best sounding tuners at its price level, it was a bit let down on AM but RF performance was good	FM/AM, digital	BB	50
SAE T-102 £449	Good + Good +	Expensive for all the radio you get, but sounds interesting. AM - Poor	FM/MW only	R	65
Sansui TU-099XL £249	Very Good Good +	This slimline compact model gave good FM sound quality and strong RF performance. But the AM sounded unpleasant	FM/AM, 16 presets	R	50
Sony ST-S300L/ ST-S100L £140/£100	Good Good	A reasonable entry point, not for difficult areas. AM - Poor	All bands	R	65
Sony ST 500ES £200	Good + + Average -	Disappointing sound quality but good lab performance. (Includes long wave)	10 AM/FM presets, auto scan digital		55
Sony ST-S 700ES £299	Very Good Very Good	First class in every respect including FM sound quality. Even AM was well above average	FM/AM, 10 presets, digital scan	BB	60
Yamaha T -L400 £130	Good + + Good +	Good FM sound, let down by poor AM but otherwise good value	16 presets, auto scan, digital, FM, MW, LW	BB	55
Yamaha T -500 £150	Average + Average	Under a gaudy coat, this sensitive tuner gave reasonable stereo results. However, the AM had again been thrown down a well	20 presets (10 buttons) digital		50

## HEADPHONES

There are a variety of different approaches to headphone design, and examples of each turn up in this group. Amongst the more expensive esoteric models, electrostatic drivers are used in square open-backed phones such as the Jocklin and Stax models. The majority of these come with some form of transformer which takes the signal initially from the speaker terminals on the amplifier. The actual speaker cables then travel from this unit via a

bypass switch to the loudspeakers.

The more down to earth models feature dynamic drivers in circular open-backed designs. The advantage of open backs seems to be a correspondingly open sound and a less claustrophobic feel to the music. One can also of course hear external noises and irritate people on public transport.

The third category are closed-back designs,

which are useful in situations where it is necessary to block out background noise.

Another means of distinguishing different types is the way they sit on your head or ears. There are three styles: circumaural models enclose the ear and rest on the side of the head; supra-aural designs press on the outer ear (pinna); and intra-aural types rest inside the ear and are popular amongst users of personal stereos.

NAME PRICE	SOUND COMFORT	COMMENTS	TYPE	VALUE	BACK ISSUE FULL REVIEW
Atwa HP-X8 £49	Good Very Good	Very slick Walkman oriented phones which are tonally well balanced and go loud without becoming painful	Supra-aural, closed-back, dynamic	R	63
Atwa HPE -200 £90	Good Good	Modern looking and well finished the Excelsas, as they are dubbed, had meaty bass and sounded reasonably open for the type	Circumaural, closed-back, dynamic		63
AKG K135 £35	Fair Poor	Despite a very appealing design the K135s don't live up to the usual AKG standards, though they do have the ability to reproduce rhythm well	Supra-aural, semi-open, dynamic		63
AKG K240 Monitor £60	Good Very Good	Something of a classic these AKGs are very user friendly in all respects; sonically on the warm side of neutral	Circumaural, semi-open, dynamic	R	63
AKG K280 Parabolic £110	Very Good Good	A very revealing and unusual twin driver design that uses the same principle as a satellite dish to beam sound into the ear	Circumaural, open-backed, dynamic	R	63
Audio Technica ATH 909 £55	Average Average	Quite impressive in the treble though a bit bass shy, the 909s worked well at highish levels	Circumaural, semi-open, dynamic		55
Audio Technica ATH 910 £65	Good Average	The closed-back 910s are an improvement on the 909s with a nice rhythmic quality rarely found with headphones	Circumaural, closed-back, dynamic	R	55
Audio Technica ATH-911 £75	Very Good Very Good	Nicely finished dynamic headphones with all the trimmings, plus a very clean and subtle sound	Circumaural, open-backed, dynamic	R	63
Beyer DT 325 £30	Fair Very Good	Lightweight in more ways than one, the 325s may be a little bright for some systems and tastes but will suit duller sources	Supra-aural, open-back, dynamic	R	63
Beyer DT330 Mk II £45	Poor Good	Not the most revealing 'phones encountered, the 330s were nevertheless enjoyable and rarely offended	Circumaural, semi-open, dynamic		55
Beyer DT550 £69	Good Good	On their own the 550s sound articulate with a slightly 'gritty' treble and 'keen' midrange; not suitable for headbangers!	Circumaural, semi-open, dynamic		55

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## HEADPHONES

NAME PRICE	SOUND COMFORT	COMMENTS	TYPE	VALUE	BACK ISSUE FULL REVIEW
Beyer DT880 £90	Good Good	Well made cans with a warmish sound but fairly solid midrange, though they're not that informative for the price	Circumaural, semi-open, dynamic		63
Beyer DT990 £119	Very Good Very Good	The 990s are definitely a significant pair of dynamic headphones; they have a smooth and yet revealing, neutral sound that is hard to criticise.	Circumaural, open-back, dynamic	R	55
Jacklin Float Model One £79	Very Good Good	Whilst very unusual in appearance the Floats give remarkable sound quality and openness at a reasonable price	Circumaural-ish, open-back, dynamic	BB	55
Jacklin Float Model Two £99	Very Good Good	Helmet shaped and pretty unflattering but open sounding and comfortable in the long term. Note lack of adjustment means you should try before you buy	Circumaural-ish, open-backed, dynamic	R	63
Jacklin Float Electrostatic £399	Excellent Good	One version of the state-of-the-art, these electrostatics have an openness of sound rarely found in the breed, with good dynamic range to boot	Circumaural-ish, open-back, electrostatic	R	55
Koss K/6X Plus £30	Poor Fair	'Sixties-style' phones from the good ole US of A, their sonic style is unique and can make a system sound quite different	Supra-aural, closed-backed, dynamic		63
Quart Phone 30 £40	Fair Good	Whilst not as seductive as their PMB25 predecessor the 30s are reasonably neutral and do improve on some of the competition - though not stunning	Circumaural, semi-open, dynamic		63
Quart PMB 25II £40	Good Good	Despite a somewhat unconventional suspension system the 25s put in a convincing and enjoyable performance with warm yet lively balance	Circumaural, open-back, dynamic	BB	55
Quart Phone 70 £70	Good Good	Competent performers that were hard to criticise but lacked the life and sparkle of which some of the competition are capable	Circumaural, closed-back, dynamic		63
Quart PMB 65 £70	Good Good	Quite revealing and neutral albeit with the usual closed back sound, this competes well with more established models	Circumaural, closed-back, dynamic	R	55
Quart PMB 85 £90	Very Good Fair	These more expensive Quarts bear a striking resemblance to the Jacklin Float models and use two drivers per ear. Sound is a bit bass heavy but not bad overall	Circumaural, open-backed, dynamic		63
Ross RE-2760 £35	Fair Poor	Stylish white cans from the only British firm in the business. Unfortunately sound quality is not up to par in this price range	Supra-aural, closed-back, dynamic		63
Sennheiser HD30 £13.50	Poor Good	Built specifically for the personal stereo market these small and light Sennheisers have a slightly synthetic sound, but are an upgrade on the average Walkphones	Supra-aural, semi-open back, dynamic		55
Sennheiser HD450 £27	Fair Good	Modern, simple and lightweight phones that are remarkably robust and which turned in a relaxed if weighty performance that was at worst pleasant	Supra-aural, semi-open, dynamic	R	63
Sennheiser HD480 £37	Fair Good	Using the same shell as the 450s, the 480s were a little softened and unrevealing by comparison with their competitors	Supra-aural, semi-open, dynamic		63
Sennheiser HD420SL £47	Good Good	The 420s gave a full and tangible quality to instruments and voices; whilst not the most revealing headphones around they would suit slightly brash sources	Supra-aural, open-back, dynamic		55
Sennheiser HD540 Ref Gold £160	Very Good Good	The 540 Golds prove that dynamic headphones can be subtle, informative and capable of creating a remarkable sense of space	Circumaural, open-back, dynamic	R	55
Sony MDR V3 £30	Good Fair	Portable stereo oriented phones that are very nicely made and combine clarity with a pleasant lack of distortion	Supra-aural, closed-back, dynamic	BB	63
Sony MDR V6 £70	Good Very Good	A little more civilised and dynamic than the V4s, these were pretty good for their type and fold up to boot	Circumaural, closed-back, dynamic	R	55
Sony MDR V7 £70	Very Good Very Good	Classy sounding cans that are very slick and work well with all types of music, setting the standard in their price range	Circumaural, closed-back, dynamic	R	63
Stax SR34 £140	Very Good Fair	The least expensive Stax headphones around, the SR34s are lively and rhythmic with good tight bass and a sweet midrange	Supra-aural, open-back, electret		55
Stax SR84 £210	Very Good Very Good	The stepping stone between dynamics and full electrostatics, these electret phones are revealing, open and highly enjoyable	Supra-aural, open-backed, electret	R	63
Stax Gamma pro/SRD-X pro £296/£230	Excellent Very Good	The Gamma pros are like a stethoscope for your hi-fi, revealing subtleties that many loudspeakers fail to resolve	Circumaural, open-backed, electrostatic	R	63
Stax SR Gamma £299 (inc. SRD-6 Adaptor at £100)	Very Good Very Good	The next model down the Stax range from the Lambda, the Gamma is an excellent headphone with little to criticise but the price.	Circumaural, open-back, electrostatic	R	55
Stax SR Lambda Pro £545 (inc. SRD-7SB Mk 2 Adaptor at £185)	Excellent Very Good	A bit of an industry reference the Pros are frighteningly revealing, bringing across more information than loudspeakers costing twice as much	Circumaural, open-back, electrostatic	R	55

## PERSONAL STEREO

Whilst not exactly hi-fi components, personal stereos probably play more music to more ears than all manner of domestic systems and as such demand some attention. Now that personal CD players have joined the ubiquitous Walkman in the market, the variety and standard of sound quality is huge, with obscurely named cassette players practically falling out of your cornflakes packet and Discmen going for £300.

Despite their diminutive size personals attempt to incorporate as many gimmicks and features as

possible, cassette players often incorporating tuners, graphic equalisers and Dolby noise reduction. CD players are still relatively expensive and don't tend to vary that much on the features front, rather the amount and quality of accessories differs. Most models come with a mains adaptor and some include remote control.

Sound quality on the cassette front seems to have a proportional relationship to price and integrity of construction - wow and flutter being quite obvious on the cheaper models. CD players

become less noisy as they get dearer and also reduce in size; one drawback of the latter seems to be that immunity to shock suffers as a consequence. Cassette players do, on the whole, seem better suited to the outdoor life than their digital counterparts, as does the software. Bear in mind that the sound and lab ratings given below cannot realistically be compared to those in other categories or between cassette and CD personals.

## PERSONAL CASSETTES

MODEL NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa HS-G35 MkII £30	Poor Fair	A reasonable player for the price but not well suited to classical material and let down by the headphones	Autoreverse, graphic EQ, types I & II		56
Aiwa HS-J36 £89	Good— Average	Comprehensive facilities and reasonable sound are no mean feat for the price.	Dolby, autoreverse, types I, II & IV, AM/FM, recorder	R	56
Aiwa HS-PX101 £149	Average— Good	A very slick little number with soft touch controls and remote control headphones	Dolby B, C, autoreverse, types I, II & IV	R	56
Ferguson 3T46 £35	Very Poor Poor	Not particularly subtle but having reasonable speed constancy, it's OK with most material but can get painful	Autoreverse, AM/FM		56
Philips D6658 £30	Very Poor Poor	The low price limits sound quality, and this is not a spectacular machine, but it does a reasonable job nonetheless	Graphic EQ, AM/FM		56
Saisho PS90R £40	Poor Poor	A bit of a jumble of features and gadgets, the PS90R has on-board speakers, an extending aerial and even records, but sound quality is dubious	Graphic EQ, types I, II & IV, AM/FM, recorder		56
Sanyo MGR-77 £35	Very Poor Very Poor	Rather a basic machine with a raw edgy sound, not helped by poor speed stability	Graphic EQ, AM/FM		56

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## PERSONAL CASSETTES

MODEL NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Sanyo MGR-87 £50	Very Poor Fair	The 87 came up with a slightly fast but rhythmic sound. Although lacking in finesse, it worked OK with pop material	Autoreverse, graphic EQ, AM/FM		56
Sanyo MGP 600D £50	Average+ Average-	With a yling aimed at the fairer sex the 600D sounded a little better than the similarly priced MGR-87. Lacking in clarity, it was still quite enduring	Dolby, autoreverse, graphic EQ, types I, II & IV		56
Sanyo JJ-P4 £100	Poor Good	Claimed by its makers to be the world's smallest personal stereo the JJ-P4 is a tasty looking object that's capable of good sounds to boot	Dolby, autoreverse, tape types I, II & IV, rechargeable		56
Sony WM-34 £40	Poor Average	This straightforward no frills Walkman makes pretty plausible sounds at a reasonable price and apart from the Walkman Pro was the only model to earn a Best Buy rating	Dolby, types I, II & IV	BB	56
Sony WM-F63 £100	Average- Average-	This attractive Sports Walkman is nicely built but sonically flawed by rather hissy intra-aural headphones	Dolby, autoreverse, types I, II & IV		56
Sony Walkman Pro £249-£289	Good+ Excellent	One of the finest sounding cassette decks on the market today. A mandatory Best Buy, it takes other personals to the cleaners (except on weight and power consumption)	Dolby B, C, types I, II & IV, record, line in/out, varispeed	BB	52/56
Toshiba KT-4027 £35	Very Poor Very Poor	Not a very wonderful machine, the 4027 sounded pretty appalling with all but the most subtle music	Graphic EQ, AM/FM		56
Toshiba T-4047 £60	Average Average	This model proved capable of making the most of better recordings, and sounds reasonably tuneful	Dolby, autoreverse, graphic EQ, types I, II, AM/FM	R	56

## PERSONAL CDs

MODEL NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Goodmans GCD-10 £120	Average- Poor	Cheap, flashy and not short on accessories the GCD-10 is a rather noisy player that left a lot to be desired on the sound quality front	13.5 x 3.7 x 18cm, 478g, mains adaptor		66
Kenwood OPC-77 £270	Good+ Very Good	Very chunky and well made, the OPC-77 is the only player to include a digital output and sounds very good through its analogue output - a suitable domestic alternative	12.8 x 3.5 x 14.5cm, 750g, digital output, mains & in-car adaptors	R	66
Philips D6800 £130	Average Average-	A competitively priced and reasonably attractive looking player whose sonic performance is somewhat marred by a rather grainy top end	13 x 4 x 17.5cm, 516g, 3" ready, twin hdph sockets		66
Sanyo CP-12 £260	Fair Good+	Sonically amongst the more enjoyable personal CD players and capable of revealing the musical aspects of a disc in an interesting and entertaining fashion	12.5 x 2 x 12.7cm, 380g, wired remote, mains adaptor	R	66
Sony D-20 £150	Average+ Fair	Not bad for a machine at this price, it's nicely designed and reasonably robust, with reasonable sound quality	13.8 x 3.8 x 15cm, 450g, mains adaptor	R	66
Sony D-40 £200	Fair Good	A 'largish' but attractive player that works well as a Discman being fairly immune to shock and capable of making a good job of reproducing the discs it's given	13.6 x 3.7 x 14.7cm, 480g, mains adaptor, slinky case	R	66
Sony D-88 £300	Average- Fair+	A stylish and 'cultish' object, the D-88 is very small and has an adjustable disc drive for three and five inch discs. Sound quality doesn't quite match appearance	9.4 x 3 x 9.8cm, 300g, 3" ready, mains adaptor, no line out		66
Sony D-150 £300	Fair+ Very Good	One of the most enjoyable machines encountered, sounding informative and sweet and looking very tasty to boot. Comes complete with a tough carrying case	12.6 x 2.1 x 13.5cm, 420g, 3" ready, R mains adaptor	R	66
Toshiba XR-9458 £250	Average+ Good-	Accompanied by a plethora of accessories including a meaty plinth and infra red remote, the Toshiba didn't quite make it on the sound quality front but is worth considering	12.6 x 2.4 x 12.9cm, 460g, 2 remotes, mains adaptor, 3" ready etc		66
Xenon CDP-03 £180	Average- Fair+	A well made and competitively priced machine that's ergonomically spoiled by flat slightly unresponsive buttons. Sound quality ain't too bad but a trifle boring	12.6 x 2.7 x 12.6cm, 560g, high frequency filter, key lock		66

## CD PORTABLES

CD Portables or Yuppie Blasters as we classified them are basically portable stereos gone digital, ie a compact disc player is included alongside the usual AM/FM radio and single or double cassette deck. Compact disc is a novelty that seems to add a fairly hefty premium onto the price of the standard ghetto blaster, but the improved sound quality over standard cassettes may justify this for some.

In virtually every case a CD output socket is

filled which means that it's possible to play silver discs through a domestic amplifier and loudspeakers, thus they are some sort of substitute for standalone mains machines (as are the personal CD players). One drawback with having a CD player on board is that batteries are gobbled up even quicker than usual, up to ten batteries being required in some cases. Neither are the units particularly light, the heaviest weighing eight kilos!

However they do all run off the mains too, and come with an appropriate lead for this purpose. Other useful features common to most are spare input sockets to record from an external line source such as a preamplified vinyl disc signal, and microphone sockets for recording live events (although the usual lack of record level adjustment is a nuisance).

MODEL PRICE	SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Ferguson RCD02 £300	Poor	A large, slightly tinny midi system-esque unit with removable speakers and a slightly brash sounding CD player	Twin cassette, graphic equaliser, spare input (DIN)		53
Fisher PH-D473F £300	Average	The Fisher is quite a neat and compact player which is nice to use but doesn't offer particularly great sound quality	Autoreverse, AFC		53
Hitachi CX-W800 £300	Average+	This meaty Hitachi lives up to Blaster expectations, its super woofer bass speaker giving maximum street credibility	Twin cassette, graphic equaliser, phono input	R	53
Memorex CD-3300 £280	Average	A little bit tacky, the Memorex put in a plausible if unenthalling performance, and will work with external speakers	Spare input		53
Panasonic RX-FD80L £300	Average-	Shiny in a glitzy way, this Panasonic features a reasonable cassette deck but a below par CD player with tiny transport controls	Autoreverse, spare input		53
Sharp WQ-CD15 £250	Good	A reasonably compact machine with a quite impressive CD player and a novel twin cassette mechanism	Twin cassette, graphic equaliser, spare input	R	53
Sony CFD-66L £350	Good	A very attractive player in the true yuppie mould of white plastic with silver details, it even sounds OK	Spare input, shuffle play, AMS (tape search system)	R	53
Toshiba RT-7096 £250	Poor	Quite a large box for the money, the Toshiba isn't too special when it comes to sound quality but does have partly wooden detachable speakers	Twin cassette, graphic equaliser, spare input		53

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## 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 a

broad schools of design. The most common is the open frame type which uses square section steel tubing (usually less than an inch square) made up to form a tripod or quadropod stand usually fitted with spikes top and bottom to ensure good coupling to both floor and cabinet. However, for reasons of domestic harmony this latter option is often not pursued as eagerly as perhaps it should be. The alternative approach is to use mass. Larger section (approximately 3 inch x 2 inch) tubing is welded between square top and bottom plates and filled with sand and/or lead shot. Again, this type uses

spikes at the base but Blu-tack or the like for coupling with the speaker cabinet.

Equipment supports generally place isolation quite high on the list of priorities and usually use a lightweight steel frame to support an MDF platform. Once again spikes are used to minimise contact with the platform and ensure good coupling to the floor. Minimising weight without compromising rigidity seems to be the aim with turntable supports but those designed for electronics often employ some form of damping to kill vibration, sometimes in the form of mass.

### LOUDSPEAKER STANDS

MODEL PRICE	TYPE FINISH	COMMENTS	TOP PLATE SIZE HEIGHT	VALUE	BACK ISSUE FULL REVIEW
Appolo AB20 £40	4 leg Fair	A light open-framed budget design slightly lacking in rigidity and subjectively superceded by other stands costing £10 more.	19 x 19cm 53cm		58
Appolo A10 £47.25	4 leg Fair	A robust and lightweight model, it would make an ideal upgrade for those still happy with the big boxes of old.	19 x 19cm 44cm	R	58
Foundation Fred £65	2 leg Average	With sand filling the Freds made speakers sound tight and coherent with a more even balance.	19 x 19cm 36/43/59cm		58
Foundation Maggi £159	Pair Very Good	Made for Magneplanar and other similar panel speakers they seem to have a healthy effect on the sound quality thereof.	50 x 2cm 2cm	R	58
Foundation Pi £250	2 leg Very Good	Overpriced in material terms the Pi nevertheless has a very positive effect on the low frequency performance of conventional speakers.	20 x 20cm 25/38/46/53cm	R	58
Heybrook Point 5 £50	3 leg Very Good	An unusual triangulated open frame stand that can help certain speakers sound more transparent and fluent - a good value stand	23 x 21.5cm 47cm	BB	58
Heybrook HBS1 £75	4 leg Very Good	With its new aluminium base frame the HBS1 fared very well in the listening tests. It allowed much of the speakers own 'sound' to remain intact.	23 x 21cm 47cm	R	58
Linn Kan II £74	4 leg Very Good	Built to support Linn's Kan speaker this stand is well suited to the task, but is less successful with other loudspeakers	19 x 16cm 59cm		58
Linn Sara £80	4 leg Very Good	The Sara exhibits some odd properties so its use other than with the Sara loudspeaker should be viewed with caution.	25 x 21cm 53cm		58
Monotrak Engineering M1 £58	1 leg Good	The M1 gave the mid and treble a commendably smooth and detailed presentation but bass sounded rather lacklustre and muddy	19 x 18.5cm 48cm		58
Monotrak Engineering M4 £58	4 leg Very Good	Begging comparison with Heybrook's HBS1 the M4 maintained much of the openness and forthright detail of that model.	23 x 21.5cm 53cm	R	58
Monotrak Engineering M4S £58	4 leg Very Good	Its stature and stability would seem to mark it out as most suitable for smaller, lighter cabinets. The M4S possessed an open midband and clear treble.	20 x 17.5cm 53cm		58
Mordaunt-Short IS1 II £45	3 leg Good	Suited to low mass speakers, preferably using spikes to effect coupling, they sounded slightly 'jazzed up' but the overall sound was quite unmuddled.	18 x 15cm 56cm	R	58
Origin Live £117	3 leg Good	An unusual tripod stand devoid of top plate and taking up more floor space than normal, subjective and technical performance was exemplary	(support area) 22 x 17.5cm 52cm	R	58
Partington PP4 £50	1 leg Good	The PP4 offers a rather mixed performance, though when damped with sand infill it was less ready to embellish the overall sound and low frequencies became lauter and quicker.	18 x 16.5cm 48cm		58
Partington Dreadnought II £120 (filled)	1 leg 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 63cm		58
QED TS22 Tristand £50	3 leg Very Good	Most tracks sounded uplifted or buoyant, never thick nor coloured. It worked well with most of the speakers tried and encouraged a fluid and revealing midband.	19 x 17cm 45/50/58cm	BB	58
RATA Torlyte £190	2 panel Excellent	Suited to low mass speakers, these unusual stands are hardly discreet but offer transparent and clean sound - much like the Torlyte table!	25 x 21cm 48cm	R	58
Target HS20 £53	1 leg Excellent	This monopod stand can be used either filled or unfilled and encourages different characteristics in the sound accordingly	19 x 16.5cm 53cm		58
Target HJ15/3 £83	3 leg Very Good	Sound quality was basically very good though without the sand infill some loudspeakers may sound a little unbalanced as both bass and treble regions are subjectively exaggerated.	28 x 28cm 40cm	R	58

### EQUIPMENT SUPPORTS

MODEL PRICE	TYPE FINISH	COMMENTS	SIZE (H x W x D)	VALUE	BACK ISSUE FULL REVIEW
Audioquest Sorbothane Feet £10 each	Feet Good	These large gumdrops are very useful for damping vibrations in amplifiers and especially CD players.	6.5 x 2.5cm (circular)	R	57
Cornflake TCS5 £50	Table Very Good	A little too close to the ground for comfort, perhaps, but this novel and stylish little table is certainly worth seeking out.	29 x 43 x 33cm	R	57
Cornflake TCS6 £50	Shelf Good	A squat and rigid frame supports a Medite top board with four adjustable spikes, better suited to suspended sub-chassis turntables.	43 x 23 x 33cm		57
Delttec Isolation Base £135	Platform Good	Designed for all CD players, amplifiers and separates, but not suspended sub-chassis turntables, the isolation is second to none.	50.5 x 40cm	R	57
RATA Model A £125	Table Very Good	A three-legged Torlyte turntable support that has become something of an industry reference.	46 x 46.5 x 38.5cm	R	57
RATA Ampiat £40.25	Platform Very Good	A lightweight and rigid Torlyte slat with spikes for floor or shelf mounting, it works well in conjunction with the Target TT2.	4 x 44.5 x 35cm		57
Sound Organisation Table £55	Table Very Good	A deceptively simple structure that just happens to be engineered in a thoughtful, and ultimately successful manner.	37 x 45 x 35cm	BB	57
Sound Organisation Wall Stand £40	Shelf Very Good	The first of its ilk and still amongst the best, this simple framework represents a vast improvement over standard furniture shelves.	27.5 x 43 x 35cm	BB	57
Target TT1 £46.50	Shelf Excellent	This rigidly braced shelf offers both good sound quality and material value for money.	26 x 46.5 x 35.5cm	BB	57
Target TT2 £47.50	Table Very Good	Standing up to the best in most areas, the TT2's only real foible concerns a slight loss of bass 'slam'	52 x 46.5 x 35.5cm	BB	57
Townshend Suspension Base £145	Platform Fair	Designed to complement the Rock turntable, this platform will bring subjective improvement to a wide range of electronics.	43 x 36cm	R	57

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# THE DIRECTORY

## CABLES AND CONNECTIONS

Although cables and connections are sometimes thought to be the least important items in an audio system there has been a growing awareness in recent years that they have a significant effect on sound quality. To this end there is now a vast array of exotic cables and interconnects available to those interested in experimentation. The key observation on cables is that they are much more than mere accessories. Carrying the audio signal, just as any amplifier does, it's really not too surprising that they can influence 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

interconnect summarised here were tested in 1m terminated lengths and therefore the results and prices relate to that length – some cables may well perform differently when used in longer lengths. The features column contains information on the material make-up of the different cables with the following abbreviations: OFC – oxygen free copper, OFHC – oxygen free high conductivity (Audionote define the HC as high crystal), PC-OCC – pure copper by ohno continuous casting, LC-OFC – linear crystal oxygen free copper.

### INTERCONNECT CABLES

MODEL PRICE (per metre)	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aature LSD N/A in UK	Poor Fair	Faint resonant boom was audible at very low frequencies, but otherwise this cable sounded remarkably neutral.	Silver plated copper, PTFE dielectric		59
Audioquest Reference 2 £29	Good Fair	Ultimately Reference 2 simply damped much of the atmosphere and emotional charge of a musical performance.	OF copper		59
Audioquest Livewire Topaz £29	Good Fair	Sounding 'bigger' and faintly richer than Reference 2, Topaz was also slightly grainy at the top end.	Gold-plated plugs, OFHC copper		59
Audioquest Livewire Ruby £45	Fair Good	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 £65	Good Good	Quartz has an ideal, neutral balance that embodies sparkling clarity without the drawbacks of harshness or compression.	3 piece plugs, PTFE dielectric	R	59
Audio Technica AT6115 £50	Very Good Fair	This cable sounds somewhat 'quieter' than the original LC-OFC interconnect, but is also less transparent and three dimensional.	PC-OCC copper coaxial		59
Audionote Copper ANC £35	Fair Good	ANC sounded punchy with a faintly lean but tightly-focused bass character. This crystalline precision waned slightly at higher frequencies.	OFHC copper twin-axial	R	59
Audionote Flexible Silver ANS £85	Fair Good	ANS scored a hit with its transparent midband and revealing but quite unforced treble quality. Bass transients were slightly softened.	Silver signal & Copper screen	R	59
Audionote Silver ANV £140	Poor Fair	Fair weightier-sounding than the flexible ANS, ANV interconnect also possesses a fair degree of treble clarity and sparkle.	21 strand silver Litz		59
Aural Symphonics N/A in UK	Poor Good	This cable enjoyed an open and transparent midband and sounded remarkably neutral and faithful to the source.	OF copper PTFE dielectric	R	59
Budget Patch Cords see text	Fair Poor	As thrown in gratis with cassette decks and the like – frequency extremes were restricted and performances were veiled.	Thin coaxial		59
Budget OFC circa £7	Fair Fair	Subjectively, this cable did lift much of the aural fog experienced with scrawny standard hook-up leads.	OFC		59
Deltec Slink £32	Good Very Good	Ideally used in lengths of under 4 metres, it errs on the lean side of neutral but has an uncommon transparency in the midrange.	4 silver plated OFC strands PTFE dielectric	BB	59
Deltec Black Slink £152	Excellent Excellent	Inherently neutral the cable faithfully reproduced broad and deep stereo soundstages with precise focus and a sense of facility.	8 silver plated OFC strands PTFE dielectric	R	59
Denon LC-OFC N/A separately	Very Good 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 £15- 5	Fair Good	Transparent in the midband and full of sparkling detail in the treble, low bass was slightly curtailed (unterminated price £4.60 per m.)	Single strand nickel-plated copper. Unshielded	R	59
Kimber Kable PSB £32	Very Good Very Good	An exceedingly transparent midband but slightly 'clanky' treble. It always managed to sound remarkably uncluttered and open.	OFC, PTFE dielectric	BB	59
Kimber Kable KC-1 £47	Very Good Fair	Tonally faintly leaner and brighter than the more open-weave PSB, KC-1's treble detail was just too sharp and grainy.	Multi-gauge PTFE dielectric		59
Kimber Kable KC-AG £375	Good Very Good	Treble detail resolution was perceived in a slightly up if wholly controlled fashion. Depth re-creation and lateral separation were excellent.	Multi-gauge silver, PTFE dielectric	R	59
MDM Interconnect £14.95	Good Fair	The subjective performance of MDM did appear a little imprecise at the frequency extremes, but a worthwhile upgrade on budget interconnect.	Coaxial, solid core, gold plated plugs		59
MIT PC-Squared £75	Fair Good	This multi-gauge cable produced a very open and buoyant midband but sounded slightly 'peculiar' at frequency extremes.	OFC, multi-gauge	R	59
MIT Spectral MI330 £193	Poor Fair	MI330 displays a marvellously open and enticing midband quality, bass is warm and rich but this character has a tendency to dominate.	Multi-gauge balanced bandwidth		59
Monitor PC 0100381 £17	Good Fair	There is more than a hint of instrumental muddling and bass is slightly soft, however, the slightly 'shut-in' sound is par for the course at the price.	OFC, coaxial	R	59
Monster Interlink 400 £30	Good Good	Bass is solid and punchy, counterpointed by a slightly overblown midband which tends to make vocalists sound larger-than-life.	Multi-gauge	R	59
Monster Interlink CD £44	Fair Fair	Low frequency is commendably weighty, but the top-end sounds vague and lacking in image focus. Suited to some systems better than others.	Multi-gauge		59
Monster Interlink Reference £88	Good Fair	Protracted listening indicated a lack of dynamic speed – a subjective sluggishness. It may prove well suited to up-front systems.	Multi-gauge Balanced bandwidth Gold plated plugs		59
Myst Tm £15.60	Fair Good	Fairly neutral with a pleasantly open and transparent midband. Some deep bass detail is lost but treble is sharply focused.	Solid-silver PTFE dielectric	BB	59
Origin Live Soli-Core Super £60	Good Fair	Improves over previous Soli-core samples in stereo depth and bass weight, but a 'loud' treble presentation remains.	Solid-core gold-plated AT plugs		59
QED Incon P1-Gold £14.95	Good Good	A lively open presentation that just borders on the lean side of neutral, the quick and lucid delivery affording considerable musical insight.	OFHC, gold plated Deltron plugs	BB	59
QED Incon Graphite GP1 Gold £18.95	Fair Fair	A shielded version of Incon P1, it sounded thicker at the frequency extremes, the top end being coarser and more out of focus. Good for long runs though.	OFHC Graphite shielding	R	59
Sony RK-C310ES £40	Excellent Good	Possessing deep firm bass and a sparkling top end it offers a balanced perspective with negligible coloration.	Coaxial LC-OFC	R	59
Sterling £250	Fair Good	Possessing a neutral if faintly rich overall balance it supplies a pleasantly open and transparent perspective. (Reviewed in pre-production form.)	2 silver strands per conductor		59
Thorens SAC 100 £50	Good Fair	Performance is undermined by a slightly coarse and splashy treble, not necessarily bright, simply rather confused – and fine detail lacks resolution.	Silver-plated OFC, coaxial		59

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# THE DIRECTORY

## INTERCONNECT CABLES

MODEL PRICE (per metre)	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Van den Hul MC-D300II £59	Poor Good	It tended to highlight some upper mid detail, but a generally open and spacious acoustic proved its saving grace. Slightly soft at LF.	Silver plated single strand VdH plugs	R	59
Van den Hul MC-1021II £69	Good Good	Possessing the same endearing qualities as the D300 it presented open and transparent soundstages and improved timbral resolution	Twin axial silver plated copper	R	59
Van den Hul MC-D502 £77	Fair Fair	The tonal balance was 'tilted' by a strong and authoritative bass line, which had the knock-on effect of muting treble detail. A bit dear.	Twin axial silver plated copper, teflon dielectric		59
Van den Hul Thunderline £147	Good Fair	Thunderline essentially parallels the sonic performance of the cheaper D102. HF is occasionally tainted by a 'tizzy' coarseness, bass is tight and dry.	Silver plated 'matched copper'		59
Van den Hul MC-Gold £247	Fair Good	It possesses a rich and beguiling treble balance that matches a weighty, slightly warm bass character. Seductive balance may prove worthwhile in some circumstances.	Silver & gold plated copper		59
Van den Hul MC-Silver £747	Good Good	Although remarkably transparent for an asymmetric design this costly cable was not considered to be a 'state-of-the-art' standard, and is bettered by cheaper models.	19 silver plated copper strands		59
Vecteur 8045 £49	Very Good Good	Sounding solid and forthright it might seem slightly cold in some systems but the treble 'edge' is mercifully clean. Very low frequencies were a little lacking in 'slam'.	LC-0FC signal & screen	R	59

## LOUDSPEAKER CABLES

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Absolute Wire Force 4 £4.50 per metre	Good Fair+	By current standards there was a loss of fine, sharp detail at the frequency extremes, but it has a big and friendly sound	744 OFC strands, PVC dielectric		64
Audionote OR-200 £16 per metre	Fair+ Fair+	Open and detailed throughout the midband but a grainy coloration tended to corrupt subtle timbral information at very high frequencies	200 LC strands, polyurethane and cotton dielectric		64
Audionote AN-SP £100 per metre	Average- Good	A clean and open sounding cable that offered a deep and pleasantly detailed perspective. Bass was slightly restricted, but seemed tight and coherent nonetheless	15 silver strands, polyethylene dielectric		64
Audioquest BC-4 £2 per metre	Average+ Good+	There was a slowing of fast transient edges to contend with but in general BC-4 offered a delightful clarity and sparkle throughout the highest octaves	4 OFHC strands, PVC dielectric	BB	64
Audioquest Livewire Black £15 per metre	Good Good	It proved clear and punchy but with some grain across the treble. Nevertheless Black remains an interesting concept and proved better than Livewire Green	OFHC, surface only - foam core construction	R	64
Audioquest Livewire Green £30 per metre	Good Fair+	Green proved more overtly dynamic and forward than BC-4 with simple music, but complex passages tended towards a mushy and ill-defined perspective. FCL - functionally crystal less	FCL, surface only - foam core construction		64
Audio Technica AT6120 £95 - 10m	Fair+ Fair	Compared to earlier LC-0FC cables this PC-0CC derivative sounded smoother and less aggressive	PC-0CC, PVC dielectric		64
Bellwire £2p per metre	Poor Average-	Broadly speaking it delivered a bright and tizzy sounding treble with a fairly open and detailed mid with little or no bass resolution	0.5mm single strand, PVC dielectric		64
Deltec 8S £144 - 5m pair	Good Good+	The unerring transparency and detail resolution of 8S throughout the midband makes it a far cleaner and more spacious sounding cable than others at the price	4 silver plated OF copper strands, PTFE	R	64
Deltec Black Sixteen £456 - 4.5m pair	Very Good Excellent	Bass was deep and rhythmically secure, the mid tonally pure and free of additional sibilance while the treble was both relaxed, sweet and highly detailed	16 silver plated OF copper strands, PTFE dielectric	R	64
DNM Solid core £2.30 per metre	Average Fair	DNM cable seems too unbalanced for general consumption but excellent results have been obtained in sympathetic systems	0.54mm single strand, webbed PVC dielectric	R	64
Exposure £2 per metre	Good Good	It could sound a trifle matter of fact but this emotive flattening was also somewhat dependent on the music program. It is also highly suited to long runs	56 OFC strands, webbed PVC dielectric	R	64
Kimber Kable 4PR £49.45 - 5m pair	Fair Fair+	This directionally marked cable benefitted from an open and airy treble quality but seemed notably leaner than 4TC. Bass was well round and satisfyingly taut	4 x 7 copper strands per conductor, PVC dielectric		64
Kimber Kable 4TC £16 per metre	Good Good+	4TC made a great impression in the listening tests with an open midband, a smooth and unflagging treble with slightly rich but suitably weighty bass	OF copper, PTFE dielectric	R	64
Linn K20 £2 per metre	Good Fair	Subjectively it erred on the forward and bright side of neutral but enjoyed an essentially clear and punchy delivery	56 OFC strands, webbed PVC dielectric		64
Marantz ML-55S £24.90 - 10m	Fair Fair	Subjectively this cable offered a loose and splashy treble which, though not overtly bright, did compromise both tonal and timbral accuracy	30 OFC strands, 3 conductors PVC dielectric		64
Mission Cyrus £2.50 per metre	Average+ Good	Because of its impedance characteristic this cable will deliver a smooth and unflagging treble balance with loudspeakers offering an easy load	0.8mm single strand, PVC dielectric	BB	64
Monitor PC Silverline PC4 £5.75 per metre	Good Average	Sonically it laboured under a heavy and claustrophobic balance, lacking the see through transparency and lucidity of the better solid core cables	2072 x 0.07mm silver plated copper strands		64
Monster Superflex £2.50 per metre	Fair+ Fair+	Treble detail was both reserved and confused though there was little in the way of harshness and grain. Deep bass notes were also found to be lacking	OFC, multistrand, Duraflex dielectric		64
Monster Original £4 per metre	Good Fair+	Original sounded relatively congested and murky at higher frequencies but possessed weight and conviction in the bass	Multistrand		64
Monster Powerline 2 £12 per metre	Good Good-	Powerline stamped its own hallmark on the sound with a strong taut bass and an essentially clear midband giving tactile stereo images	Multistrand, helical construction		64
Musical Fidelity Lifeline £11.50 per metre	Fair Good-	Lifeline did demonstrate a strong directional inclination, affording a laid back but fairly neutral balance when correctly oriented	4 x 0.8mm PC-0CC strands	R	64
Naim NAC-AA £2.25 per metre	Good Fair+	Tinged with brightness while the deep bass response seemed both over heavy and poorly integrated compared to the immediate competition	Multistrand, webbed PVC dielectric		64
NVA £6 per metre	Average+ Good	A light and breezy sounding cable best suited to short lengths. NVA benefitted from a clear and transparent outlook	7 x 0.25mm silver alloy strands, PTFE	R	64
Origin Live Soli-Core Ordinary £1.80 per metre	Good Fair+	Subjectively it bettered the performance of the costlier Super version, affording a pleasantly detailed and spacious soundstage with firm bass but slightly coarse treble	1.8mm and 0.5mm single strands	R	64
QED 79-Strand 90p per metre	Good Fair	For much of the last decade QED 79-Strand has been the first port of call for enthusiasts on the upgrading ladder, a tradition that should still hold true today	79 strand, PVC dielectric	R	64
QED Incon Graphite £1.75 per metre	Fair+ Fair+	This graphite version of Incon sounded cruder and generally more heavy handed than the cheaper unshielded type. Overall presentation was mildly restricted and cloaked in a faint aural fog	OFHC, polymeric screen		64
QED Flat 200 £1.95 per metre	Good Good	I detected a degree of confusion at low frequencies but this did not stifle the acoustic atmosphere which remained open and positive	200 strands, flat webbed PVC dielectric	R	64
Rotel Supra 4 £2.49 per metre	Good+ Good	Ideal for both long and short runs, it furnishes a big sound that benefits further from a smooth, unflagging treble	1,036 OFC strands, webbed PVC dielectric	R	64
Rotel Supra 10 £6.49 per metre	Good+ Good	Supra 10 provided a very free and open sound that was unhindered by any excess at low frequencies. Worth its weight in scrap copper!	2,562 OFC strands, webbed PVC dielectric	R	64
Sony RK-SSES £59.95 - 5m	Fair+ Fair+	The sound of this cable was also somewhat controlled and over damped. The treble was relatively free and airy but lower octaves, including the midband, were constrained	350 x 0.08mm OFC strands, heat shrink dielectric		64

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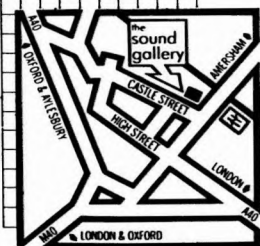
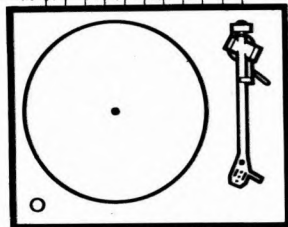
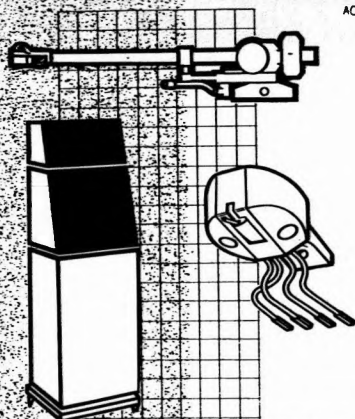
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## LOUDSPEAKER CABLES

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
<b>Solid core mains cable</b> 36p per metre	Fair+ Good	It enjoys much of the smooth treble and articulate midrange usually associated with the better solid core derivatives. Lean but taut and rhythmically coherent	1.5mm square, 3 cores, PVC dielectric	BB	64
<b>Sterling</b> £499 - 5m pair	Fair Fair	This pre-production sample possessed a strangely muddled and reserved sound quality. It suffered from a progressive instrument modulation that totally confused more complex orchestral passages	Pure Silver, PTFE dielectric		64
<b>Townshend Isolda</b> £400 - 5m pair	Fair+ Good	Isolda possessed a truly dark background out of which rose a very solid and extended bass together with an excellent sense of transparency through the upper octaves	8 coax cables per conductor - very thick	R	64
<b>van den Hul CS-122</b> £5.50 per metre	Fair+ Good-	Characterised by a driving and powerful bass, CS-122 proved to be a heavy sounding cable. Mid treble detail was refreshingly clear but there was a slightly muted air about the extreme treble	19 x 0.45mm silver plated strands, webbed rubberised dielectric	R	64
<b>van den Hul CS-352</b> £12.95 per metre	Good Fair+	Subjectively it sounded like CS-122 only more so, the deep rumbling bass tending to overwhelm subtle musical details. It also appeared a trifle peaky in the treble	7 x 0.76mm + 168 x 0.125mm silver plated strands, rubberised dielectric		64
<b>van den Hul SCS-12</b> £29.95 per linear metre	Good+ Good+	SCS-12 set a high standard with a tight and well focused soundstage populated with tactile stereo images. Bass wasn't as extended or resolved as some other cables	19 silver plated strands of 12 different gauges, PTFE dielectric	R	64
<b>van den Hul SCS-2</b> £99.95 per linear metre	Good+ Good+	Overall it was commendably neutral and transparent but nothing less would be acceptable bearing in mind the tremendous cost of a stereo pair	665 silver plated matched crystal copper strands, PTFE dielectric	R	64
<b>Vecteur R-CV30</b> £4.99 per metre	Fair Good	Subjectively the better of Vecteur's three-strong cable line-up offering a neutral overall perspective but with a slight loss of detail resolution at both frequency extremes	4 x 0.8mm LC-0FC PTFE insulated strands	BB	64
<b>Vecteur S-CV90</b> £199 - 5m pair	Fair+ Fair+	It seemed both less transparent and integrated throughout the midband than R-CV30, though both frequency extremes were spruced up with a tighter sharper delivery	6 x 0.7mm LC-0FC strands		64

## IN-CAR ENTERTAINMENT

In-car entertainment is an area not usually associated with the esoteric world of domestic hi-fi. However, it represents a source of musical entertainment that many of us are exposed to every day. The majority of new cars are fitted with some form of radio before they leave the showroom and in many cases this usually very basic player is taken for granted and accepted as representative of in-car audio standards.

For the price of a budget amplifier 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 usually of the digital variety with varying degrees of sophistication in signal tuning and presetting, with some machines featuring as many as 18 FM presets. The emphasis

is on the frequency modulated band and AM often suffers as a consequence, but fortunately for radio enthusiasts there are some exceptions.

The amplifier is usually designed to drive two pairs of speakers mounted fore and aft of the vehicle, and a fader is fitted to adjust the balance between the two. The dearer machines feature separate bass and treble controls which can be quite handy given the unusual acoustic of the car environment and the variety in balance and presentation to be had from car speakers.

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
<b>Alpine 7282L</b> £250	Good Very Good	A very attractive and seductive sounding player. The matt surfaced transparent preset keys are especially sexy	Bass/treble controls, 12 FM 6 AM presets, chrome eq., clock, 8W	R	61
<b>Aiwa CT-Z3500YL</b> £199	Fair Fair	A nicely designed machine with a flip up lid for disguise purposes. Sound quality from cassette is a bit poor but the radio is exemplary especially on AM	Bass/treble controls, 6 FM, 12 AM presets, Dolby, chrome eq., 8.4W	R	62
<b>Blaupunkt Paris SQM 48</b> £253	Average Average	A powerful and sensibly designed player but let down by a very dull sounding cassette. The radio is a bit better	Bass/treble controls, 5 FM, 10 AM presets, uni-directional, 11.5W		62
<b>Blaupunkt Windsor SQR 38</b> £275	Good Average	Not very enthralling sonically, the Windsor is rather low powered but does have a reasonably stable tape transport	5 FM, 10 AM presets, 3.1W		62
<b>Clarion 916HP</b> £160	Good Average	With its rubbery buttons and touches of white this is a modest looking player let down by a weak cassette	Bass/treble controls, 5 FM, 5 AM presets, 9W		61
<b>Clarion 946HP</b> £250	Very Good Very Good	A good FM side let down slightly by AM performance. This Clarion is particularly nice to use with its nifty SAM tuning system	Bass/treble controls, 12 FM/6 AM presets, Slot-in, 15.1W	R	61
<b>Goodmans GCE229</b> £150	Fair Average	If knobs, switches and legends are your bag then the GCE229 is the one for you - a lot of gizmos for the price and it even sounds OK	Bass/treble controls, 6 FM/6 AM presets, Chrome eq., clock, MSS, 10.1W	BB	61
<b>Hitachi CSK-402E</b> £250	Good Good	An attractively designed little player that for once doesn't disappoint when it comes to playing music, and it even has a security system	Bass/treble controls, 6 FM, 12 AM presets, Dolby, chrome eq., music search, 7.4W	R	62
<b>JVC RX-318</b> £200	Average Average	This JVC sounded quite enjoyable and turned in an impressive performance on FM. It even looks quite nice	Bass/treble controls, 5 FM, 10 AM presets, slot-in, 8.8W	R	62
<b>JVC RX-418</b> £250	Average Fair	An attractively designed machine with a fair selection of features - even an aux socket for a portable CD player	Bass/treble controls, 10 FM, 10 AM presets, Dolby, chrome eq., slot-in, aux socket, 7.7W		62
<b>Nakamichi TD-400E/PA-300</b> £450/£275	Very Good Excellent	If you want your in-car entertainment to compete on sound quality grounds with your domestic system, this combo offers a very strong challenge	Bass/treble controls, 5 FM, 10 AM presets, uni-directional, chrome eq., Dolby B, C, 75W	R	62
<b>Panasonic CQ-497</b> £117	Fair Poor	The CQ-497 has a traditional style analogue tuning system making it easy to use. AM reception was good but the other sources are less encouraging	Bass/treble controls, chrome, NR, 7W		62
<b>Philips 553</b> £120	Average Average	Not the most ergonomic player on test but sound quality was quite refined for the price. Presets are a bit gauche	4 FM, 4 AM presets uni-directional cassette 3.1W		61
<b>Philips DC680</b> £180	Average Good	A colourful and musically competent player that despite a gammy volume knob is well worth checking out.	8 FM, 4 AM presets 3.5W	R	61
<b>Pioneer KE-303D</b> £150	Poor Fair	A tasty looking, if sonically bass heavy, little box well suited to blasting out rock or dub	18 FM, 6 AM presets 4.2W		61
<b>Pioneer KEH-5080B</b> £230	Fair 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	61
<b>Sansui RX-3100L</b> £180	Poor Fair	Quite flash looking with a reasonable feature count but FM sound and cassette replay quality could be a bit stronger at the price	Bass/treble controls, 12 FM, 12 AM presets, chrome eq., 8W		61
<b>Sansui RX-5100L</b> £250	Good Very Good	One of the cleaner machines around the 5100 has an excellent AM section and a reasonable cassette player	Bass/treble controls, 12 FM, 6 AM presets, chrome eq., slot-in, 12.5W	R	61
<b>Sharp RG-F816E</b> £200	Poor Average	Nothing if not novel the 816, with its unusual anti-theft system is custom built for the furry dice brigade, but is sonically a bit lacklustre	Four band graphic, 8 FM, 16 AM presets, ASP, Dolby, MSS, 10.9W		62
<b>Sharp RG-F882E</b> £220	Average Average	Again a glitzy full feature machine with a flip out control panel and plenty of lights. However, sound quality is a bit disappointing	Seven band graphic, 5 FM, 10 AM presets, ASP, chrome eq., Dolby, 8.5W		62

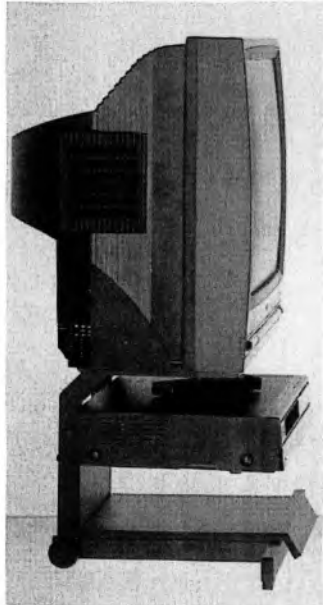


# PERSONAL MESSAGES

*Paul Messenger turns his attentions to the new generation of flat tube television screens.*

I had intended to cover the interesting and keenly priced Goodmans Subwoofer this month, but am currently suffering from a surfeit of speakers, and haven't finished playing with it yet in any case.

To give me a break from sound monitors, and cover a topic which looks like becoming increasingly relevant in the near future, I have decided to kick around a few ideas on the monitoring of moving pictures instead – known colloquially as TV sets.



*Ferguson's new technology 59K5.*

So common and widespread that they are found in over 90 per cent of homes, average more than two per household and are stared at for 20+ hours each week, TV sets nevertheless tend to be taken for granted by the majority of users, who have little or no knowledge of or interest in the design issues and compromises.

I don't pretend to be an expert myself, but in the kingdom of the blind, the one-eyed man gets to watch a lot of telly, and has had the curiosity to ask a few questions about what's going on.

Monitoring implies criteria of accuracy; in the more familiar case of loudspeakers, a number of these can be identified, covering levels of coloration, flatness of response, precision and stability of stereo imaging – even the ineffability of musical and emotional communication, not to mention suitability for a particular room. So what sort of

criteria apply in monitoring moving pictures?

Sneak in through the back door of a broadcast studio and you'll find various different types of monitors, mostly quite small and each according to its task. Monochrome (black and white) is still relevant, particularly for accurate camera focusing and grey scale luma balancing. The very top performance, Grade 3 monitors give the most accurate colours, but at the expense of limited brightness, and are invariably used under dim lighting. And you're unlikely to find an FST (flatter, squarer tube) in the building.

The domestic TV has a quite different set of criteria to satisfy – probably more than one viewer to start with, as far as large screen sets are concerned anyway. Then there are the aesthetics of fitting a large box in the lounge, the need to place it sensibly in relation to windows, artificial light sources and seating positions, and so on. I could probably manage a book, given time, and will in any case return to these issues in more detail in a future article.

The focus of this piece is the tube – described variously as cathode ray (CRT) or colour picture (CPT) according to taste, and the geometry of the screen/faceplate in particular. Which in every sense of the word is the heart of the machine. Although it's basically just an overgrown valve, at least as much high technology as any other consumer product is involved, together with the sort of engineering precision that is quite difficult to conceive.

A CPT consists of an evacuated glass bottle, with screen and (internal) mask at the fat end, and an electron gun down the pointy end. In the early monochrome days, faceplates resembled a section from a goldfish bowl, the curved surface providing good inherent strength to support the vacuum and also facilitating focusing the electron

beam by maintaining a constant distance from the gun to all parts of the screen.

Compared to the references provided by the cinema screen, watching the world monochromatically projected onto the inside of a goldfish bowl is a severe limitation. Straight lines turn into curves based on the radius of curvature.

Tube technology evolved slowly but steadily through the introduction of colour, increasing the horizontal and vertical radii to the point where many would regard the geometry as perfectly acceptable.

Indeed Sony went one step further than the competition. Its unique Trinitron tube is virtually flat in the vertical plane (ie radius approaches infinity), though the horizontal curvature is more conventional. But if you ever try lifting a big Trinitron, your back will remind you that this is not a job for one person. Flattened screens need thick, heavy glass to avoid risk of vacuum implosion, and is one reason why Sony sets are rather expensive.

For many years Sony's 'half flat' approach ploughed a lonely though quite successful premium price niche. Then rival Japanese manufacturers led by Toshiba flattened and squared their tubes to create a premium product, and in the mid '80s the FST concept came to fruition.

Although for once the US has been less easily persuaded, FST has never looked back in Teletext-oriented Europe: in the UK, FST sets took eight per cent of 1985's large screen TV sales – and nearly 80 per cent by 1988.

Apart from a little 'squaring off' at the corners (and apart from the cylindrical Trinitron), all screens to date have stuck to spherical sections horizontally and vertically. Which means that straight lines are reproduced as constant radius curves.

Now a new generation of tubes from Thomson subsidiary Videocolor is introducing

aspherical geometry, creating probably the flattest tube yet and without any weight or performance penalties.

The central section, over more than half the area, is very flat indeed, particularly horizontally – but the tradeoff is that the edges are rather more sharply curved than normal FSTs.

These Super Planar tubes are found on the new K-series Ferguson sets (which also come with optional NICAM stereo and rather neat monitor styling). The screen geometry makes an interesting comparison with conventional spherical section sets. After an initial acclimatisation to the unfamiliar, I have grown to like the £530 51K5, and accept that the extra flatness is its own reward in progress towards the screen ideal, even though some panning shots create a strange effect at the screen edges.

Perhaps partly to make the unfamiliar geometry less noticeable when the set is switched off, the K series also has a special non-reflective screen finish. To my eyes this is an undoubted bonus in coping with daylight and room lighting reflections, though it does leave the screen looking a little pale when the set is off.

But an examination of the ins and outs of the light transmission factors of different glassware and phosphor matrices will have to wait for another occasion, as will consideration of relative brightness and contrast ratios – and the dozen or so other factors that make colour TV tubes almost as interesting as loudspeakers.

Ultimately, TV screen geometry is all compromise, whether traditional spherical, Trinitron, FST or Super Planar – each has strengths and weaknesses that leave the final decision down to personal taste. But it's the sort of decision that's better made with some knowledge of the issues involved, rather than under the influence of a fast-talking salesperson.



*Screenplay: Super Planar tube does it better.*

SOUND AND STYLE



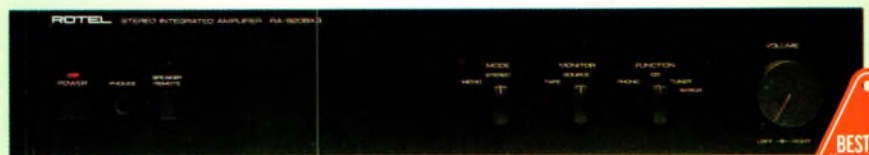
# PUT THE BEST TO THE TEST



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**RA820A** 30W STEREO INTEGRATED AMPLIFIER



**RA820BX3** STEREO INTEGRATED AMPLIFIER



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